ARSENAL FOR THE BRAVE

A HISTORY OF THE UNITED STATES ARMY MATERIEL COMMAND

1962 - 1968

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UNITED STATES ARMY MATERIEL COMMAND
1962-1968

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FOREWORD

One of the major aspects of the sweeping reorganization of the Army in 1962 was the creation of a single major command charged with developing and furnishing the Army with the weapons and tools of modern war. This command, the Army Materiel Command, assumed the materiel missions of six of the Army's Technical Services.

Following its activation on 1 August 1962, the new command quickly demonstrated its ability to respond to the needs of the Army when Russian missiles were discovered in Cuba in the fall of 1962. Its greatest challenge to date came when the President decided to send United States combat units to Southeast Asia, and the Army was faced with the unprecedented task of simultaneously developing a logistical base and building the required levels of supply and maintenance support. The performance of the Army Materiel Command in meeting this challenge has been outstanding.

I have been in contact with the Army Materiel Command since its inception and have personally observed the splendid manner in which that command has performed its mission.

This volume is a testimonial to the ability and devotion to duty of all personnel in the command, but particularly to its Commanding General, Frank S. Besson, Jr. Because of his organizational ability and leadership, the Army Materiel Command truly lives up to its motto—"ARSENAL FOR THE BRAVE."

Paul R. Ignatius

PAUL R. IGNATIUS

Washington, D.C.
31 January 1969

Preface

An Army historian of World War II wrote:

> While the importance of logistics is repeatedly asserted, little has been written to indicate the complexity of the administrative machinery needed to bring the required logistic support to bear at the proper time and place, or show the difficulty of anticipating the requirements of distant battles.*

The U.S. Army Materiel Command, the Army's first centralized logistics command to exist in peacetime, was formed in 1962 to reduce the complexity in administrative machinery and to gain new control of that machinery. It was also formed to improve determination of requirements for distant battles and, as it turned out, for nearer engagements of the budget and the economy.

This history, a first version of an Army Historical Program historical monograph, attempts to trace the trends of complexity, difficulties and achievements of the Army Material Command in the period from April 1962 to March 1969 when it was under its first commander, General Frank S. Besson, Jr. It attempts to portray some of the finished business upon which General Besson could look back with satisfaction as he turned his command's distinguishing flag over to its new commander, General Ferdinand J. Chesarek, on 10 March 1969, and some of the unfinished business which logistics organizations have been trying to finish since there were logistics organizations.

The account was based on a variety of operating element submissions and on materials gathered by the U.S. Army Materiel Command Historical Office during the course of its existence. Mr. Charles W. Lynch prepared chapters I, II, and X. Mr. Raymond J. Snodgrass prepared chapters III, IV, and IX. Mr. Myles G. Marken, Sr., prepared chapters V and XI. Chapters VI, VII, and VIII were initially prepared by Mr. Leonard C. Weston, Chief Historian, U.S. Army Test and Evaluation Command, and were revised by the Historical Office staff after the termination of Mr. Weston's temporary duty. Chapter XII is a joint product of Mr. Marken and Dr. Dale Birdsell. Miss Dora M. Fletcher was responsible for copy editing and typescript preparation of the several review drafts.

DALE BIRDSELL
Chief, Historical Office

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*Roland G. Ruppenthal, *Logistical Support of the Armies*, UNITED STATES ARMY IN WORLD WAR II (Washington, GPO, 1953), I, ix.

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BACKING INTO A BUZZ SAW

In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist. We must never let the weight of this combination endanger our liberties or democratic processes. We should take nothing for granted. Only an alert and knowledgeable citizenry can compel the proper meshing of defense with our peaceful methods and goals, so that security and liberty may prosper together.

President Dwight D. Eisenhower,
Farewell Address, 17 January 1961,
as quoted in *Keesing's Contemporary Archives*, Vol. XIII, 1961–62 (Bristol, England) p. 17888.

CHAPTER I

BACKING INTO A BUZZ SAW

The Climate of the Times

On 6 December 1961 the Chiefs of the Army's Technical Services gathered to hear, officially, what had been whispered in the corridors of the Pentagon for months. A major reorganization of the Department of the Army was in the making—the most sweeping in modern times. The heart of the proposed reorganization was the Army logistics system which had, since the founding of the Republic, been the special province of the several Technical Services. Now these proud institutions were to become relics of the past—victims of the revolution in science and technology which had occurred since World War II, and of the new concept for Defense management which was coming into being.

To one observer, it seemed the chiefs did not appear to realize that this time "it was for real." Reorganization plans had come and gone without working any basic changes, and it was hard to conceive that this plan would prove any different. Reorganizations were disruptive and risky in times of heightened international tensions, and the general reaction of the Technical Service chiefs was a mixture of disbelief and disapproval. One of them did concede that the current decisionmaking process was unnecessarily cumbersome, and to this extent at least he, more than the others, reflected the climate of the times.[1]

In actual fact, the reaction of the Chiefs of the Technical Services to the plan under discussion was largely immaterial. The plan was a product of Office of the Secretary of Defense (OSD) Project 80, and in the conduct of this project both time and opportunity for resistence to develop had been successfully finessed. The study had been conducted outside of normal staff procedures and it had received the personal attention of the Secretary of Defense, Robert S. McNamara. When the Chiefs of the Technical Services gathered to hear Mr. McNamara outline the concept for the reorganization of the Army, the concept had already been accepted by the Army Chief of Staff, the Secretary of the Army, and the Secretary of Defense. To make it official, there remained approval by the President and acceptance by the Congress.[2]

The subject of reorganizing the Technical Services had arisen before. Twice in times of national emergency—during World Wars I and II—it had been necessary to build an organization over the Technical Services to control and give direction to their efforts. On each occasion, the Technical Services, some of which was older than the Nation itself, tracing their origins back to 1775, had reverted to their previous status once the crisis had passed.

The autonomous nature of the Technical Services had been the subject of persistent criticism, and in a letter to the President during the Korean Conflict Secretary of Defense Robert Lovett had proposed a reorganization. The process, he parenthetically remarked, would be "no more painful than backing into a buzz saw, but long overdue." [3] In response to this criticism the Deputy Chief of Staff for Logistics (DCSLOG) assumed a command position over the Technical Services during the reorganization of the Army in 1954. But this

[1] Martin Blumenson, "Reorganization of the Army, 1962," OCMH, DA, Monograph 37M, pp. 70–71.

[2] *Ibid.*, pp. 62–63.

[3] Ltr, Robert Lovett to President Truman, 18 Nov 52. This letter, given in testimony to the Congress and made public with the permission of the President, was published in the *Army, Navy, Air Force Journal*, 10 January 1953.

reorganization, as every other since World War II, was rather halfhearted and inconclusive. It left the DCSLOG sharing direction and control of the Technical Services with other agencies in the areas of personnel and training and in the increasingly important area of research and development. As a consequence, effective integration of the supply system was not achieved, and in fact the Army continued to operate with seven separate supply systems. The lack of a single, integrated Army supply system had obvious disadvantages for the users; furthermore, it made coordination in the development and production of increasingly complex —and costly—weapons systems a difficult, time-consuming process.

By 1960 the winds of change were gathering, not over the Department of the Army alone but over the Defense establishment as a whole. They were fueled by a growing uneasiness in both the executive and legislative branches of the Government over the Government's ability to manage and control its massive Defense effort, particularly in the spectacular area of research and development. This was evident in President Eisenhower's final message to the American people as the Nation's chief executive in January 1961.

Before World War II, the President explained, the United States had had no armaments industry, but in the postwar era it no longer had been able to risk its safety on emergency improvisation. Instead, it had been compelled to create a permanent armaments industry of vast proportions and to harness it to the swift coursing of science and technology. The American people, he said, needed both to recognize the imperative need for this development and to comprehend its grave implications.[4]

There was uneasiness on yet another score. Through the 1950's the Nation had come to rely to a large extent on the doctrine of massive retaliation, with its emphasis on strategic nuclear weapons. For the Army these had been lean years, and for the Nation a time of growing apprehension. Protection of national interests, it was argued, was being reduced to a choice between nuclear holocaust and retreat; the Nation needed more diversity in its military power, a "more flexible response." Where national interest but not necessarily national survival was at stake, it needed nonnuclear forces to avoid being nibbled to death.[5] Still, there were the costs to consider. Already about half of all Federal expenditures—or ten percent of the gross national product—was going for defense, and many of the possibilities being opened up by science and technology simply could not be pursued.

These key questions—the structuring of the Nation's defenses, and the selection of the most promising from among the myriad possibilities being opened by burgeoning science—prompted several significant actions during 1961. One was the appointment of Robert S. McNamara as Secretary of Defense with a mandate from the President to develop the military force structure necessary to support U.S. foreign policy without regard to arbitrary budget ceilings, though at the lowest possible cost. Another was the appointment, by President Kennedy in July 1961, of a high-level task force, headed by David E. Bell, Director of the Bureau of the Budget, to study policies and procedures governing the Government's contracting for research and development.[6]

These moves put the stamp of change on the Defense environment of the 1960's. The revolution in science and technology since World War II had brought a veritable explosion in the range of warfare, and generated a need for Defense management to keep pace with these changes. In the process, many of the organizations, systems, and procedures of the past were to be replaced. Many would see these changes as a revolution in Defense manage-

[4] Quoted in *Keesing's Contemporary Archives*, vol. XIII, 1961–1962 (Bristol, England), p. 17888.

[5] (1) By June 1965, the Secretary of Defense would later report to the Congress, the U.S. had increased its nonnuclear forces markedly as compared to 1960. He cited, among other examples, a 45 percent increase in combat-ready Army divisions, a 45 percent increase in combat helicopters, a doubling of airlift capability, and a tenfold increase in Special Forces trained for counterinsurgency operations. (2) *Hearings* before a subcommittee of the Committee on Appropriations, H.R., 89th Cong, 2d sess, DOD Appropriations for 1967, pt. I, p. 8 (GPO, 1966).

[6] Ltr, John F. Kennedy to David E. Bell, 31 Jul 61, n.s., in S. *Doc* 94, *Rpt to the President on Govt Contracting for Research and Development*, U.S. Senate, 87th Cong, 2d sess (GPO, 1962).

ment, but much that occurred was the product of evolution.

Ever since 1799 the United States had had two military departments, the War Department and the Navy Department. But World War II saw the development of strategic air power, and the Army Air Corps became autonomous, another service in fact, although not yet authorized by law. The war had also demanded teamwork among land, sea, and air forces as never before, and to coordinate the efforts of the military services the Joint Chiefs of Staff came into being, also without benefit of any law.

The Defense management structure of the 1960's had its origins in the National Security Act of 1947. This act created the National Security Council; established the Joint Chiefs of Staff and the U.S. Air Force by law; and created a national military establishment as one body under a civilian Secretary of Defense. The U.S. military establishment remained but a very loose federation, however, for the Army, Navy, and Air Force still retained their Secretaries with full cabinet rank. The amendments of 1949 corrected this. They created a unified Department of Defense under a civilian Secretary, and established a chairman for the Joint Chiefs of Staff. The Secretaries of the Army, Navy, and Air Force, now subordinate to the Secretary of Defense, lost their cabinet rank.

This organization carried the United States through the Korean War, but there were still problems with the chain of command and with the role of the Joint Chiefs. This led to the passage of the last piece of major Defense Department legislation during the Eisenhower Administration, the Defense Reorganization Act of 1958.

This act created the Defense structure of the 1960's. Before 1958, the chain of command went from the President down through the Secretary of Defense to the Departments of the Army, Navy, and Air Force, and from there to the unified and specified commands. The Joint Chiefs of Staff served primarily in an advisory capacity. After 1958, the chain of command continued to flow from the President to the Secretary of Defense, but from there through the Joint Chiefs of Staff to the unified and specified commands. Now removed from the line of command, the Departments of the Army, Navy, and Air Force were limited to administrative and logistics functions, to providing the trained men and modern equipment that constituted the sinews of war.[7]

There was no further legislation in this area during the decade which followed. In 1960, however, a Senate subcommittee under the leadership of Senator Jackson of Washington called, among other things, for a more vigorous employment of the broad authority already invested in the Secretary of Defense. The subcommittee also called for a budgetary process more consistent with the requirements of modern weapons technology.

Secretary McNamara took office in January 1961, and apparently that advice complemented his own philosophy of Defense management. As he was to say many times, either of two broad philosophies of management were open to the Secretary of Defense. He could exercise a passive (judicial) role, arbitrating quarrels among the services, or he could be an aggressive leader, asking questions, suggesting alternatives, and proposing objectives. For McNamara, the latter was the proper role for the man charged with the biggest management job in the world.

National security policy had its origin with the President, who alone had the final responsibility and the final authority. This policy was converted into military missions, and military missions were translated into plans, programs, and budgets, through the workings of the Joint Chiefs of Staff's family of war plans, the vehicle for determining the right mix of people, skills, ships, tanks, missiles, and airfields needed for national defense.

Given the speed of technological change and the multitude of possible contingencies, this was not easy. Each year the Joint Chiefs of Staff prepared three basic war plans covering the long range, medium range, and short range period. The Long Range Strategic Study, largely a crystal ball effort, was an attempt to look 10 to 14 years into the future. The Joint Strategic Objectives Plan (JSOP) covered the mid-range period 5 to 10 years ahead. It pro-

[7] This summary of Defense structure and the following discussion of Defense management are from the lecture, "Defense Management," Capt Bernard A. Thielges, Special National Security Seminar, ICAF, 15 September 1967.

vided sort of a timetable for getting the military establishment to where it wanted to be five years in the future. The key word was objective, and for the Department of the Army, the JSOP provided the basis for its Procurement of Missiles and Equipment, Army (PEMA), and its Research, Development, Test, and Evaluation (RDTE) programs, the funding programs which provided the major portions of the Army's logistics effort. Finally, there was the Joint Strategic Capabilities Plan, the key word being capability. Covering the short range—the next year—it spelled out how the United States would fight a war with what it had on hand, and it provided the basis for the contingency war plans of the unified and specified commanders.

Since Defense management was concerned with requirements rather than capabilities, it was on the JSOP—the middle plan—that Secretary McNamara focused attention, and it was in this area that he instituted a major advance in Defense management. In the past, each service—Army, Navy, Air Force, and Marine Corps—had taken the JSOP from the Joint Chiefs of Staff and prepared its own program, which was then translated into a separate budget. Three separate budgets went up to the Secretary of Defense for approval, and the total Defense budget was reviewed by the Bureau of the Budget, the President, and the Congress primarily on the basis of requirements fragmented into individual service programs. Budgetary decisions were made and funds handed out according to who was going to spend the money, rather than on the basis of what the money was going to buy in terms of defense.

Mr. McNamara changed this approach to the requirements of National defense by instituting a planning, programing, and budgeting technique developed by Charles J. Hitch, the Defense Comptroller. Known as the Five Year Force Structure and Financial Program (FYSFP), it represented a five-year financial program designed to back up the Mid-Range War Plans. It brought a mission or functional approach, rather than an individual services approach, to Defense management, and its success was such that President Johnson subsequently directed other departments to adopt this method of management.

Under the FYSFP there was no mention of the Army, Navy, Air Force, or Marines. Instead, all programs and budgets for all four services were restructured into nine major divisions: Strategic Forces, General-Purpose Forces, Specialized Activities, Airlifts and Sealifts, Guards and Reserves Forces, Research and Development, Logistics, Personnel Support, and Administration. Since Air Force bombers and missiles as well as the Navy's Polaris missiles submarines were included under Strategic Forces, this made it possible to compare total costs of competing weapons systems which had generally the same purpose.

The Five-Year Defense Program also provided a means for evaluating the force structure in terms of its total cost over the next five years, rather than only one year ahead as in the past. It meant a new kind of financial management, one which related day-to-day operations to the appropriate elements of the Five-Year Defense Program. In the past, military commanders had budgeted only for about 20 percent of their costs, with things like their military payroll and their real estate and maintenance costs being budgeted on a servicewide basis. Under the new system these items were related, by organization, to the Five-Year Defense Program.

Once this system was started, each succeeding year was largely a process of updating and changing the existing program. Changing the program raised the question of centralized versus decentralized decisionmaking—the question of who could approve changes. Obviously, every change could not go up to the Office of the Secretary of Defense (OSD) for approval, so dollar limits, or "thresholds," were established to determine where decisions could be made. For research and development programs costing more than $10 million in the current year or $25 million overall, the decision level was the Office of the Secretary of Defense. The same was true for weapons program elements, but in the area of military construction, any program costing over $5 million the first year required OSD approval. The net result of the Five-Year Defense Programs, the "Thresholds," and Mr. McNamara's own active management meant more management decisions than ever before being made at the top.

Much came to be written about the revolution in Defense management after Mr. McNamara became the Secretary of Defense, but essentially what he and Mr. Hitch did was to introduce two things: one was the Five-Year Defense Program; the other was systems analysis. Systems analysis amounted to formalizing the means for finding all the ways a particular thing could be done and for comparing these choices on the basis of cost and effectiveness. Since these comparisons were based to a large extent on mathematical quantification, computers and mathematics became primary tools for determining which option would buy the most effectiveness for the same money. The basic components of systems analysis were logic, economics, and mathematics, and they were used to pick out the solution or combination which would do the job at the most reasonable cost.

The use of systems analysis did not mean that computers were replacing military judgment in the DOD, as was sometimes said. Computers were useful, even essential, for analyzing problems that required handling data on a very large scale or making repetitive calculations, but all they did was arithmetic. While disagreements developed between the military and civilian leadership, these differences were not over things like computers, systems analysis, or the Five-Year Defense Program. In general, military men welcomed these things as genuine management improvements. The differences, when they developed, were primarily over centralized versus decentralized decision-making (the threshold), over specific individual decisions, such as whether the United States needed to deploy an antiballistic missile system, and over the level of resources (men, machines, and money) required to accomplish assigned tasks.

Many saw such controversy as a sign of health, for it showed a free exchange of ideas. But it was also inevitable. With advancing technology offering ever more options in the area of national defense, opinions differed concerning what resources the Nation should devote to military power, and concerning what programs, within the available resources, would produce the military posture best suited to the Nation's needs.

This view of conflict was reflected at various levels of the Department of Defense, wherever managers were devoted to making the best decisions possible under prevailing circumstances. It was, for example, the firm belief of General Besson, Commanding General of the Army Materiel Command, that "the most valid decisions result from conflict, not from compromised concurrence." He encouraged conflict, he said, for by having different people examine different aspects of each specific program, problems were brought out into the open where they could be resolved.[8]

OSD Project 80

Soon after he took office as Secretary of Defense, Robert S. McNamara established numerous special study groups to consider various aspects of the huge Defense establishment. One of these, known as OSD Project 80 (Army), was established to study the functions, organization, and procedures of the Department of the Army. Another was DOD Task Force 97, established to review the quality of the in-house laboratories. Subsequently becoming involved with the Bell Committee, it became a primary instrument for strengthening the in-house research laboratories and the Government's capability to manage its huge investment in research and development.

OSD Project 80 was precipitated by a debate which had been carried on for years. The debate concerned how well the Department of Defense was adapting itself to the explosion in technology, to new management concepts, and to the unprecedented complexity of its missions. Insofar as it touched on the Department of the Army, it was concerned to a considerable extent with how well that Department could adapt to the fast-changing Defense environment, given its existing basic organizational structure. There had been significant changes in the Defense environment, particularly since the Defense Organization Act of 1958, and the purpose of OSD Project 80 was to determine

[8] Address, Gen F. S. Besson, Jr., CG, AMC, to Combined Southwest Area Chapters, Armed Forces Mgmt Association, San Antonio, Texas, 18 Apr 68.

how these changes affected the Department of the Army.[9]

A group of Army officers and civilians working under the direction of Mr. Leonard W. Hoelscher, Deputy Comptroller of the Army, began this study in April 1961, and published their report "Study of the Function, Organization, and Procedures of the Department of the Army, OSD Project 80 (Army)" in October 1961. Known as the Hoelscher Report, it became the basis for one of the most sweeping reorganizations in the history of the Department of the Army.

The Hoelscher Report consisted of separate studies of six areas, but the heart of the report was that portion concerned with the office of DCSLOG, the Technical Services, and logistical functions. The final report of the Project Director, largely a synthesis of the six primary studies, presented the overall findings, conclusions, and recommendations of the Project 80 study organization.[10]

The guidelines provided by the Deputy Secretary of Defense did not direct Mr. Hoelscher to present a plan for reorganizing the Army, but rather to analyze the existing organization and make whatever recommendations seemed appropriate. But considerable change was already underway in the Defense establishment, and in the course of the study it became evident that the basic task of the Committee was to reshape the Army and give it a structure more in consonance with the managerial philosophy and techniques coming into prominence.[11]

Significant new trends in Defense management were already discernible at the time the Hoelscher Committee made its study. One was an increasing tendency toward centralized control by the Secretary of Defense, with the Secretary of the Army becoming more an extension of the Office of the Secretary of Defense than an active proponent of strictly Army objectives. Centralization was evidenced in the logistics area in plans for the establishment of a Defense Supply Agency, in the intelligence area by the establishment of the Defense Intelligence Agency, and in the research and development area it was manifested by detailed control over projects. There was also the likelihood —soon to be realized—that Defense budgets would be based on program packages designed to provide military capabilities to meet threats, rather than on bulk allocations of manpower and funds to the services as in the past. There was the probability that managerial and budgetary procedures would soon be uniformly prescribed throughout the Department of Defense; and there was a growing emphasis on systems of project management. The study group also detected an increasing emphasis on the maintenance of conventional as well as nuclear forces in support of a national defense strategy calling for a capability to meet all types of threats, and it saw a growing emphasis on the search for new concepts as well as new hardware, for technology had become a potent instrument of international power.[12]

The Technical Services and logistics were of particular interest to the Office of the Secretary of Defense, and the group which studied these areas noted two Defense trends as bearing most directly on this area. One was the tendency to assign all combat forces to unified and specified commands, which made the Army's logistical mission a very large part of its total responsibilities. The other was the tendency toward integrated supply management and financial control at the Defense level which, together with increasing technological innovation and greater complexity and costs of weapons systems, was leading to tighter management at the Defense echelon and to increased public and Congressional scrutiny of Defense budgets. It was also evident that the General Staff, especially the DCSLOG, needed to be separated from logistical operations and the Technical Services removed from the wholesale materiel function. What the Army needed, the group concluded, was a single commodity-oriented organization responsible for both development and production.

Within the Project 80 organization, opposition to the concept of a single materiel command came mainly from the group concerned

[9] Rpt, "Study of the Functions, Organization, and Procedures of the Dept of the Army (Hoelscher Rpt) OSD Proj 80 (Army)."

[10] Hoelscher Rpt, pt. I.

[11] Unless otherwise noted, the following account is based on (1) Martin Blumenson, *op. cit.* (2) AMC Historical Summary, FY 1963, chs. I–III.

[12] Hoelscher Rpt, pt. V, pp. 3–4.

with research and development. This group argued that there should be two materiel commands, one concerned with research and development; the other with production and procurement. To do otherwise, they held, would be to subordinate development to immediate, day-to-day requirements, thereby creating the same sort of condition that had prompted the separation of the Chief of Research and Development from the DCSLOG in 1954. This matter was argued at length during July and August 1961.

Hoelscher Report

In its overall report the Hoelscher Committee found four major functional areas in which worthwhile improvements could be made: materiel, training and readiness, personnel management, and combat developments. Under the existing organization there was no unified direction of the Army wholesale materiel functions, as carried out by the Technical Services, short of the Army General Staff level. This made difficult the coordination required by the complex weaponry of the postwar years. Training and readiness responsibilities were also diffused in the existing organization, as were responsibilities for personnel management and combat developments.[13]

The report cited a number of ways in which the existing pattern of organization and management failed to meet the Army's needs, but it found no simple solution to the problem of organization of the Department of the Army. The committee presented several possible patterns, and discussed the advantages and disadvantages of each. This done, it presented as its recommendation a pattern designed to provide the best overall organization, on balance.[14]

The Project Director was troubled lest the sheer volume of the subjects covered and materiel presented should obscure one critical requirement, and in forwarding his overall report to the Secretary of the Army he singled this out for special mention. There was, he said, a need for strong and continuing emphasis on the anticipation of the nature of future military demands, and on planning and action to meet them. "The nature of the Government environment," he wrote, "is such that exceptional effort and procedural arrangements are required to accord the future the attention and resources it deserves." [15]

The reorganization of the Army, as proposed by the Hoelscher Committee and subsequently approved by the Army Staff and the Secretary of the Army, contained five major proposals. One was to combine the materiel functions of the Technical Services, and the service test functions of the U.S. Continental Army Command (CONARC), under a new U.S. Army Systems and Materiel Command. Another was to combine the combat developments functions and doctrinal responsibilities of the Technical Services and other agencies under a new U.S. Army Combat Developments Agency. The third was to assign all responsibility for individual and unit training to the CONARC. The fourth called for modification of the Army Staff to relieve it of command-type and operating functions so as to permit a greater emphasis on planning, programing, and policymaking. A fifth proposal, and a key one, was that an Office of Personnel Operations be established at the Special Staff level with broad responsibilities for career development and the assignment of military officers.[16]

The Hoelscher Committee had considered the proposal to strengthen research and development by dividing the Army's materiel functions between two materiel commands: one responsible for the development and initial procurement of all equipment, and the other charged with total inventory control and distribution. However, this would mean that control of the total logistic effort would be achieved only at the Chief of Staff level, and in its final report the Committee recommended the establishment of a single major field command responsible for all Army materiel functions.

The new command, soon to be redesignated the U.S. Army Materiel Development and Logistics Command (MDLC), would have three main elements: a group of commodity commands to perform research, development, procurement, and production of Army ma-

[13] Hoelscher Rpt, pt. I, p. I–23.

[14] *Ibid.*, pp. 46, 49, 103.

[15] Ltr, L. W. Hoelscher to Elvis J. Stahr, Jr., 5 Oct 61, Hoelscher Rpt, pt. I, pp. iii–iv.

[16] Rpt on the Reorganization of the DA, Dec 1961 (The Green Book), p. 23.

teriel; another subordinate command to perform test and evaluation; and yet another to operate the Army supply system.

In addition, there was to be provision for giving special attention to research and development, for it was recognized that the total materiel process was beset by two mutually interacting but opposing forces. At one extreme there was the necessity for capitalizing on the fruits of scientific discovery, and at the other were the pressing problems of present day support. Apart from these forces was the necessity to pursue scientific breakthroughs to avoid one day being confronted by an enemy with far superior weapons and equipment. The concept provided for a Director of Research and Development to be established within the command headquarters to unify and direct the total research and development effort, and for certain laboratories with Army-wide functions to report directly to him.[17]

From a research and development standpoint, it was conceded, a more desirable organization would be one that would have research, development, and selected production in a command separate from the one charged with other logistics tasks. On the other hand, it was viewed as impracticable to divide materiel responsibilities in view of the extensive changes being contemplated. During the critical period of transition to the new organization it was considered essential that a single commander control all wholesale logistics functions pertaining to materiel. The sub-task force which had studied research and development had, itself, recognized that there were other facets to the complex problem of DA organization, and that its principal proposals which emphasized the Army's future would involve some cost on other activities. It left the "Solomon judgment" of weighing the trade-offs involved to those bearing the final responsibility for the overall study.[18]

[17] Hoelscher Rpt, pt. I, p. 110.

[18] (1) *Ibid.*, pt. I, p. 111; pt. V, p. v. (2) In forwarding his final report, the Project Director called special attention to the Research and Development report because of the discussion it contained of factors, other than major organizational structure, which influenced the effectiveness of research and development, such as overall planning, basic and applied research, and management of technical and scientific personnel, all of which were complex problems and difficult of solution. (3) Hoelscher Rpt, pt. V, foreword by L. W. Hoelscher.

Review and Approval

With the publication of the Hoelscher Report, the Army Chief of Staff appointed a committee of senior officers, headed by Lt. Gen. David W. Traub, the Comptroller of the Army, to "develop and recommend to the Chief of Staff the views of the Army General Staff" on the report and to "prepare for a plan of implementation." The Traub Committee had its report ready before the end of November. It recommended general approval of the concepts contained in the Hoelscher Report, but cited several places where some modifications, all at the Army Staff level, had been approved by the Secretary of the Army.[19]

The Committee also offered guidelines for implementing the reorganization so as to preserve the Army's effectiveness and efficiency during the critical period of transition. The transition would start with a planning phase, the success of which would depend on the early designation of the new commanders. This would be followed by an activation phase, beginning when the new commanders assumed responsibility for the newly assigned functions. In the third and final phase, the internal structures of the new agencies and commands would be modified as required, and the mid-management and field organizations would be structured. The Hoelscher Committee had estimated that it would take 12 months after final approval for the reorganization to be accomplished; the Traub Committee considered 18 months to be an optimistic estimate.[20]

No firm decision had yet been made on whether to implement the reorganization, and no firm basis beyond a conceptual framework yet existed to shape an actual reorganization effort. It did become apparent, however, that the Secretary of Defense was satisfied with the concept, and that he was particularly interested in the MDLC portion. A brief statement explaining the concept of the reorganization became necessary, and a new paper, known as the Green Book,[21] came into being. It set

[19] (1) CSM for Dep Chiefs of Staff *et al.*, 14 Oct 61, subj: Study of Army Organizations: (2) Study of Army Organizations Rpt of the Committee Appointed to Develop and Recommend to the CofS, Army, the Views of the Army General Staff on Proj 80, Nov 1961 (Traub Committee Rpt).

[20] *Ibid.*, p. 18.

[21] Rpt on the Reorganization of the DA, Dec 1961 (The Green Book).

forth the conceptual framework of the reorganization, and on 10 December it was submitted to the Secretary of Defense.

Approval by the President and the Congress followed. The McCormack-Curtis amendment to the Defense Reorganization Act of 1958 authorized the Secretary of Defense to reorganize non-combat agencies within the Department, to become effective if the Congress did not object within 30 days of notification. In January 1962, Mr. McNamara sent the President his formal proposal for reorganizing the Army, and on the 16th the President approved it. On the same day, the Secretary's Reorganization Order was placed before the Congress, and in the absence of any congressional objection it became effective one month later, 16 February.[22]

Planning for the MDLC

Secretary McNamara's Reorganization Order transferred the military duties performed by the Chief of Engineers to the Secretary of the Army. It also abolished the Chief Signal Officer, The Adjutant General, the Quartermaster General, the Chief of Finance, the Chief of Ordnance, the Chief Chemical Officer, and the Chief of Transportation as statutory offices, and it gave Army Secretary Elvis Stahr the authority to transfer their functions as he saw fit. While it became effective on 16 February 1962, Mr. Stahr exercised his option of continuing the existing organization as required to facilitate an orderly transition.

The issuance of this order signaled the official opening of plans to implement the reorganization, and on 26 January the basic machinery of the reorganization was established by the Army Chief of Staff. Among other things, he named General Traub as the Project Director and designated the chairmen of the four major planning groups. As chairman of the MDLC Planning Group he named the 51 year old Chief of Transportation, Maj. Gen. Frank S. Besson, Jr., and it was generally understood at the time that General Besson would command the organization he was responsible for creating.[23]

Planning Group

The work of the MDLC Planning Group was initiated immediately after General Besson was named chairman, and by 19 March, when the Department of the Army Reorganization Project Office (DARPO) authorized detailed planning to start,[24] much preplanning had been accomplished. Initially authorized 50 personnel spaces for officers and civilians and 12 clerical spaces, the Planning Group was organized into four principal sections. This enabled it to focus, under an overall control group and secretariat, on the broad areas of financial management, systems management, functional management, and on the command's operations in the area of research, development, test, and evaluation.

Preparing detailed plans for an orderly assumption of the wholesale materiel functions of the Army was a complicated undertaking, and a host of difficulties soon materialized. The basic problem lay in the fact that the Green Book, which had been approved as the basis of the reorganization, provided only a conceptual version of what the new organization should be. There were a multitude of decisions, large and small, remaining to be made, and no one on the decisionmaking level of the Army seemed anxious or had time to make them. Consequently, the planning groups were hampered and delayed in their work. For example, the commanders of the MDLC subordinate commands were not named until 11 April; decisions regarding sites did not come until May; and guidance in the area of financial management was so slow that the command ultimately found itself assuming responsibilities for financial mangement without benefit of guidance from the Department of the Army.[25]

One of the problems that appeared early and stayed late was that caused by the lack of a clear definition concerning what functions the General Staff agencies were going to transfer to the MDLC. Early in March, General Besson

[22] Martin Blumenson, *op. cit.*, pp. 75, 77, 80.

[23] DA ltr, AGAM-P(M)320 (25 Jan 62) COMPT-M, 26 Jan 62, subj: Reorganization of the Dept of the Army.

[24] DARPO 10 1, 19 Mar 62, subj: Organization and Functions: DA Reorganization Plan.

[25] (1) AMC Historical Summary, FY 1963, p. 83. (2) Martin Blumenson, *op. cit.*, pp. 98–99.

informed the Planning Council that he would like to know, even on a fragmentary basis, what the DCSLOG and the Chief of Research and Development did *not* intend to do in the future, but it was April before the roles and functions of the General Staff were discussed in the Council. Even then, staff discussion of the basic problem was largely a rationalization for retention of authority, and it grew evident that little responsibility was to be delegated to the new command, despite the Hoelscher Committee's findings that the General Staff should be relieved of command-like detailed operating functions.

There also developed, in the early weeks of preplanning, a need to clarify the guidelines to be followed in organizing the midmanagement structure of the MDLC, in view of the conflicting statements and recommendations then being made. Early in February, for example, the Secretary of Defense wrote a member of Congress that the Department of the Army wanted to place Chemical Corps and Ordnance materiel under one commodity command so as to facilitate the development and production of advanced weapons that combined chemical and ordnance technologies; but at that time the Army was considering establishing a separate development and production command for chemical, biological, and radiological (CBR) activities. Various other proposals for the structuring of the commodity commands were also being made during this period.

Then, in a letter dated 24 February 1962, the Secretary of Defense introduced another factor. In response to inquiries, he assured members of the Michigan congressional delegation that there would be no transfer of functions in or out of the Ordnance Tank-Automotive Command (OTAC), in Detroit, at least for some time to come. The effect was to raise the question of who was responsible for initiating any changes in the organization outlined in the Green Book, and of whether the MDLC Planning Group was locked to the organizational pattern set forth therein.

To resolve these questions, the Planning Group made a staff study of how many development and production commands there should be, and how commodity management responsibilities should be assigned. Of the many solutions possible, the study selected four for consideration by the Army Staff. One followed the approved organization of the Green Book; it provided for five commodity commands: Missile, Communications and Electronics, Weapons and Mobility, General Equipment, and Munitions (including CBR) Commands. But there were two problems. This solution involved the transfer of combat vehicle activity from Detroit, and so was inconsistent with the assurance given by the Secretary of Defense. Furthermore, it lacked balance, for the General Equipment Command would be a very small organization responsible for a nonhomogeneous grouping of materiel ranging from food and clothing to construction equipment and demolitions material.

The other three patterns all recognized the freeze on movement into or out of Detroit, but with variations. The pattern recommended by the study group provided for six commands, including a separate CBR Command. The Detroit problem would be met by splitting the mission of OTAC between combat and general purpose vehicles, the former going to a Weapons and Combat Vehicle Command and the latter to the Mobility and General Equipment Command.

At a briefing for the Secretary of the Army on 19 March, it was decided that the mission of OTAC would indeed be split. It was further decided that the headquarters of the Mobility and General Equipment Command would be in Detroit, and that of the Weapons and Combat Vehicles Command would be at Rock Island, Illinois. It was also decided, during the general discussion which followed this briefing, that the recommended structure should be modified to provide for only five commodity commands by assigning CBR activities to the Munitions Command.

Determining the relative roles of the various echelons of command also occupied a considerable amount of the planners' time. In the process, the planners investigated the systems used by major industrial firms, such as Ford, Dupont, General Electric, and General Motors. After prolonged discussion, it was decided that each activity would need to have a complete staff for its respective mission and functional responsibilities. With this decision made and the commodity command structure of the MDLC settled, the Planning Group could proceed

with the preparation of detailed implementation plans.

Preliminary Implementation Plan

Detailed planning began on 19 March 1962 when the DARPO directed the MDLC Planning Group to submit a preliminary implementation plan (PIP) six weeks later. As a point of departure, General Besson furnished a draft of a structure that organized the MDLC into principal elements. Thus armed, all branches of the Planning Group prepared preliminary implementation plans in their respective areas of responsibility, and on 30 March the planners gathered to discuss their proposals at an all-day meeting. Later, General Besson approved a basic organizational structure and statements of missions and functions presented by the planners.

Discussions at this meeting had made clear the need for a sharper definition of responsibilities between the supply and maintenance functions of the Director of Logistics Management, and between the Directors of Research and Development and of Logistics Management on the one hand and the Directors of Programs on the other. These findings became the basis for additional planning, and on 17 April the MDLC Planning Group held another all-day review, and further revisions were forthcoming.

More modifications were required when, on 18 April, the overall personnel ceiling for the MDLC Headquarters was fixed at 2,650. The planned strength was substantially greater than this ceiling, and the chairman provided certain ground rules for staying within this limitation. For one thing, some functions could be rewritten to decentralize more authority to midmanagement commands. For another, the Supply and Maintenance Command was to be given the responsibility and authority for basic supply doctrine, while MDLC Headquarters would limit itself to broad policy guidance and review of supply doctrine. These changes made, General Besson submitted the completed Preliminary Implementation Plan, on 27 April, to the Director of DARPO for approval.

Activation of the Army Materiel Command

The original plan for Army reorganization had envisaged very detailed planning, including the preparation of procedural regulations and operating policies, as being completed before any implementing actions were taken. As noted above, the Traub Committee had considered 18 months after the effective date of the Reorganization Order as an optimistic estimate, and subsequent planning was based on this projection. Under this time schedule, the MDLC would not begin operations before November or December 1962 and would not become fully operational before March 1963.

Acceleration

The crunch came in March 1962, when the Secretary of Defense began to exert pressure on the Army to speed up the reorganization. On 20 March, the day after detailed planning began, he asked to be kept informed of the progress of the reorganization, and of the MDLC effort in particular. More to the point, he let it be known that he wanted to accelerate its activation to 1 July 1962. This represented a drastic acceleration, for it chopped nine months off the carefully developed and approved planning and activation phases.[26]

Yet earlier activation was desirable for a number of reasons. It would more closely parallel developments in the U.S. Army Combat Developments Command and the CONARC, as well as the changes resulting from the establishment of the Defense Supply Agency, which was already absorbing Army functions and personnel concerned with single manager operations. Also, acceleration would reduce personnel turbulence by resolving uncertainties, and a takeover on 1 July would coincide with the beginning of a new fiscal year. Perhaps most important from the OSD standpoint, it would put the MDLC in a position to prepare, for the first time, an Army program based on the new Five Year Force Structure and Financial Program concept.

On the other hand, acceleration would seriously disrupt current operations and create ex-

[26] (1) Martin Blumenson, *op. cit.*, p. 101. (2) AMC Historical Summary, FY 1963, pp. 48–49.

treme personnel problems. The MDLC would have to be capable of controlling the entire logistics system before it accepted responsibility for it and the existing machinery was destroyed. This meant that in erecting the new machinery and attaching its working parts to the larger Army apparatus, the MDLC Planning Group had to solve many complex problems involved in merging into a single organization the functions of eight separate organizations.

Since there was no alternative, General Besson, who on 2 April 1962 was promoted to lieutenant general and appointed Commanding General, MDLC,[27] proposed a plan for assuming operational responsibilities on an accelerated basis, and the Secretary of the Army, hoping for an extension of time, informed the Secretary of Defense that the MDLC could be ready to take over on 1 August. This accelerated schedule was approved by the Secretary of Defense and less than two weeks later, on 8 May 1962, the Army activated the MDLC under its new name, revised for clarity and simplicity to the U.S. Army Materiel Command (AMC). The major subordinate command headquarters were activated on 23 May.[28]

Thus the AMC did not spring full blown into being. At AMC Headquarters, a nucleus organization took over programing, funding, and fiscal responsibilities on 1 July 1962, and a month later, on 1 August, the command became operational. The AMC took over, in place, the various materiel elements of the Technical Services, though some of the offices were continued for a time in the interest of convenience.[29] Following activation, there was a period of modification and amalgamation. As control of materiel functions was transferred, the personnel performing these functions were absorbed in AMC Headquarters and in the seven subordinate commands. By the end of December 1962, this process was essentially complete, but the process of getting civilian personnel permanently assigned to firm job positions in the headquarters and in the subordinate commands continued for months.

By the early part of 1963, the reorganization of the Department of the Army under OSD Project 80 had been accomplished. Both before and after the reorganization, the Army consisted, essentially, of two parts: its operational forces overseas, and its organization in the continental United States (CONUS). The reorganization of the Department of the Army in 1962 had restructured the latter. It had redesigned the CONUS organization to handle four major functional missions supporting the operational forces: developing doctrine, managing personnel, training troops, and providing equipment. In the process, it had brought into being three new operating agencies: the Combat Developments Command to establish doctrine, determine how the Army would fight, and decide what kind of equipment it needed; the Office of Personnel Operations at the Army Staff level to manage military careers; and the Army Materiel Command to exercise "womb-to-tomb" responsibility for almost all of the Army's equipment. In addition, the Continental Army Command had been modified to make it responsible for turning out trained troops and units for assignment to the combat forces, and certain changes had been made in the Army Staff.[30]

[27] DA SO 75, 2 Apr 62.

[28] (1) DA GO 23, 4 May 62. (2) AMC GO 4, 23 May 62, subj: Establishment of Major Subordinate Comds and Organizations.

[29] (1) Only the offices of the Chief of Ordnance and the Chief Chemical Officer were inactivated on the effective date of the reorganization; the others remained in modified existence beyond the effective date of the reorganization to facilitate the transition. Martin Blumenson, *op. cit.*, p. 104. (2) AMC Cir 3, 18 July 62, subj: AMC Plan for Assumption of Comd on 1 Aug 62.

[30] (1) Address, Gen F. S. Besson, Jr., CG, AMC, to the Combined Southwest Area Chapters, Armed Forces Mgmt Association, San Antonio, Texas, 18 Apr 68. (2) Remarks, Lt Gen F. S. Besson, Jr. to the Washington Post, American Ordnance Association, 21 Nov 63.

When the AMC became operational in August 1962, it took over about 189,000 people, some 250 installations and activities in all parts of the country, an inventory of weapons and equipment estimated to be worth $23.5 billion, and annual expenditure programs of some $7.5 billion. It organized these installations and personnel into seven major subordinate commands. Five of them (Weapons, Munitions, Missile, Mobility, and Electronics Commands) were oriented toward hardware. A sixth, the Test and Evaluation Command, was responsible for assuring that the equipment developed by the commodity commands was in fact suitable for use in the field. The seventh, the Supply and Maintenance Command, was responsible for distributing Army equipment and keeping it operating.

The AMC Headquarters, located in Building T–7, near the Pentagon in Washington, D.C., was organized essentially on functional lines [Figure 1], for this was the pattern followed by the Department of the Army, and this was the way the AMC received its funds. The headquarters of the major subordinate commands followed that of AMC Headquarters and up to this point the AMC organization did not represent much of a departure from the way things had been done in the Technical Services. Superimposed on this structure, however, was the AMC system of project management. In analyzing Army RDTE and PEMA expenditures by program or specific items of equipment, it had become evident that a relatively small number of programs accounted for about 50 percent of the AMC's research and development and production expenditures, and the AMC's system of project management was developed to provide intensive management for these key programs.[31]

Before the reorganization, General Besson had said that he had one major criticism of the Army—that it was necessary to go through the same decisionmaking process to get a new pair of pants as to buy a new main battle tank. In organizing the AMC, he decided that the weight of the problem should determine the level on which the decision was made. He believed that top management's time should be reserved for the decisions that belonged at the top. His goal, in organizing the AMC, was to echelon decisionmaking, and, as a necessary prerequisite, fix responsibility.

This was complicated by the fact that the AMC found it necessary to use various methods of management in the discharge of its responsibilities. The first was command management, as reflected in the organization of its commodity commands. Another was program management, such as research, development, and procurement, based on the way the command got its money from the Congress. Still another method of management provided for a qualitative appraisal of how the command did its work, and included such programs as quality assurance, value engineering, cost reduction, and equal employment opportunity. There was also project management, which General Besson considered one of the best management concepts ever adopted by the Army.[32]

Within the AMC, the concepts utilized for the management of materiel systems fell into three general categories: project management, commodity management, and functional management. There were advantages to each, but there were also disadvantages, and the mixture of all three organizational concepts caused problems. Project management, for example, provided the coordination of effort needed to assure effective management of a major program, but it also cut across both functional and commodity lines of management. To General Besson this meant that the AMC needed to engage in a constant search for better methods of management, methods by which the efforts of AMC activities could be integrated to the maximum extent throughout the life cycle of materiel systems. In August 1966, therefore, he called upon the AMC Board to evaluate current concepts for the management

[31] Address, Lt Gen F. S. Besson, Jr. to Natl Advanced Technology Mgmt Conf, Seattle, Wash., 5 Sep 62.

[32] Presentation, Gen F. S. Besson, Jr., CG, AMC, to the Combined Southwest Area Chapters, Armed Forces Mgmt Association, San Antonio, Texas, 18 Apr 68. (2) Presentation, Gen Besson to the Natl Capital Chapter, Armed Forces Mgmt Association, Naval Yard Annex, Wash., D.C., 8 Dec 64.

of materiel systems throughout their life cycles, including those employed in other Government agencies and in private industry, to determine how management within the AMC could be strengthened and improved.[33]

The resulting AMC Board study was concerned with the life cycle management of materiel systems. It evaluated current concepts and practices of the AMC, other Defense agencies, and private industry applicable to the management of materiel systems in the research, development, production, and initial logistic support phases of the materiel life cycle. Based on these evaluations, recommendations were made on how the Army Materiel Command could improve its life cycle control of materiel systems.

The AMC was established to acquire and support the weapons and equipment used by the Army. In meeting this obligation, a cradle-to-grave concept of life cycle management was a basic requirement. Of the three major management concepts used in life cycle control, functional management was the oldest and the one that applied to the broadest spectrum of events, ranging from basic research through final disposal. Most of the items of materiel developed and fielded by the AMC, were under functional management. But no one manager followed an item from cradle to grave. Under functional management, each functional area managed its aspect of the effort, and the item moved from research to field use and phaseout under a number of functional managers. Functional management did not cut across channels, and it did not, therefore, draw programs together in the best manner. It was for this reason that the larger, more expensive and higher priority systems needed the more intensive management techniques of commodity and project management during engineering and early production.

Commodity management was designed for use on systems requiring more intensive management than normally could be provided by a functional organization. Commodity commanders could be appointed at any time in the life cycle that a materiel system required intensive management. Normally, this would occur during the concept or definition phase and continue until the system was fielded.

Although some form of commodity management had been used in the AMC since 1962, there were wide differences in emphasis. In March 1965, the value of commodity management having been established, General Besson directed that an ad hoc committee be established to monitor the implementation of commodity management throughout the AMC in accordance with certain principles. During the year, pilot commodity offices were established in each command, and by December 1966 1,343 major end items, both under development and fielded, were commodity managed within the AMC. The technique, however, had still not been uniformly implemented within the major subordinate commands. In February 1966 an AMC regulation had been published on "Commodity Management," but it contained deficiencies which made application difficult. For one thing, there needed to be a focal point within AMC Headquarters for monitoring the application of the commodity management concept throughout the Command, and in May 1967 this responsibility was assigned to the Directorate of Management Systems and Data Automation.

Project management, a vertical management technique used in both industry and the services, was designed to provide for intensive management of larger items or systems. Under it, responsibility for development, production, and fielding of a system was assigned to one individual, who was given full-line authority over all planning, direction, and control of tasks and resources involved in accomplishing this mission. Normally, a project manager was supposed to phase out as initial deliveries of a system and the allied logistic support were accomplished, and a functional or commodity manager would take over the materiel system.[34]

Both the Hoelscher Report and the Green Book had maintained that the proposed materiel organization would provide an "optimum climate" for developing the full benefits of project management. While the overall system for materiel management would be based on

[33] Proj Brief, AMCB-3-66, 2 Aug 66, subj: Mgmt of Materiel Systems, Anx. A to AMCB-3-66, 30 Jun 67, subj: same.

[34] AMCB-3-66, 30 Jun 67, subj: Mgmt of Materiel Systems, pp. 14-15.

centralized control by commodity groupings, project management could be injected into any level of the organization, as warranted by the importance or complexity of the item or system.

This was in line with the prevailing trend toward centralization, and it was ideally suited to General Besson's own concept of management within something so large and complex as the Army Materiel Command. In the course of developing the Preliminary Implementation Plan, therefore, the MDLC Planning Group developed a concept for the utilization of project managers which would enable General Besson to pinpoint responsibility for weapons or equipment systems which merited special attention.[35] Upon activation of the AMC, the project manager system proved its worth, for it enabled General Besson to establish close control over the most sensitive and important items, the ones to which 50 percent of Army RDTE and PEMA funds were committed.[36]

From the time the AMC became operational in August 1962, General Besson relied heavily on project management. Over the years, he made it the AMC's hallmark, for he considered it indispensible to the effective management of an organization so large and complex as the AMC, where so many programs vied for attention and priority.

Others agreed. Early in 1965, the Department of Defense adopted the concept for DOD-wide application, and issued instructions on its use and application. A DOD directive issued in May 1965 made mandatory the application of such management to systems or projects in the BRICK-BAT category, as well as those programs which would require total RDTE funding in excess of $25 million or a total production investment of over $100 million.[37]

Valuable though it was, project management was not an unmixed blessing. The responsibilities and authorities of the project managers cut across those of the functional/commodity managers. This could interfere with the orderly exercise of functional/commodity management, and cause responsibilities to become blurred. It also caused career and staffing problems.

But the command's organization was not designed to facilitate an orderly decisionmaking process, General Besson pointed out. It was designed to facilitate the process of "management by exception," so as to assure that problems of lesser importance were screened out at appropriate lower echelons so the important and sensitive items could get attention at the top.[38] While filling project manager staffs created some shortages of talent, he believed this was simply something the commodity commanders would have to live with, for he needed project managers to give him control of the major projects and project managers needed to be free to get the resources they needed to do their jobs.[39]

Project Managers and (later) Product Managers were individuals designated by General Besson to assume full-line authority throughout the command with respect to a specific mission. With this authority, General Besson coupled responsibility. There developed in the course of the years, a wide variance in the methods and procedures employed to resolve the managerial and systems interfaces between the commands and project managers responsible for major items and systems and the commands and laboratories which furnished them technological and materiel support.

In a policy statement issued in November 1968, General Besson clarified the matter of interfaces for materiel involving more than one command or project manager. "There can be no division of responsibility in this area," he wrote, "it lies squarely upon the commander or project manager assigned responsibility for the item or system." It was up to these individuals to initiate intercommand agreements covering the support required, and it was up to them to insure satisfactory performance by the supporting elements.[40]

[35] Preliminary Implementation Plan, pp. A-29, I 1-3.

[36] AMC Historical Summary, FY 1963, p. 58.

[37] AMC Historical Summary, FY 1965, pp. 205-206.

[38] Presentation, Gen F. S. Besson, Jr., CG, AMC, to the Combined Southwest Area Chapters, Armed Forces Mgmt Association, San Antonio, Texas, 18 Apr 68.

[39] AMCB-3-66, 30 Jun 67, subj: Mgmt of Materiel Systems, p. 36.

[40] AMCR 1-12, 15 Nov 68, subj: CG, AMC, Policy Book: Policies 10-2 and 10-4.

What had the reorganization of the Department of the Army accomplished? In essence, it had created single points of responsibility for combat doctrine, training, career development, and materiel, functions which had previously been fragmented among a number of Army agencies. As noted above, the key feature of the Reorganization was the establishment of the Army Materiel Command with responsibility for managing the Army's multibillion dollar materiel program. Modern weapons systems had simply grown too complex and costly to be developed, fielded, and supported under existing organizational patterns and methods of management.

The reorganization had certainly not established this newer and better system, but it had recognized the need for change and it had created an environment in which the process of change could flourish. It had done this by assigning to the Commanding General, AMC, responsibility for the continued development and acquisition of new weapons, for the development and operation of a single, integrated Army supply system, and for assuring, by test and evaluation, that any new items met established standards of performance and reliability before they were introduced into the Army supply system.

Management of Development and Acquisition

These responsibilities gave form to the new organization. Responsibility for the development and acquisition of Army materiel was divided according to broad commodity groupings among five major subordinate commands: The U.S. Army Electronics Command (ECOM), the U.S. Army Munitions Command (MUCOM), the U.S. Army Weapons Command (WECOM), the U.S. Army Mobility Command (MOCOM), and the U.S. Army Missile Command (MICOM). These commodity commands were responsible for the execution of nearly all of the AMC's materiel development and acquisition programs, including those controlled by project managers.

The only major change in the AMC commodity command structure during the first six years of the command's existence was the division of the U.S. Army Mobility Command into three separate major subordinate commands. Though not the largest of the major subordinate commands [Table 1], the Mobility Command had its share of problems, particularly at the U.S. Army Tank-Automotive Command (ATAC). These problems, coupled with the wide range of commodities involved and the growing importance of Army aviation, led to the establishment of three new commodity commands and the disestablishment of Headquarters MOCOM. The U.S. Army Aviation Command (AVCOM) and U.S. Army Mobility Equipment Command (MECOM) were established as separate commodity commands effective 1 August 1966. Several months later, on 31 January 1967, the U.S. Army Tank-Automotive Command (TACOM) was also established as a major subordinate command and Headquarters MOCOM was eliminated.[41]

*Table 1. AMC Personnel Structure, 31 August 1962 **

Command	Military	Civilian	Total
ECOM	2,712	11,439	14,151
MICOM	1,187	11,221	12,408
WECOM	121	12,509	12,630
MOCOM	633	12,848	13,481
MUCOM	2,460	25,152	27,612
SMC	2,981	67,910	70,891
TECOM	10,281	11,906	22,187
HQ AMC	225	2,900	3,125
OTHER	961	12,297	13,258
Totals	21,561	168,182	189,743

*Manpower Utilization & Requirements Rpt CSGPA-553, Part A, 31 Aug 62.

In terms of the hundreds of thousands of line items of Army materiel involved, these commands had almost all of the development and acquisition program, but in terms of the funds involved [Research, Development, Test and Evaluation (RDTE) and Procurement of Equipment and Missiles, Army (PEMA)], they were responsible for only about half of the AMC's total program. The other half was contained in a relatively few high-cost, high-priority development programs, and each of these programs was put under the tight, vertical system of control contained in the AMC's system of project management. This system

[41] AMC Historical Summary, FY 1966, p. 34.

was the most significant feature of the new Army materiel organization, and in many respects its adoption was a stroke of genius—it enabled the Commanding General, AMC, to seize strong control of the key materiel programs from the technical services immediately upon activation of the command.

Managing the development and acquisition of Army materiel was a major part of the AMC mission. These were the areas of the major funding programs, RDTE and PEMA, and more will be said later of both project management and commodity management. But the AMC was also responsible for testing materiel before it was introduced into the supply system, and for operating the Army's wholesale supply and maintenance system. Separate major subordinate commands, the U.S. Army Test and Evaluation Command (TECOM) and the U.S. Army Supply and Maintenance Command (SMC), were established to carry out these portions of the AMC mission. In both cases, difficulties in defining the specific responsibilities of each of these commands soon appeared.

Management of Test and Evaluation

Before March 1965, TECOM was little more than a service agency. Both test methodology and instrumentation requirements were sent to TECOM by the developers (commodity commands), and under these circumstances the command was not in a position to serve as an independent tester. In March 1965, TECOM was made responsible for planning, directing, and controlling "a research and development program for test instrumentation, test facilities, and test methodology." [42] This meant that TECOM rather than the developer would decide requirements for methodology and instrumentation. It represented the first step in establishing TECOM as an independent tester.

While this strengthened test and evaluation within the AMC, it did not, in the opinion of the Combat Developments Command (CDC), provide adequate attention to the user's requirements. What the CDC was getting at the time were technical evaluations; what it was not getting were comparisons with existing equipment and evaluations of the new item in terms of the battlefield. To a considerable extent the controversy that developed between the AMC and the CDC turned on the fact that the term "evaluation" meant one thing to the AMC, a materiel development organization, and quite another to the CDC, a combat doctrine agency.

The CDC took the position that TECOM should be assigned to it or, as an alternative, established as an independent agency under the Department of the Army. The one, however, would tend to make test and evaluation overly oriented toward theory, and the other seemed unlikely to fulfill the requirements of either the AMC or the CDC. In October 1965, therefore, the Army Chief of Staff ordered a Study of Army Test and Evaluation (SATE) to consider what were the clear-cut responsibilities between the contending parties, TECOM, and the CDC.[43] In effect, SATE concluded that TECOM was too much divorced from the user, but that the same was true of the CDC in regard to materiel. What the CDC was looking for in response to the increased emphasis on cost effectiveness actually exceeded its currently assigned role. Still, improvements were needed to meet CDC requirements, and the study suggested eight modifications for achieving these goals.[44]

In announcing his decisions regarding the SATE recommendations, the Army Chief of Staff drew the distinction between equipment service test and equipment evaluation. The former were tests made to observe empirically the performance of an item of equipment—a responsibility of the AMC. The latter was the overall assessment of the utility, or value, of such equipment—a responsibility of the CDC. Although conducted by the AMC, such tests were to be according to a plan approved by the CDC. This recognized that while TECOM had been engaged in wringing out equipment from a mechanical/technical point of view, it had not been involved in providing the kind of evaluation the CDC was looking for.

The Chief of Staff decided that TECOM

[42] (1) AMCR 10-24, 28 Dec 62, subj: Missions and Major Functions of the USATECOM. (2) *Ibid.*, C2, 1 Mar 65.

[43] (1) See CSM 65-526, 25 Oct 65, subj: A Study of Army Test and Evaluation. (2) TECOM Historical Summary, FY 1967, p. 65.

[44] (1) *Ibid.*, p. 58ff. (2) See also, A Study of Army Test and Evaluation, vols. I–III, Systems Analysis Group, Ofc of the CofS, May 1966.

would remain in the AMC, but that various actions would be taken to improve AMC-CDC working relationships, of which giving CDC authority to approve all service test plans was perhaps the most important. Among other things, he directed that the current study of an element (Advanced Concepts Agency) to bring AMC into the user's sphere, and an element (Institute for Land Combat Studies) to interface with materiel developers, include recommendations for a division of existing resources to increase CDC capabilities. This task was assigned to a Committee of Four.[45]

The report of the Committee of Four contained six improvement opportunities, several of which interfaced with areas studied in detail by the DA Board of Inquiry on the Army Logistics System (Brown Board), which was also being completed in the fall of 1966. In commenting on these reports, the Army staff was directed to consider both reports simultaneously when addressing these interfacing areas.[46]

In the areas of interface between the Brown Board and Committee of Four reports, the AMC favored the latter. One reason was its recommendations for filling an existing void in conceptualizing the Army of the future. To this end, the Committee proposed the establishment and collocation of a Threat Forecast Group under the Assistant Chief of Staff for Intelligence, an Advanced Materiel Concepts Laboratory (AMCL) under the AMC, and the Institute of Land Combat under the CDC. The AMC believed this would be a big step in overcoming a recognized weakness in the Research-Combat Developments-Materiel Development process, but additional resources would be required. Except for an initial increment of ten personnel spaces for the AMCL, the AMC had no personnel spaces to offer for these new activities.[47]

As a result of SATE and the Brown Board, AR 70–10 was in the process of being revised as 1968 drew to a close. In the new version, major new testing responsibilities were to be assigned to TECOM. In anticipation of these changes, TECOM, long plagued by testing workloads which exceeded its facilities, prepared a substantial program change request aimed at obtaining the additional resources needed. What action higher headquarters would take on this request remained to be seen.[48]

Some apparent exceptions to the "independent-tester" philosophy were involved in this matter of resources. To Lt. Gen. William B. Bunker, Deputy Commanding General, AMC, the fact that the Aviation Test Activity had been transferred from TECOM to AVCOM in November 1966 [49] was no real exception to this philosophy. He believed that AVCOM, as a procuring activity, needed to conduct engineering flight tests to assure that an aircraft system was airworthy and that it met specifications. He held that this in no way abridged TECOM's responsibility for comprehensive service tests of aircraft systems. This was also true of production testing, another apparent exception, for in most cases the hardware being tested had already received a TECOM independent evaluation during the engineer-service test phase of the prototype.[50]

Within the AMC, the implementation of an adequate "independent-tester" concept had been an evolutionary process. During 1964 and 1965, the AMC had begun to receive complaints from oversea commands of major deficiencies in equipment, and some of the earlier emphasis on development and reduction in leadtime was shifted to the processes of testing and evaluation. The position of the Commanding General, TECOM, continued to be a rather anomalous one, however, for he was viewed as a representative of both the developing and using elements of the Army.[51]

[45] CSM 66–418, 20 Sep 66, subj: A Study of Army Test and Evaluation, with incl, Decisions on the 8 Improvement Actions Contained in vol. II, SATE.

[46] (1) CSM 66–548, 10 Dec 66, subj: Staffing of Rpt of Committee of Four and Brown Board Rpt. (2) Ltr, OCRD to CG, AMC, 23 Dec 66, subj: Rpt of the Committee of Four and Brown Board Rpt. (3) Ltr, Actg CRD to CG, AMC, 29 Nov 66, subj: Committee of Four Rpt Related to SATE Improvement Action No. 3.

[47] Ltr, Dir/Development, AMC, to CRD, DA, 12 Jan 67, subj: Committee of Four Rpt Related to SATE Improvement Action No. 3, with 2 incls.

[48] Ltr, Lt Gen William B. Bunker, DCG, AMC, to CRD, DA, 7 Oct 68, subj: Testing Responsibilities.

[49] TECOM Historical Summary, FY 1967, p. 124.

[50] Ltr, Lt Gen William B. Bunker, DCG, AMC, to CRD, DA, 7 Oct 68, subj: Testing Responsibilities.

[51] (1) Ltr, Gen F. S. Besson, Jr., CG, AMC, to Maj Gen Alden K. Sibley, CG, MOCOM, 26 Oct 64, n.s. (2) Ltr, Gen F. S. Besson, Jr. to each Commodity Comdr and Proj Mgr, 16 Feb 65.

In March 1965, General Besson directed his Director of Quality Assurance to strengthen procedures for controlling the release of major items for field use. He specified that there be one AMC element with authority to release items, and made it clear that no new end items were to be issued to troops, other than under emergency or exceptional circumstances, until they had been demonstrated to be suitable for issue. This resulted in the publication of a regulation which vested in the Director of Materiel Readiness, AMC, the sole responsibility for insuring the suitability of new end items for issue.[52] This did not solve the problem, however, for responsibility for assuring adequate testing had still not been nailed down.

In February 1966, General Besson enunciated some basic precepts of adequate testing. These were (1) ensuring that enough of each item was tested to assure an adequate basis for decision, (2) ensuring maximum use of available test facilities—by round-the-clock scheduling if practicable—and (3) testing the most likely areas of deficiency first so as to provide more time for correction.[53] The role of the Commanding General, TECOM, was still limited to one of the providing facilities for testing and advice concerning the suitability of new end items for release. Consequently, there continued to be three general problem areas: insufficient testing of production items prior to release; test conditions not representative of the expected field conditions; and lack of timely corrective action on failures observed during testing. To strengthen the initial production test (IPT) process, TECOM was made responsible in March 1967 for evaluating IPT plans developed by the commodity commands and the project managers to assure that they would yield the data required for a release decision.[54]

But it was the release decision that was causing the problem. In July 1967, General Besson dispatched a strong letter to the commanding generals of the major subordinate commands and the project managers reiterating his concern over a series of incidents involving the production and issuance of materiel which had not been tested, accepted, and approved for release. These incidents, he wrote, "reflect a failure to grasp the essential intent of the cited regulations and a serious miscalculation of the severity with which I view inadequate performance in this area." [55]

Actually, General Besson had already quit looking to the developers for the decision as to suitability for release. A revision to AMC Regulation 700–34, published in April 1967, established that until TECOM "signed off" on a piece of equipment it was not ready for type classification. This was to remove any doubt as to where the responsibility lay if a piece of equipment reached the field and failed to perform as it should.[56] This established the Commanding General, TECOM, as an independent tester within the AMC, and it strengthened immeasurably his authority and, of course, his responsibility. To discharge these new responsibilities, the Commanding General, TECOM, would need the instrumentation necessary to test the increasingly sophisticated equipment moving through the development process, and this was the basis of the rather considerable program change request mentioned earlier. Also, it remained to be seen how the commanding generals of TECOM, who would be putting their reputations on the line when they signed off on a piece of materiel, would fare in the face of pressures from the developers and from the field to get new systems through the development-production cycle and into the hands of the users.

Management of the Supply System

The U.S. Army Supply and Maintenance Command (SMC) was established to develop, out of the multiplicity of systems inherited

[52] (1) AMCR 700-34, 8 Jun 65, subj: Logistics: Insuring Suitability of New End Items for Issue. (2) Fact Sheet, AMCMR, n.d., Brief History of AMCR 700-34.

[53] Ltr, Gen F. S. Besson, Jr. to each Commodity Comdr and each Proj Mgr, 25 Feb 66, n.s.

[54] (1) AMCR 700-34, 8 Jun 65. (2) Ltr, Maj Gen Selwyn D. Smith, Jr., CofS, AMC, to CG, WECOM *et al.*, 24 Mar 67, subj: Testing Operations in Support of Insuring Suitability of End Items for Issue.

[55] Ltr, Gen F. S. Besson, Jr. to CGs, AMC Major Subordinate Comds, and Proj Mgrs, 9 Jul 67, subj: Release of Equip.

[56] AMCR 700-34, 3 Apr 67, subj: Logistics: Release of End Items for Issue.

from the technical services, a single Army supply system. The study, "The Army Supply and Maintenance System," initiated a few days after the command became operational, became the blueprint for the new system, which involved a complete reorganization of the inventory control points and consolidation of the depot structure. Since the SMC was responsible for the operation of the depots, it was the largest of the major subordinate commands [Table 1].

Drawing lines of demarcation between AMC Headquarters and Headquarters, SMC, proved to be one of those areas where a compromise was necessary. During the planning period, the SMC Planning Group pointed out that supervision of stock control and supply management (then called inventory control) belonged together, either in Headquarters, AMC, or in Headquarters, SMC. They felt it would be impractical to separate them.

General Besson, however, thinking mainly of major items, believed it inappropriate for the SMC to be responsible for developing requirements for the procurement operations of his commodity commands. Nor did he want the functions of overseeing stock control and distribution to be in AMC Headquarters. Besides loading his headquarters with operational detail, such a move would emasculate Headquarters, SMC. Therefore, when the AMC became operational on 1 August 1962, responsibility for supply management was in AMC Headquarters and responsibility for stock control was assigned to Headquarters, SMC.

Time and the Cuban Crisis of 1962 changed General Besson's mind, though not on all points. Staff supervision over stock control involved management of over 300,000 items from the time materiel became available to the supply system until it was cleared from the records through expenditure or salvage. It measured the effectiveness of the supply system, back orders being one of its barometers. These functions had so close a bearing on requirements determination, the heart of supply management, that they logically belonged in the same command handling Army supply and maintenance.

Consequently, in January 1963, General Besson transferred supply management of secondary items and repair parts to the SMC. This was a highly significant action, for it put commandwide (Headquarters, AMC-type) responsibilities for staff supervision under a major subordinate command, and in keeping with this broad delegation of authority, General Besson authorized Lt. Gen. August Schomberg, Commanding General, SMC, to speak for him with the DA staff and throughout the command in regard to secondary items. The effect on the SMC was immense. It meant that Headquarters, SMC managed supplies for the Army from the time they were received from production until they were delivered to AMC customers.

With supply management of major items being retained at AMC Headquarters, the problem had been changed but not solved. Since logistics support functions of asset management, allowances, cataloging, data management, and interservice supply support were so closely tied to supply management, they too were transferred in January 1963. The fact that these functions pertained to major items, as well as secondary items and repair parts posed a problem, for it was impracticable, if not impossible, to divide these functions accordingly. Thus, difficulties remained for no clear-cut line could be drawn between major items and secondary items. There were many items, engines and radios for example, which could be either, depending not on the item itself but on the use to which it was put. Improvements in supply management procedures, it was hoped, would justify the decision to transfer the logistics support activities to Headquarters, SMC,[57] but this was to prove an over-optimistic view.

[57] SMC Historical Summary, FY 1964, p. 113ff.

IN THE BUZZ SAW

When a corporation fails to correct a serious mistake, competition will drive it out of business. When a government agency makes errors, it can sometimes cover itself by higher taxes.

To avoid such unhappy situations, the Army depends on management.

LTG F. S. Besson, Jr.
Civilian Aides Text
Pentagon
3 December 1962

CHAPTER II

IN THE BUZZ SAW

The Scope of Change

The AMC had been born in a time when advances in technology were bringing changes not only in the concepts and techniques of warfare, but also in the concepts and techniques of management. Thus in the early years of its existence, the AMC, itself a product of change, operated in the shifting sands of changing missions, changing materiel requirements, and changing methods of management.

The impact of these changes was outlined by the Secretary of Defense early in February 1965, when he appeared before the House Committee on Armed Services to report on the Nation's military posture and to describe the Department's plans for the coming fiscal year. He pointed out that the changes which had been instituted in the Army in recent years had been both numerous and extensive, and said that the Army now needed time to digest and consolidate them. The program for Fiscal Year 1966 was planned accordingly. Army capabilities had been increased with regard to conventional and guerrilla warfare, and the nation now had a wider range of military responses. Current plans called for slackening draft calls and reducing the Army's active strength to 963,273 by the end of June 1965. In the area of air mobility, critical shortcomings had been remedied, the Secretary said, and caution was to be exercised in proceeding with any further expansion. For Fiscal Year 1966, an austere program of Army aircraft procurement was planned, one about 21 percent less than in the current year. The largest single item in this category, the UH-1D (Iroquois) helicopter, would be bought to replace older aircraft, while procurement of the CH-47A (Chinook) transport helicopter was to be reduced somewhat from the level planned earlier. At the time, there were approximately 23,500 U.S. military personnel in Vietnam, as advisors not as combatants.[1]

From Peace to War

For the AMC as for the rest of the Army, neither Fiscal Year 1966 nor the years that followed would be a time for consolidating and digesting. They would, instead, be committed to a vicious war of attrition halfway around the globe. The groundwork for this commitment had already been laid in August 1964,[2] and the event that would trigger it had occurred at Pleiku in South Vietnam a few days before the Secretary spoke.[3]

Actually, preparations were already underway: a top command had been established in Vietnam and the Army was building under it. But the exact opposite was true in the logistics area, and to General Besson this meant that an intolerable situation was developing. He urged, in mid-February 1965, that a top-flight general officer of two- or three-star rank be selected without delay to head the logistics effort in Vietnam, as Tom Larkin and John C. H. Lee had done in North Africa and Europe during World War II. This needed to be done immediately, he said, even it it were not yet

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[1] *Hearings* on Military Posture and H. R. 4106 before the Committee on Armed Services, 89th Cong, 1st sess, pp. 139, 264–265 (9 Feb 65) and 316–317 (19 Feb 65).

[2] "The Gulf of Tonkin, the 1964 Incidents," *Hearing* before the Committee on Foreign Relations, U.S. Senate, 90th Cong, 2d sess, 20 Feb 68 (GPO), *passim.*

[3] "Buildup is the Keyword in Vietnam: It Started With Mortar Shells on Bien Hoa," *Armed Forces Mgmt*, Nov 1965, Vol 12, No. 2.

politically expedient to formally place the selectee in the command structure.[4]

For some reason, this was not done. There was no logistical "czar" in Vietnam until mid-January 1966, when Lt. Gen. Jean E. Engler took over as Deputy Commanding General, U.S. Army, Vietnam (USARV).[5] In the meantime, Vietnam had become a logistical nightmare. Much of the difficulty experienced with logistics, and much of the time, effort, and expense involved in bringing corrective action to bear, would seem to stem directly from this failure to give adequate attention to the logistical requirements of a major American buildup in Vietnam. Within the AMC, it seemed more than a coincidence that no realistic requirements for airfield landing mat (critical for operations in Vietnam) could be obtained until General Engler arrived on the scene in January 1966, many months after the buildup began.[6]

Several factors contributed to the development of the logistical nightmare. In the jockeying for power that followed the overthrow of Ngo Binh Diem in November 1963, the will to fight for an unidentifiable government had evaporated and the elusive Viet Cong had steadily expanded its dominion over the countryside. By the time the decision to intervene was announced, the position of the Saigon government was desperate. To prevent victory by the Viet Cong during the coming monsoon season, it was agreed in July 1965, the United States would have to inject combat forces into Vietnam faster than the logistical base could support.[7]

The problems inherent in this situation were soon compounded, for North Vietnam proved capable of reinforcing the Viet Cong much faster than United States intelligence had estimated. This meant still more deployments before a logistics base could be prepared, and to the AMC it meant that for many months there would be no firm guides as to either size or composition of the forces to be supported.

Nor was it clear what role U.S. forces were to play in Vietnam, though this, too, would have an important bearing on what their materiel requirements would be. In a statement to a congressional committee early in August 1965, the Secretary of State said that the primary missions of American ground forces were to secure air bases and to provide a strategic reserve, thus releasing South Vietnamese troops for offensive operations against the Viet Cong. "The main task of rooting out the Viet Cong," he told the committee, "will continue to be the responsibility of the South Vietnamese. And we have seen no sign that they are about to try to shift that responsibility to us." [8]

The Secretary of Defense described the U.S. role in substantially the same terms to a Senate subcommittee the next day. He emphasized the use of U.S. forces for increased air and naval action, and said the principal role of the ground forces would be to supplement the central reserve of the South Vietnamese Army. It was not readily apparent, but the Secretary had left, in his description earlier of the role of the central reserve, an opening for the use of U.S. ground forces on the offensive, search-and-destroy type operations that were soon to characterize the American ground effort in Vietnam.[9]

The logistical support provided to Vietnam was, as frequently stated, unparalleled in the annals of warfare. It had to be. Under the conditions prevalent in the situation, the scales were weighted heavily against the achievement of effective logistical support. The

[4] (1) Ltr, Gen F. S. Besson, Jr. to Gen Creighton W. Abrams, Jr., VCofSA, 13 Feb 65, n.s. (2) Among those suggested by Gen Besson for this post were Lt Gen Jean E. Engler, CG, SMC, who "would do a superb job," and Maj Gen William B. Bunker, DCG, AMC, who "has no peer in the logistics game" but who was "absolutely invaluable" in his present job.

[5] Gen William C. Westmoreland, Commander, U.S. Army Military Assistance Command, Vietnam (COMUSMACV), who "wore two hats" was the Commanding General, USARV.

[6] (1) AMC Historical Summary, FY 1966, pp. 194–195, 197–198, 201–202, 217. (2) For similar problems with regard to prefabricated piers and other items required for base development, see *ibid.*, pp. 218ff, and *passim.*

[7] Osborn Elliott, "A Day With Westmoreland," *Newsweek*, April 18, 1966, p. 32.

[8] Statement, Secy of State Dean Rusk to House Foreign Affairs Committee, August 3, 1965, reprinted in pamphlet, "Why Vietnam," (GPO, 1965), p. 14.

[9] Statement, SECDEF Robert S. McNamara to Defense Subcommittee of the Senate Appropriations Committee, August 4, 1965, reprinted in "Why Vietnam," p. 22, and in *Defense Industry Bulletin*, vol I, No. 8, August 1965, p. 1.

fact that it could be accomplished at all was a tribute to the great technological advances represented by huge transport aircraft, sophisticated communications systems, the Army's family of helicopters, and to the power of American industry. Under the circumstances which obtained, it need be added, it was accomplished at staggering costs and with problems aplenty.

Describing the task the AMC had faced two years earlier, General Besson could, in October 1967, express relief and satisfaction that "somehow the Army's logistic system kept pace with the buildup." [10] This was true of the first hectic months when United States forces were being increased in Vietnam from 75,000 in July 1965 to 125,000 by the end of the year. But it was also true that by the end of 1965 the logistical system, specifically that portion beyond the CONUS, had become the pacing factor in the buildup of U.S. forces in Southeast Asia.

The AMC was barely three years old when it received the call to support a major war 8,000 miles away. The command had inherited a vast complex of installations and activities in August 1962, a complex employing 189,743 persons and operating under a variety of policies and procedures. It was the AMC's task to weld these resources, physical and human, into a single Army wholesale supply organization, while at the same time assuring that the flow of goods and services to the users remained uninterrupted.

During the first few years, this was being done within the atmosphere of heavy emphasis on management generated by the DOD Cost Reduction Program, and within an environment of continual change. These included major changes in mission and function deriving from the establishment of the Defense Supply Agency (1962), the Defense Contract Administration Service (1964), and the Military Terminal and Traffic Management Service (1965), as well as significant changes in policy and procedure flowing from the adoption of the Five Year Force Structure and Financial Program system. And there were more abstract aspects of this welding process. There were, for example, those who did not readily accept the need for change, and getting people to accept new methods was a persistent problem in bringing into being the new order.

The physical plant inherited by the AMC consisted of 122 installations and 158 activities. It included complex commodity-oriented arsenals, exotic laboratories and test facilities, depots and rebuild shops, and an industrial empire of manufacturing plants for weapons, munitions, bulk military explosives and propellants, rockets, and missiles. Various programs for achieving better use of these resources—consolidations of activities and disposal of unneeded facilities—resulted in the number of AMC installations being reduced to 86 by the end of 1968, and the number of activities to 119.

Much of the physical plant inherited from the Technical Services needed to be replaced if the AMC was to acquire a modern physical plant complex. Since this would ultimately require vast amounts of construction and rehabilitation, the development of a command-wide installation master plan was undertaken to give direction to these efforts. By mid-1968 such a plan had been developed. In the meantime, early construction programs had been designed to meet only the most pressing needs, and these efforts were soon slowed to a crawl by the requirements of Vietnam. Vast sums in production appropriations were allocated for rehabilitation, conversion, and new construction of manufacturing plants to produce the materiel and munitions needed overseas, and construction was expedited at costs exceeding normal construction costs by approximately 50 percent.[11]

Base closures, transfers of functions, and productivity and budget cuts produced a reduction in AMC personnel strength between August 1962 and the end of June 1965. Beginning with an initial authorization of 167,895 civilians and 21,423 military, the AMC had an authorized strength of 145,200 civilians and 17,652 military by the end of Fiscal Year 1965. A breakdown of personnel gains/losses during this period is shown in Table 2.

[10] Address, Gen F. S. Besson, Jr., CG, AMC, to Association of the U.S. Army, 11 Oct 67, Wash., D.C.

[11] Submission, AMCIS to AMCHO, 2 Dec 68.

Table 2. Personnel Gains/Losses in AMC, FY 1963–1965

Action	Military	Civilian	Total
Base Closures*	424	1,813	2,237
TASAMS*		3,725	3,725
Project 60		5,773	5,773
Transfer of functions	270	10,422	10,692
Decrease in missions	4,555	17,813	22,368
Total decrease	5,249	39,546	44,795
Increase in missions	463	9,838	10,301
Net reduction	4,786	29,708	34,494

*Savings from Base Closures and TASAMS, a result of action taken during 1963–1965, were realized through FY 1968. Submission, AMCPT to AMCHO, 2 Dec 68.

The sudden buildup of U.S. forces in Southeast Asia (SEA) had a major impact on AMC personnel requirements. Anticipating this, General Besson took it upon himself, in August 1965, to authorize his subordinate commanders to hire the people they needed to meet SEA support requirements.[12] The AMC subsequently submitted, during Fiscal Year 1966, validated requirements for 23,404 additional people to handle the SEA workload, but higher headquarters increased the AMC authorization by only 14,523 spaces.

Despite the diversion of more than 20,000 civilian spaces from non-SEA work to work in direct support of SEA, as well as sharp increases both in the use of overtime and in the contracting out for services, AMC manpower requirements continued to exceed its authorization. General Besson therefore continued to grant his commanders overhire authority during Fiscal Year 1967. The AMC submitted requests for an additional 19,129 spaces during the year, but less than half of these (8,291) were approved. As a consequence, the AMC was 14,482 spaces overstrength in July 1967 when strength accounting procedures were changed to require temporary and part-time positions to be reported against the authorization. Impact statements, new justification, and reclamas to DOD resulted in AMC's authorization for Fiscal Year 1968 being increased to 167,598, but the AMC was still overstrength by 3,396.

Through calendar year 1968, the AMC had had to meet its manpower requirements for SEA and other essential missions by juggling part-time, overtime, contracting for services, shifting personnel from non-SEA workloads, and, to be candid about it, by abridging some of the regulations pertaining to manpower ceilings. To a considerable extent, management of manpower was more by default than decision, since for quite some time higher headquarters neither approved nor disapproved AMC requests for increases in personnel authorization.

New, stringent personnel controls were contained in the Revenue and Expenditure Control Act of 1968 (PL 90–364), signed by President Johnson on 28 June 1968. Among other things, this law required that civilian full-time permanent positions be reduced to the 30 June 1966 level, and that temporary and part-time strength not exceed that for the corresponding month in calendar year 1967. As implemented in the Department of the Army, only vacancies created by in-Government transfers could be filled on a one-for-one basis; all other losses could be filled only on a 7 for 10 basis. The use of overtime, military personnel, or contracts to offset the effects of these hiring restrictions was prohibited.[13]

What all this meant in terms of the war in Vietnam is perhaps best illustrated by the status of the Army Supply and Maintenance System (TASAMS). Of the host of problems facing the AMC in the fall of 1962, the creation of a single, responsive supply system to replace the multiplicity of systems inherited from the technical services was one of the most important. On 15 August 1962, a field committee was established to study the existing system and develop a single, integrated Army supply system. This committee submitted two systems for decision—one centralized by region and the other centralized by commodity—and on 17 December 1962 the Commanding General approved the centralization by com-

[12] On 18 May 1965, when he made public the use to which the first supplemental appropriations for Vietnam ($700 million) was to be put, President Johnson pledged ". . . the entire resources of the federal government are available to assist our men in South Vietnam. Our soldiers, sailors and airmen have a blank check for the equipment they need to assist the South Vietnamese." *Defense Department Digest*, vol. 2, No. 12, 15 Jun 65, p. 1.

[13] Submission, AMCPT to AMCHO, 2 Dec 68. (2) AMC Historical Summary, FY 1966, Chap X.

modity concept as contained in the TASAMS study.[14]

This concept provided for the consolidation of certain NICPs (National Inventory Control Points) in the CONUS, and the transfer to them of the stock control and requisition processing functions of the Oversea Supply Agencies (OSAs), and of accountability from the Army depots. In July 1963 the Department of the Army confirmed the decision to phase out the OSAs and divide their functions among the NICPs, the depots, the terminal commands, and the oversea ICPs (Inventory Control Points). This was done, effective 1 July 1964, and under the new concept requisitions from the oversea ICPs were to go directly to the NICPs in the CONUS, rather than through the OSAs.[15]

The three Oversea Supply Agencies, though originally established in 1942 as integral elements of the Ports of Embarkation, had become DCSLOG Class II Activities in 1948. They served primarily as single points of contact, by geographical area, between oversea customers and supply agencies within the CONUS. Acting for the DCSLOG, they communicated directly with the Chiefs of the Technical Services, and operationally they also communicated directly with the NICPs, depots, the Defense Supply Agency, and the Navy and Air Force supply agencies.[16] Under the Reorganization of the Army, the OSAs were pushed down three echelons, being assigned to the terminal commands of the AMC's Supply and Maintenance Command.

In February 1962, the Army Logistics Management Center (ALMC) completed a study of the essentiality of the OSAs to the Army supply system in peace and war. Each function of the OSAs was reviewed to determine whether they should be discontinued, transferred elsewhere, or retained. Since the primary role of the OSAs was to reduce the number of contacts in the CONUS for oversea requisitioners, the study concluded that it was important that they be retained during the period the Defense Supply Agency and the Army Materiel Command were becoming operational. But ALMC found it feasible and possibly desirable to eliminate these agencies when certain conditions were met: when the number of supply agencies within the CONUS had been significantly reduced, and when provision for the assumption of OSA functions by the NICPs and other elements had been made.[17]

The Oversea Supply Agencies were abolished on 1 July 1964 and their functions transferred to the NICPs, the depots, the terminal commands, and the oversea ICPs. Under the new concept of centralized commodity management, requisitions from the oversea ICPs were to go directly to CONUS NICPs, which would own and control Army supplies within the CONUS. Army depots would ship materiel on the basis of materiel release orders issued by the NICPs.

Following the deactivation of the OSAs, AMC still had some residual responsibilities which were not provided for in these transfers of functions. The command was responsible for automatic supply support under contingency war plans. Consequently, it needed to be able to monitor any shipments made in support of forces deployed from the CONUS. It needed a central point for obtaining information on shipments from the depots, and on the status of these shipments within the transportation pipeline.

During the early phases of the Dominican Republic operation, the AMC had no central source for such information, and this made it difficult both to forecast transportation requirements and to determine the effectiveness of the support being rendered. Initially, these functions were handled on an ad hoc basis at the CONUS air terminal (Ft. Bragg, N.C.), but that installation did not have the capability to manage such voluminous data.[18]

Responsibilities for operations plan support information were accordingly assigned to the Logistics Control Offices (LCOs) at the Army Terminal Commands in New York, New Or-

[14] See TASAMS 1963–1970, vol. I, Summary n.d.

[15] TASAMS Implementation Plan Summary, SMC TASAMS Coordination Field Ofc (TACFO), Letterkenny Army Depot, 11 Oct 63, *passim.* (2) Interv, Charles W. Lynch with Col V. O. Smith, Ch, Opns Br, Stock Control Div, D/S, SMC, 14 Jan 66.

[16] AR 10–430, 5 May 58, subj: Organization and Functions, U.S. Army Oversea Supply Agency, DCSLOG.

[17] ALMC Study, Essentiality of Oversea Supply Agencies in the Army Supply System, Feb 1962, pp. 32–33.

[18] Ltr, Actg Ch, OPRED, AMC, to ACSFOR, 2 Mar 66, subj: Special Comd Rpt for Period 1 Jan 65—31 Oct 65 [RCS-CSGPO-28 (R1)].

leans, and San Francisco. When the Army Terminal Commands were transferred to the Military Traffic Management and Terminal Service (MTMTS) on 1 April 1965, the LCOs were not included. Instead, they were organized as separate SMC field elements, and as the buildup in Vietnam got underway the LCO-P at Oakland, California, served not only to monitor automatic supply shipments, and oversea movement (POM) requisitions, but also to flash word to Headquarters, SMC, staff agencies whenever some problem appeared.[19]

In November 1965, the Army Chief of Staff dispatched Maj. Gen. O. E. Hurlbut to Southeast Asia to determine what was wrong with supply and maintenance support to Vietnam, and what should be done about it.[20] Among other things, General Hurlbut found that both Hawaii and Okinawa were bottlenecks in the logistics structure in the Pacific. The USARPAC Inventory Control Point had been established, under a concept approved in April 1963, to provide a centralized source of logistic data for the Pacific theater, and it had been scheduled to come into being under a timetable designed to coincide with the complete realignment of the CONUS supply system as envisioned by TASAMS, including the phasing out of the OSAs.

In approving TASAMS in December 1963, OSD reduced the time frame for its implementation by one year. This meant the USARPAC ICP system had to be installed in six months, rather than 18 months as planned. The speed-up led to the introduction of hastily-conceived data processing procedures. The USARPAC was still in the process of overcoming these faults, through the installation of its Standard Supply System (3–S concept), but this process was far from complete when the buildup in Vietnam got underway. At the time, the "3–S" system was not scheduled to become operational on Okinawa until December 1965, and somewhat later for Japan and Korea. The net result was that the USARPAC ICP was unable to handle the avalanche of documentation generated under MILSTRIP by the buildup, and Okinawa was poorly equipped to serve as an offshore logistics base for Vietnam.[21] This led to proposals (and plans) for extending the CONUS logistics system overseas, by establishing the Okinawa depot as a major subordinate command of the AMC, and to plans for expanding the Logistics Control Office—Pacific to a point closely approximating that of the old OSAs. More will be said later on these matters.

The AMC had recognized in 1964 that the implementation of TASAMS involved major changes in the logistical structure within the continental United States, and that these changes made the relationships of NICPs to oversea supply activities a matter of vital importance. Senior logistics officers overseas lacked any clear understanding of the changes underway in the United States, and the need for more effective liaison between the AMC and the oversea commands became increasingly apparent.

An AMC Board study completed in November 1964 contained specific proposals for improving these relationships, including the establishment of AMC liaison offices in oversea commands.[22] Known as the AMC Customer Assistance Offices (CAOs), these consisted of small staffs of AMC representatives at each theater headquarters, which could be augmented by the attachment of technical representatives from the AMC major subordinate commands, as required. CAOs were established in USAREUR in July 1965, and in USARPAC in September. Through the urgings of General Engler while he was still Commanding General, SMC, a third CAO was established in Vietnam, after some lost motion, early in February 1966. It was not, however, established at the highest headquarters in Vietnam, as the AMC preferred, but at Headquarters, USARV.[23]

[19] SMC GO 10, 1 Mar 65. (2) SMCR 10–37, 26 Jul 65, subj: Organization and Functions, SMC Logistic Control Ofc, Oakland. (3) DA GO 41, 10 Dec 65, established the U.S. Army Logistics Control Ofc, Pacific, as a Class II Activity under the jurisdiction of the CG, AMC, effective 1 Oct 65. (4) AMC OPLAN SEA, C25, 28 Dec 65, p. A–8. (5) Briefing, Lt Col Lawrence Edholm, Ch, Plans Br, Program Ofc, D/S, SMC, for Brig Gen Frederick Austin, 10 Jan 66.

[20] CSM 65–565, 15 Nov 65, subj: Special Asst to the CofS for Supply and Maintenance, Southeast Asia.

[21] Trip Rpt, Special Asst to CofS, Southeast Asia Supply and Maintenance, 17 Dec 65.

[22] AMCB 5–64, 8 Dec 64, subj: AMC Oversea Commands Relationships.

[23] AMC Historical Summary, FY 1966, pp. 106–111.

Changes in Missions and Functions

To a considerable extent, the climate of change under which the AMC operated during its early years derived from efforts within the Department of Defense to consolidate common supply and service functions. One such step was the designation, in November 1964, of the Secretary of the Army as the Single Manager for Military Traffic, Land Transportation, and Common-User Ocean Terminals. On 15 February 1965, the Military Traffic Management and Terminal Service (MTMTS) was formally activated, under Maj. Gen. John J. Lane, as a major field command of the Department of the Army to carry out this Single Manager responsibility.[24] To the AMC, this meant the transfer of responsibility for the Army ocean terminals at New York, New Orleans, and Oakland (California), together with the 612 military and 3,670 civilian personnel involved in these operations.[25]

The creation of the MTMTS was the culmination of a long history of efforts to eliminate unnecessary duplication in various areas of the Defense Establishment. The lack of centralized control of inland transportation and traffic management during the early days of World War I had caused confusion and congestion. Following the Armistice, the Quartermaster General had been designated as traffic manager for the War Department, but experience in World War II revealed the need for better integration of military transportation services. The principle of interdependence within the military departments as recognized in the Unification Law of July 1947, brought a measure of unification in the transport fields. It led to the establishment of the Military Air Transport Service in 1948 and the Military Sea Transportation Service in 1949. Efforts to assign responsibility for land transportation to the Army, however, ran into stiff resistance from the Navy and the Air Force. Land traffic management, they argued, was inseparable from, and subordinate to, the supply mission of the individual departments. In response to the Korean crisis, however, the Military Traffic Service was established at the DOD level in August 1950, but this was no more than a compromise solution. It failed to solve the underlying problem of duplication in transportation service and traffic management.

Late in 1954, the Office of the Assistant Secretary of Defense (Supply and Logistics) inititated a study of the broad area of duplication in logistics. This study led to the development of the "Single Manager Plan"—a practical approach to consolidating common military supply and service operations. Under it, the Secretary of one military department was made responsible, by the Secretary of Defense, for managing certain common-use items or services for all the military departments. A single manager for subsistence was established in November 1955. A few months later, the Secretary of the Army was designated as the Single Manager for Traffic Management, and the Military Traffic Management Agency (MTMA) was established under the Chief of Transportation to control all assigned functions of traffic management for all military departments. In January 1962, the MTMA was transferred to the Defense Supply Agency,[26] where it was renamed the Defense Traffic Management Service.

At the request of the Deputy Secretary of Defense, the Chairman of the Joint Chiefs of Staff (JCS) subsequently ordered an analysis of the CONUS air and ocean terminal system. Completed in July 1964, this study concluded that there were significant advantages to be gained from the development of an integrated common-user/ocean terminal system, and that the dominant interest in such terminals was in the Army.[27] The Secretary of Defense therefore announced, in November 1964, the decision to consolidate the management and operation of military traffic, land transportation and common-user ocean terminals under the Secretary of the Army as a single managership.

Earlier, under the Chief of Transportation, three U.S. Army Transportation Terminal Commands (Atlantic, Gulf, Pacific) had been

[24] MTMTS Historical Summary, 1 Jul 64—30 Jun 65, 10 Nov 65, p. 17. (2) The MTMTS charter was contained in DOD Dir 5160.53, 24 Jun 65, subj: Single Manager Assignment for Military Land Transportation, and Common-User Ocean Terminals.

[25] Submission, App I, AMCPT to AMCHO, 2 Dec 68.

[26] See DOD Dir 5105.22, 6 Nov 61, subj: Defense Supply Agency (DSA); and DSA GO 2, 20 Dec 61.

[27] See study of CONUS Air and Ocean Terminal System, JCS, Jul 1964.

established to supervise operations at military and commercial port terminal facilities on their respective coastlines. These terminal commands had been transferred to the AMC's Supply and Maintenance Command in August 1962, where they were redesignated U.S. Army Terminal Commands. Effective 1 April 1965, these terminal commands, as well as the Joint Army-Navy Ocean Terminal at Oakland, California, were transferred to the MTMTS.[28]

Activation of MTMTS meant that the AMC was out of the transportation business. Officially, its responsibilities ended when materiel was outloaded at the depots. Under the contingency planning process, the AMC did retain a responsibility for monitoring automatic supply shipments until they reached the far shore, but to General Besson, a former Army Chief of Transportation, the command's responsibility was larger than that. He considered it his job to see that the supply system provided whatever its customers needed, whether hardware or technical assistance, and transportation was part of the pipeline. He therefore insisted on retaining a transportation capability within his headquarters, first as a separate directorate and later as a division within the Directorate of Distribution and Transportation.[29]

Another study, known as DOD Project 60, was resulting in the consolidation of contract administration services under the Defense Supply Agency during this same period. Project 60 brought about the deactivation of the AMC Procurement Districts beginning with the Philadelphia Procurement District in November 1964. By the end of February 1966, only two—San Francisco and Detroit—of the former 11 AMC Procurement Districts remained in existence, and these were mere paper organizations.

With the liquidation of the procurement districts, AMC commodity commands assumed contract execution functions. But many personnel refused to transfer with their functions, and by August 1965 the AMC was hard put to keep up with the increased contracting workload resulting from the buildup in Vietnam. For the commodity commands, the accelerated procurement actions required by operations in Vietnam had come at an inopportune time. The AMC therefore moved to retain as many skilled procurement personnel as it could. It activated procurement detachments in Chicago and Cincinnati in October 1965, and another in New York a month later to help handle the contract execution workload. In December 1965, it also established a U.S. Army Southwest Procurement Agency at Los Angeles, and a U.S. Army Northwest Procurement Agency at San Francisco, thereby retaining about 590 personnel from the Los Angeles and San Francisco Procurement Districts for contract execution work.[30]

Merger of Headquarters AMC/SMC

Collocation

The U.S. Army Supply and Maintenance Command had been established on the basis that a single command could best develop a single, uniform Army supply and maintenance system. Since both the AMC and SMC Headquarters were to be located in the Washington area, General Besson had decided that there would be no supply, maintenance, and transportation staff functions in Headquarters, AMC. These were delegated to the Commanding General, SMC. In January 1963, largely as a result of the Cuban missile crisis, he expanded the authority of General Schomberg even more. He authorized the Commanding General, SMC, to speak with full command authority with regard to all secondary items within the Army supply system. Only the management of major items was retained within the Directorate of Materiel Readiness, Headquarters, AMC.

This division of responsibilities generated

[28] For a detailed account of the establishment of the MTMTS, including background thereto, see MTMTS Historical Summary, 1 Jul 64—30 Jun 65, 10 Nov 65.

[29] AMCR 10-2, 1 Jul 66, Organization, Mission, and Functions of HQ AMC, p. 25.02. (2) *Ibid.*, C13, 24 Jun 68, p. 23.05.

[30] (1) AMC Historical Summary, FY 1965, pp. 457ff. (2) AMC Historical Summary, FY 1966, pp. 634-637. (3) See also, Chapter V: Shopping for Defense.

increasingly troublesome problems, particularly in the areas of materiel readiness, contingency planning and execution, and international logistics, and these problems grew even more acute as international tensions increased. A headquarters organizational study initiated in May 1964 resulted, among other things, in a proposal that the two headquarters be combined. Largely because there was no facility available to house the combined headquarters, no action was taken on this proposal.[31]

A few months later it became increasingly evident that the Administration was moving toward war in Vietnam, and on 17 March 1965 General Besson asked his Chief of Staff to determine to what extent collocation of Headquarters AMC/SMC could be accomplished within the facilities available. At the time, approximately 2,500 AMC personnel occupied four of the nine wings, or 245,900 square feet of space, in Building T–7, a three-story "temporary" building of World War II vintage. Headquarters, SMC, with about 980 employees, occupied space in the Nassif Building, a modern, privately-owned office building about six miles away. By relocating the MTMTS, which occupied one wing in T–7, to the Nassif Building, Besson was told, about 80 percent of the personnel of the two headquarters could be housed at T–7.

On this basis, General Besson decided to collocate the AMC/SMC mission directorates in T–7 and the support elements in the Nassif Building. The ultimate solution, he believed, was to merge the two headquarters, but this would take time to plan and carry out. He therefore sought, and obtained, Army Chief of Staff approval for collocation of Headquarters AMC/SMC at the earliest possible date.

Collocation of the two headquarters was carried out between 21 April and 5 May, with 1,541 persons being moved between T–7 and the Nassif Building, and 177 being moved between T–7 and the Washington Navy Yard, where the AMC also had some space. Because of the lack of holding space in either T–7 or the Nassif Building, many internal moves were also required. All this shuffling caused bruised feelings and generated speculation as to whether top managment knew what it was doing, for it was not generally understood at the time that the United States was in fact at war in Southeast Asia. But despite the disruption involved in this effort, there was no doubt in General Besson's mind of the need for collocation. The merits of these moves, he wrote at the end of June 1965, were "readily visible to all concerned" and would become even more so as time moved on.[32]

Consolidation

As indicated earlier, collocation was but the first step. Planning for consolidating Headquarters AMC/SMC into a single, cohesive headquarters was carried on concurrently with the collocation efforts. Originally, General Besson hoped that this merger could be accomplished by 1 July 1965, but completion of the merger plan was delayed by problems pertaining to the staffing of the new headquarters organization, problems which derived to a considerable extent from the pressure being exerted by the Bureau of the Budget to roll back the number of high grade positions in Federal agencies. As a consequence, the merger did not become effective until 1 July 1966.

Under the merger, the Directorates of Supply and Maintenance, the major functional directorates of the SMC, were shifted, largely unchanged, to Headquarters, AMC. Other elements of Headquarters, SMC, were merged with appropriate elements of the parent organization.

Major Organizational Changes

A number of organizational changes were also made, some of them long before the merger became effective. One was the designation, on 13 May 1965, of General Engler as Deputy Commanding General for Support, AMC, in addition to his duties as Commanding General, SMC. Maj. Gen. William B. Bunker, the Deputy Commanding General, AMC, since April 1964, served as Deputy Commanding General for Development and Acquisition until General Engler was reassigned to Vietnam in January 1966, at which time he again assumed all deputy functions.

[31] For a full account of the collocation and merger of Headquarters AMC/SMC, see AMC Historical Summary, FY 1965, chs. II & III, and AMC Historical Summary, FY 1966, pp. 21–22.

[32] Ltr, Gen F. S. Besson, Jr. to Col Stanley J. Sawicki, 30 Jun 65, subj: Letter of Appreciation.

Perhaps the key change, in view of events in Southeast Asia, was the provisional establishment, on 19 May 1965, of the Operational Readiness Office (OPRED), not as an operational element but as an arm of the Command Group. Its principal job was to receive or ferret out potential problems in the area of materiel readiness and assure coordinated action within the AMC complex on such matters. To assist in this overall effort, the Theaters Division of the Directorate of Supply, the focal point for AMC liaison missions to oversea commands, was transferred intact to the OPRED. The war planning functions of the two headquarters were also combined under the OPRED, effective 30 July 1965.

Several other significant changes became effective upon the merger. Responsibilities for management systems and data systems, for example, had been divided among a number of offices and agencies, and as a consequence there was no one place the Commanding General could look to capitalize on the latest advances in the areas of management science and data systems. The consolidation of these functions under a Directorate of Management Systems and Data Automation was, therefore, one of the principal organization changes General Besson asked for in connection with the merger.

Important organizational changes were also proposed in the area of international logistics. For some time there had been skirmishing between the SMC's Directorate of Supply and AMC's Mutual Security Office/Agency as to which had inherited the functions (and personnel) for operations in support of the Grant Aid and Military Sales programs. Negotiations between the Chief of the Mutual Security Office and the Director of Supply had resulted in a Memorandum of Understanding in June 1964 on their respective staff responsibilities in reference to Mutual Security Programs. However, this agreement soon broke down over the question of whether it involved a transfer of functions and therefore of personnel spaces, and this proved a sticky point for some time to come. In the merger, all spaces and functions were pooled and a Directorate of International Logistics was created.[33]

[33] For developments in this area, see Chapter IX, International Arsenal.

Planning for the research within the AMC was carried out at the same time as the merger effort, but as a separate enterprise. As noted in chapter I, the Hoelscher Committee had been divided over organization for research, and the matter was deferred rather than resolved during the reorganization of the Department of the Army.

Actually, a fundamental conflict was involved, one that had perhaps best been explained by Dr. Vannevar Bush, Director of the Office of Scientific Research and Development during World War II. In a report to the President in 1945 he emphasized the importance of basic research—it was, he said, the "pacemaker of technological progress." But he also warned of a "perverse law" governing research. "Under the pressure for immediate results, and unless deliberate policies are set up to guard against it," he wrote, "applied research invariably drives out pure." [34] Still, research programed and funded by a Government agency needed to bear some relationship to that agency, and therein lay the problem. Nor was it confined to the Army. As the Associate Director of the National Institute of Health told a United Nations conference in Geneva in February 1963: [35]

> . . . a central fact is the newness of the entire question of science policy in the context of government. The United States is experimenting and innovating in this area, and the manner in which the Government will be organized to deal with science policy is not yet settled. . . .

A fundamental conclusion of the Bell Report, which was approved by President Kennedy in April 1962, was that the Federal Government, as a matter of national policy, should seek to enhance the capability of its in-house laboratories.[36] Since then, many addi-

[34] Dr. Vannevar Bush, "Science, the Endless Frontier," (Jul 1950), p. 19, as reprinted by the Natl Science Foundation, Jul 1960.

[35] Charles V. Kidd, in Introduction to *Scientific and Technological Policy, Planning, and Organization,* vol. IX of U.S. Papers prepared for the U.N. Conf on the Application of Science and Technology for the Benefit of the Less Developed Areas, Geneva, Feb 1963.

[36] S. Doc 94, U.S. Senate, 87th Cong, 2d sess, *Rpt to the President on Government Contracting for R&D,* prepared by the BOB and Referred to the Committee on Govt Operations (Bell Rpt) (GPO, 1962), pp. v, 21–24.

tional studies and analyses had been made to determine more specifically how this should be done. Among these, the more significant, from the DA point of view, were the report on in-house laboratories (Skifter Report), the report on scientific personnel (Vance Report), and the studies of program structure and management conducted by the Army Research Council (TARC).[37]

Both the Skifter Report and the Vance Report expressed concern over the existing research management structure and its effects on the Army's research and development effort. At an AMC Board meeting in June 1964, General Besson directed that action be taken to develop a definite proposal for organizational improvement. An AMC Research Ad Hoc Working Group was established to formulate the most proper concept of organization for the conduct of research within the AMC complex, but this effort was soon superseded by a reorganization proposal developed by the TARC.

Consisting of a group of senior Army scientists, the TARC had been formed, in response to a recommendation contained in the Skifter Report, to study the realignment of the Army's research (6.11) and exploratory development (6.21) activities. In its report to the Assistant Secretary of the Army (R&D), the TARC added its voice to those calling for organizational change. In September 1964, Secretary Hawkins described the TARC proposal to the Commanding General, AMC, the Chief of Engineers, and the Surgeon General, and asked for their views.

While the Hawkins proposal was still under study, the Department of Defense presented the military departments with a reorganization proposal of larger scope, known as the "Sherwin Plan," with a request that "some such plan" be worked out. From this evolved General Besson's "Concept of Laboratory Management," and in discussions with key DA and DOD officials this concept was quite well received. The Director of Defense Research and Engineering considered it an "extremely attractive concept," and in June 1965 he approved it for implementation. It was this concept that was in the process of being implemented while preparations for the merger of Headquarters AMC/SMC were underway.[38]

Commodity Management

Historically, the accepted method of organizing and managing an integrated human effort had been by function, by grouping like activities and skills into compartmentalized units. By World War II, however, many of the larger United States corporations were beginning to move away from functionalism. In their search for a better way, they began to draw various corporate functions (research, production, marketing, etc.) together under a product manager concept, one reason being that research and development, the child prodigy of the early Fifties, was becoming more and more of a problem child. As expenditures for research and development shot upward, it was demonstrated repeatedly that profitable new products and significant advances in military capabilities were not the only possible consequences of a massive investment in science and technology. It was also possible for time, talent, and money to be wasted on a prodigious scale in this area, and the need for better management of these efforts became increasingly apparent. To a large extent, the movement from functional toward system management in the commercial community in the post-war years was in recognition of the need for a better means of planning, programing, executing, and controlling costly and complex materiel operations.[39]

[37] (1) Rpt of the Ad Hoc Committee on In-House Labs, ASAP, DA, Dec 1963 (Skifter Rpt). (2) Rpt of the Ad Hoc Group on Scientific Personnel, ASAP, DA, Apr 1964 (Vance Rpt). (3) "TARC Releases Massive Proposed Research Document," *Army R&D News Magazine*, vol. 5, No. 9 (Sep 1964), p. 1.

[38] (1) AMC Historical Summary, FY 1965, pp. 341–346. (2) For implementation of this concept, and subsequent developments, see Chapter IV: Shaping the Weapons to Come.

[39] William J. Tropf, Jr., "Army Programing: An Analysis Under System and Functional Mgmt," Thesis 167, ICAF, 20 Mar 64.

While the military departments had continued to carry out their responsibilities under a functional system of management, they too had resorted to various forms of system management when the materiel objectives were of sufficient importance. One such method, representing a radical departure from previous management practices, was the relatively complete delegation of authority to the arsenal commander in the Jupiter and Redstone missile programs. But these uses of system management within the military services were not the product of a special, uniform technique, but rather special reactions to special situations. Furthermore, in many cases these system and project managers were little more than coordinators or points-of-contact, and not managers in the strict sense of the word.

Perhaps the closest approach to a uniform system was the project management concept adopted by General Besson before the AMC became operational in August 1962. A study prepared for the Department of Defense in 1962 had called for "projectization" of Army programs to be carried out as part of the general realignment of the Technical Services and Army headquarters.[40] These project officers, the study made clear, should have full responsibility and authority over their particular assignments. This was the concept of Project Management adopted by General Besson. The planning directive establishing project management within the AMC specified that project managers would have both the responsibilities and the authorities of the Commanding General, AMC, for the accomplishment of their assigned missions.[41] In the AMC, project managers were to be managers in the strictest sense of the word.

The Army had been faced with two simultaneous major innovations in the reorganization and the introduction of the new DOD program system known as the Five Year Force Structure and Financial Plan. The former was directed primarily toward organizational realignments in the specialized areas of personnel, combat developments, training, and materiel. Consequently, Army programing procedures remained essentially unchanged. They continued to be prepared, reviewed, controlled, and executed along traditional, functional lines. Therefore, with the significant exception of the use of project managers for key materiel systems, the AMC was organized along functional lines. Programs and budgets had to be submitted to the Congress by functional appropriation, and financial resources accounted for in this form. This alone required that the command be structured along functional lines.

But system management was also a requirement, particularly for programs of national urgency. A purely functional organization was incapable of generating a coherent, integrated assessment of a complex program, or the management attention such programs needed. It was to fill this need that the AMC system of project management was superimposed on an essentially functional organization.

The result was a rather obvious inconsistency in the area of programing. The Five Year Force Structure and Financial Program recognized that a mission-oriented program structure was the only feasible means for evaluating and managing programs in terms of objectives and for selecting alternatives, but the actual management and control of programs continued to be by function.[42]

In the years that followed, the DOD's Planning-Programing-Budgeting System developed into Project PRIME (Priority Management Efforts), which represented the initial phase of a new system of resource management developed under the aegis of Dr. Robert Anthony, Assistant Comptroller, OSD. It involved an overhaul of the management, accounting, and reporting of operating funds, including as a first step the consolidation of Operation and Maintenance, Army (OMA), and Military Personnel, Army (MPA), appropriations. The initial target installation date in the Department of the Army was 1 July 1967, but the Congress in mid-1967 directed that there be no major changes in budget accounting systems in the DOD until Fiscal Year 1969.

[40] See "The Extension of Special Organizational Patterns and Management Techniques to Additional Weapon Systems," Rpt for the ASD (I&L) by United Research, Inc., 1962.

[41] See AMC Planning Dir 32, 27 Jun 62, subj: Interim Proj Mgmt Procedures.

[42] For a discussion of this conflict, see William J. Tropf, Jr., *op. cit.*

This new program, budget, and management accounting system for operating resources was implemented in the Department of the Army on 1 July 1968. It was designed to relate these costs to the Five Year Defense Program, thereby bringing them into accord with the decisionmaking structure of the DOD, without changing the appropriations involved or diminishing congressional control over the use of those appropriations.[43]

The search for a better integration of programs and budgets was accompanied by a search for more effective management structures. Something has already been said of the key role played by project management within the AMC, and more will follow.[44] Mention has also been made of the requirement for an essentially functional organization, and of the problems involved in management by function where large organizations and complex materiel systems were concerned. What then was commodity management, and how did it fit into the AMC scheme of things?

As a management concept, commodity management lay somewhere between project management and functional management. It was a less intensive form of management than the former, and therefore less expensive in terms of key personnel, but it was much more systems oriented than a purely functional organization. Both the Hoelscher Committee report and the AMC Activation Plans had identified the AMC commodity commands as the primary authoritative level for integrated life cycle management of materiel items and systems, and as time passed it became clear that these commands provided that point within the Defense structure where detailed, continuing consideration could be given to multiple systems and items of materiel, particularly in terms of evaluating alternatives. The commodity commands were the Government entities where ideas from the universities could be linked with the capabilities of American industry to meet the materiel needs of the Army in the field.

Early in January 1963, General Besson gave conceptual direction to the commodity commanders. The AMC had been operational but a few months, and already there was evidence of a tendency for the commodity commands to use the national inventory control points as their management points, and to neglect to assume these responsibilities within the commodity command headquarters. "I feel strongly," he wrote in a letter to his major subordinate commanders, "that the commodity commanders and the key members of their headquarters, primarily the commodity offices, should assume full responsibility for the total management, from cradle to grave, of their assigned items." Though important to the details of this management, the NICPs were not to be permitted to assume this management responsibility.[45] This emphasis on commodity offices was to eliminate duplicate engineering within sequential, functional operating elements and assure maximum integration of effort among the various functional operators.[46]

When the first partial edition of the AMC Organization and Management Manual was issued in July 1963, the section on "Concepts of Management" was not yet ready for publication. It was still missing when, in March 1964, additional material was added to the manual. However, guidance concerning the use of commodity officers had been included in the early edition. It specified that commodity officers should be designated for across-the-board coordination of specific systems or groups of items, and there where established such personnel were to report directly to the commanding general of the subordinate command.[47]

Commodity management, as developed and refined in the AMC over the next few years, represented a completely new approach to the limitations of functional management. It was recognized that the commodity commanders

[43] (1) LCDR Steven Lazarus, SC, USN, Special Asst to the ASD (Comptroller), "Project Prime," *The Review*, published by the Defense Supply Association, Mar-Apr 1967, p. 43ff. (2) "A Work-Together Plan for Financial Systems," *DOD Cost Reduction Journal*, Spring 1967, vol. III, No. 2, p. 17. (3) Profile, C/DP, AMC, vol II, Depots, 30 Aug 68, p. 79.

[44] See Chapter III: Sixty Men with Four Stars.

[45] Ltr, Lt Gen F. S. Besson, Jr. to Lt Gen August Schomburg *et al.*, 9 Jan 63, subj: Adjustments of Functional Responsibilities Within AMC.

[46] Presentation, "Army Proj and Commodity Mgmt and Their Interface," Senior Logistics Mgmt Seminar, ALMC, 18 Sep 68.

[47] AMCR 10-39, 25 Jul 63, subj: AMC Organization and Mgmt Manual, pp. i, II-4, and C1, 4 Mar 64.

were responsible for the money, manpower, and facilities provided for their mission purposes, all of which required functional management. But they were also responsible for acquiring, fielding, and supporting systems and items of materiel within well-defined commodity groupings, and it was in this area that something more than that which could be provided by functional management was required. The key question was how could this additional requirement be met without creating duplication and excessive conflict within the commodity command headquarters and its operating elements.

The Systems Management Concept

One thing that became apparent during the first year of the AMC's existence, was that greater uniformity was needed in the organization of the national inventory control points and the national maintenance points (NMPs). With this in mind, General Besson directed the Commanding General, WECOM, in June 1965, to make a study of the organization and functions of these agencies. This study was nearing completion when, in May 1966, the Brown Board [48] began its inquiry of the wholesale portion of the Army logistics system. Consequently, the AMC asked the board to evaluate the merits of this study in the course of its inquiry.[49]

In its subsequent report on "General Management" within the Army Logistics System, the Brown Board recommended that the AMC Commodity Commands be reorganized according to a standard organizational structure.[50] It attributed problems in the acquisition process to the fact that the responsibilities of various staff entities (staff elements, commands, agencies, and contractors) involved in the life cycle process were not clearly defined, and to the complexity of the task of planning logistic support for a system at the same time that specifications and technical data were being prepared. To reduce these problems, the Army Chief of Staff approved four recommendations directing the development of a procedure for logically considering and evaluating each of the military, technical, and economic variables involved in total systems design. In essence, this involved the formulation of a system approach to management, and development of a system engineering management procedure to interface with the advanced production engineering and integrated logistics support planning.[51]

The AMC took exception to some features of the board's recommendation, and in negotiations between Generals Besson and Brown it was agreed that the skeleton organization recommended by the board would be expanded by further study, and that a plan for testing the feasibility of a new, standardized organization would be submitted to the ODCSLOG. This approach was approved by the Army Chief of Staff, and the AMC was directed to prepare and perform the test at one of its commodity commands.[52]

When the AMC nominated the Electronics Command for the test, the DCSLOG questioned the selection on two counts: the physical separation of the NICP/NMP activities, and the fact that ECOM was largely concerned with materiel that was incorporated into major systems handled by other commands. Neither of these objections were considered valid by General Besson. The objective was a standardized organizational structure for all commodity commands, he argued, and if the proposed structure could not be adopted by ECOM the goal of standardization could not be achieved.

General Besson believed that the ECOM structure proposed by the AMC incorporated

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[48] For further discussion of the DA Board of Inquiry on the Army Logistics System, see Chapter X.

[49] (1) DF, DCofS, AMC, to all SMC and AMC Directors *et al.*, 12 May 66, subj: Brown Board of Inquiry on Army Logistics Sys. (2) Army Logistics Sys Review Board, Major Problem Areas AMC, Prob 29, subj: Organization and Functions of NICPs and NMPs.

[50] Rpt of the DA Board of Inquiry on the Army Logistics System, vol IV, "General Mgmt," ch VI.

[51] (1) Ltr, Actg Dir/MS&DA, AMC, to Proj Managers *et al.*, 3 Apr 68, subj: Project—Preparation of Army Manual—Systems Engineering Mgmt Procedures (SEMP). (2) For details, see: (a) Rpt of the DA Board of Inquiry on the Army Logistics System, vol III, "Acquisition Management;" and (b) CSM 67-81, 1 Mar 67, subj: same (decision actions 19d, 87c, 89c, and 94c).

[52] (1) Ltr, Ch, Logistics Doctrine and Systems Ofc, DCSLOG, to CG, AMC, 12 Jun 67, subj: Assignment of Task Regarding Organization of Commodity Comds. (2) See CSM 67-129, 27 Mar 67, subj: Rpt of the DA Bd of Inquiry on the Army Logistics System, vol IV, "General Management," with incls.

the best aspects of the commodity command structure recommended by the board, and eliminated that structure's weak points. The AMC plan provided for better integration of supply and maintenance, a major objective of the Brown Board, by assigning the depot maintenance workloading function to a Directorate of Materiel Management. The plan also incorporated the weapons system concept for supply control as recommended by the board.

The AMC plan eliminated certain elements of the board structure as infeasible. The board had recommended the establishment of separate stock control, maintenance engineering, and depot workloading functions for each major end item/weapon system/commodity grouping, which the AMC believed would mean an undesirable fragmentation of these functions. Instead, the AMC planned to separate stock control (a day-to-day operating function) from supply control (a requirements determination, or planning function) through the creation of a Directorate of Distribution. Such a directorate, responsible for processing requisitions and for insuring the accuracy of inventory records, would give commanding generals in the commodity commands more direct control of distribution. The role of the project managers and commodity managers in life cycle management was another area of disagreement. As practiced within the AMC, project/commodity managers were responsible for assuring adequate logistic support for assigned items throughout their life cycle, and it was felt that the board structure did not give adequate recognition of this fact.[53]

The Brown Board held that reorganization within the AMC commodity commands was a matter of some urgency. There was need for an organization that would assure direct, continuing personal attention to the support of materiel after it entered operational status, and that would provide commanders in the field an identifiable source of assistance, information, and logistics support concerning his materiel. Under existing organizational structure, the board believed that this could best be done by putting greater emphasis on weapon system management, and by assigning specific responsibility to a designated individual during each phase of the entire life cycle of an item. Combining the NICP and NMP into a single logistics support directorate at each commodity command was an important element of the board's recommendations for improving materiel readiness in the field.[54]

The purpose, then, was to provide an organizational structure which coupled responsibility for fielding systems and items with responsibility for all aspects of continuing logistic support. Under this concept, a single, identified individual, the item/system manager, would be responsible not only for fielding items/systems, but also for assuring the operational readiness of his materiel throughout the world. It was based on the proposition that materiel readiness was a balance between supply and maintenance, and that the dynamics of maintaining this balance dictated that a single individual at the operating materiel support level be given the responsibility and the authority to maintain this balance.[55]

Impact on Headquarters AMC Organization

A change in the commodity command organization along the lines recommended by the Brown Board, coupled with new AMC responsibilities in regard to worldwide depot programing and super high-dollar value secondary items, required a re-examination of the Headquarters, AMC organization. In December 1967, General Besson approved changes in the headquarters organization along lines set forth during a briefing on this subject in August. An Implementation Planning Group, headed by the Director of Management Systems and Data Automation, was established to develop, by 1 February 1968, a time-phased plan for accomplishing the reorganization.[56]

The major change provided for the centralization of materiel programing, for both major and secondary items, within a new Directorate

[53] 3d Ind, Gen F. S. Besson, Jr., to DCSLOG, 5 Oct 67, subj: Assignment of Task Regarding Organization of Commodity Comds, to ltr, Ch, Logistics Doctrine and Sys Ofc, DCSLOG, to CG, AMC, 12 Jun 67, subj: same.

[54] 2d Ind, Ch, Logistics Doctrine and Systems Ofc, DCSLOG, to CG, AMC, 10 Aug 67, subj: Assignment of Task Regarding Organization of Commodity Comds, to ltr, same to same, 12 Jun 67, subj: same.

[55] *Ibid.*

[56] DF, CofS, AMC, to all Directors and Staff Ofcs, HQ AMC, 22 Dec 67, subj: Reorganization of HQ AMC, with incls.

of Materiel Management. This involved the merger of the Directorates of Supply and Major Items, with the major elements of the former—Supply Management, Troop Support, and Logistics Support (less Cataloging and Management Data Branch)[57] Divisions—being transferred intact. The organization thus created was to be designated the Directorate of Materiel Management, but this was subsequently changed to Directorate of Materiel Requirements.

Under a concept approved by the Department of the Army in June 1967,[58] the AMC was made responsible for programing worldwide depot maintenance, and this responsibility, too, was to be centered in the new Directorate of Materiel Management. Functions associated with this responsibility which included the depot maintenance workload programing and scheduling function, and staff supervision of programs for the retrograde of unserviceable materiel, and Project PATRIOT,[59] were to be transferred from the Directorate of Maintenance. In keeping with its more limited mission, the Directorate of Maintenance was to be redesignated the Directorate of Maintenance Engineering.

The reorganization was also to provide for more centralization of engineering functions. The Directorate of Development was to be redesignated the Directorate of Development and Engineering, with several engineering functions being transferred to it from the Directorate of Procurement and Production. Responsibility for staff supervision of product improvement and configuration management were also transferred to the Directorate of Development and Engineering.

The first phase of the Headquarters, AMC, reorganization, which involved the major mission elements of determination of materiel requirements, procurement and production, maintenance, distribution and transportation, became effective on 1 July 1968. On that date, the Directorate of Supply was discontinued, and new organizational entities were formed: the Directorates of Materiel Requirements, Distribution and Transportation, and the Logistics Data Management Office. In addition, the Directorate of Development became the Directorate of Development and Engineering.

These changes were designed to make the headquarters organization more compatible with the standard organization for the major subordinate commands as recommended by the Brown Board. They were timed to coincide with the recent assumption by the command of responsibility and accountability for selected high-dollar secondary items in oversea areas, and of maintenance program responsibility for Army equipment on a worldwide basis. Because there were still many loose ends to be tied up, this phase of the reorganization was implemented on a provisional basis, and personnel were detailed to the new organizations pending completion of job description, staffing patterns, and approval of a new headquarters table of distribution. Changes in the administrative and support areas of the Headquarters organization were also under study, and when implemented, these would constitute phase II of the Headquarters AMC reorganization.[60]

Implementation of Systems Management

While functional management provided the expertise needed within the various stages involved in the development, acquisition, and support of materiel, it did not provide an overall view of any particular materiel system. Project management quite effectively met this need, but it did not usually provide any overall view of a *group* of materiel items—whether it be air defense missile systems or rotary-wing aircraft systems—short of the Command Group itself. It was to achieve better management over important groupings of commodities that commodity management was needed. In implementing any concept for commodity or systems management, however, the key ques-

[57] The Cataloging and Management Data Office was merged with the Technical Data Office, which was redesignated the Logistics Data Management Office.

[58] See TAG ltr, AGAM-P(N) (20 Jun 67) LOG/5N, 28 Jun 67, subj: Central Control of Depot Maintenance.

[59] A project for supporting the objectives of an AMC Provisioning Plan for the deployment, redeployment, and retrograde movement of combat and combat support materiel. AMC Cir 1-25, 17 Aug 67, subj: PATRIOT Coordinating Ofc.

[60] (1) DF, CofS, AMC, to Directorates/Staff Ofcs, 17 Jun 68, subj: Reorganization, HQ, AMC, with incls. (2) Memo, Gen F. S. Besson, Jr. to all HQ, AMC Personnel, 17 Jun 68, subj: Reorganization of AMC Headquarters.

tion, as noted above, was how this could be done without creating excessive duplication and conflict within the commodity command headquarters and its operating elements.

To the AMC, there was a two-part answer to this question. First, since the commodity command was essentially an operating entity, headquarters staff activities of a functional nature could be combined, wherever possible, directly with the respective operational elements. Program and budget direction from higher headquarters could be received and coordinated at the comptroller level, and then passed for implementation directly to the appropriate operating element, whether it be a laboratory, procurement office, or an NICP. The second part of the answer lay in the methodology for the operation of the commodity offices. Unlike project managers, the commodity manager would not be able to direct any and all elements of the commodity commands. Instead, he was to operate outside of the normal stream of program control documents—he was to be staff officer and not a line operator. His primary function was to develop life cycle plans for the items and systems in his group—abbreviated project manager master plans (PM_2Ps)—and to monitor developments within his commodity area. Among other things, he would provide a far more realistic point of contact for industry, and for unsolicited hardware proposals, than would laboratories, procurement offices, or inventory control points.

Perhaps most important of all, the commodity manager concept provided for an overview of all the items/systems within a particular commodity grouping. In most cases, the item being project-managed was but one item within a larger commodity grouping, but the project manager was not able, within his parameters and responsibilities, to see the full interaction of his item with others in the larger commodity group. This, then, was the responsibility of the commodity manager, and the concept provided for project-managed items to be matched with the commodity group to which they were most closely related.

By their nature and purposes, project managers could not be expected to recommend that their projects be removed from intensive management at the appropriate time. The tendency was for them to try to expand their authority to include other individual items or systems, or to become small R&D agencies within themselves. Excessive movement in this direction, of course, would result in a project manager becoming, in fact, a commodity office. As a matter of fact, the AMC did have project managers who managed a whole commodity grouping rather than one item or system, and who therefore were essentially commodity managers. This occurred because the AMC did not yet have adequate commodity management exercised within the commodity commands.[61]

By the end of 1968, an AMC concept of commodity management was beginning to be implemented. In the Mobility Equipment Command, for example, a new method of materiel management, representing a considerable change from that which had been in use, had been implemented during the year. The old method had been based on functional management of major and secondary items, with major items under the jurisdiction of a single item manager and secondary items and repair parts being managed independently by Federal Supply Centers (FSCs). Since an FSC manager was responsible for several Federal supply numbers which related to more than one end item, major item managers had to deal with several FSC managers. The new method provided for management on a system basis. Both the end item and the supporting materiel and repair parts were put under the management jurisdiction of a single item manager, thus providing for closer management control of each "system." [62]

Standard Commodity Command Organization

By September 1968, plans had been laid for a standard commodity command organization to be implemented, on a pilot basis, at the U.S. Army Aviation Materiel Command (AVCOM), soon to be redesignated Aviation Systems Command (AVSCOM). The rapid growth of Army aviation and the fact that the materiel managed by AVCOM lent itself to systems management were factors in the selection of

[61] Presentation, "Army Proj and Commodity Mgmt and their Interface, "Senior Logistics Mgmt Seminar, ALMC, 18 Sep 68.

[62] Submission, MECOM to AMCHO, 5 Dec 68.

AVCOM for this initial effort. The growth of airmobility within the Army had brought dramatic increases in the AMC's programs for the development and support of aircraft systems. Between 1958 and 1968, the number of aircraft in the Army inventory had more than doubled, to 10,600. Unit costs had increased sharply during this period, with the average cost of an Army aircraft jumping from $18,000 to almost $300,000 and new heavy lift and Cheyenne helicopters costing over $2 million a copy. These aircraft were also being flown more, averaging 530 flying hours per aircraft per year in 1968 as compared to 320 hours in earlier years. As a consequence of this greater inventory and greater activity, the inventory value of secondary items had increased tenfold, to $2 billion, as compared to 1958.

The bulk of this increase had occurred in the last three years. When the AMC became operational in 1962, the Army had only recently obtained authority to procure off-the-shelf aircraft, and AMC responsibilities in this area were limited largely to procurement of aircraft and to the support of fielded airplanes. In the years that followed, AMC responsibilities grew with the growth of Army aviation. In 1963 AVCOM was assigned cognizance of the Bell Plant, and in 1964 an R&D activity, the Aviation Materiel Laboratories at Fort Eustis, was added. In 1966, there was rapid growth as a result of the war in Vietnam. The Army assumed full responsibility for developing, engineering, and procuring aircraft, and AVCOM became a major subordinate command of the AMC. It also became responsible for aircraft flight standards and qualification and was assigned the Aviation Test Activity at Edwards Air Force Base. The depot maintenance center at Corpus Christi, Texas, and two more plant cognizance activities were added the following year, as were the responsibilities for funding and workloading aircraft maintenance shops at four Army depots. In 1968, under the OASIS program, AVCOM assumed responsibility for oversea ownership and accountability for selected critical air items.

The DA Board of Inquiry on the Army Logistics System (Brown Board) had produced some guidelines to commodity command operations. One of its key recommendations was that the functions of research and development, and of logistic support be specifically recognized and placed under separate deputy commanders. Another was that research and development and logistics support should emphasize the *entire* weapon or aircraft system throughout its life cycle. These guidelines, together with management trends as reflected in DA and DOD directives, provided the basis for the proposed reorganization of AVCOM. These trends included emphasis on international logistics and on tri-service programs. They also included emphasis on better management as reflected in programs for intensive management, life cycle management, and the use of automatic data processing systems to produce the information necessary for effective management.

Under the existing organization, no less than 41 different offices, directorates, and activities reported directly to the office of the Commanding General. This multiplicity of competing demands for attention and decision led to the development of a basic logic for strengthening management: some natural grouping of functions was needed to provide for better integration of broad ranges of efforts.

Following this logic, AVCOM developed an organization structured into four basic groupings: a deputy commander for research, engineering, and data; a deputy commander for acquisition; a deputy commander for logistics support; and a centralized plans and operations office. Included as a group under the latter were data processing and all other common support functions. Since it recognized the entire life cycle functions and emphasized aircraft systems support, a new name, the U.S. Army Aviation Systems Command, was proposed for the new organization.

To Maj. Gen. John Norton, Commanding General, AVCOM, immediate implementation of the new organization was not only feasible but "absolutely essential" if existing organizational problems were to be overcome as soon as possible. The introduction phases for the LOH, the Cobra, and the Chinook were largely behind the AMC, but acquisition and introduction of the Cheyenne, UTTAS,[63] and the heavy lift helicopter were looming. He wanted the

[63] Utility Tactical Transport Aircraft System.

new organization to be well shaken down before these new requirements hit.

The AVCOM plan was approved, and as 1968 drew to a close preparations for implementing it were underway. The new organizational structure represented more than the organizational requirements of AVCOM; it also represented the new standard commodity command developed in response to Army Chief of Staff memorandum 67–179. Knowledge gained in implementing this concept at AVCOM, it was expected, would be used in applying the Brown Board's concept of systems management to the total AMC materiel structure.[64]

[64] Presentation, Proposed Reorganization of U.S. Army Aviation Materiel Comd, "Standard Commodity Command Organization," Maj Gen John Norton, CG, AVCOM, to Gen Bruce Palmer, Jr., VCofSA, 9 Sep 68.

I get different points of view when my people get in conflict. I don't think it is my job as a commander to eliminate conflict. I think it is my job to assign the responsibilities to people and those people are to bite, kick, scratch, chew, cajole, and anything they can do to get the job done. If their path crosses somebody else's, then there is a conflict. It is my job to resolve that conflict, not to prevent it.

GEN F. S. Besson, Jr.
Chief of Staff's Conference for
Newly Nominated General Officers
The Pentagon
18 September 1968

CHAPTER III

SIXTY MEN WITH FOUR STARS*

This chapter briefly traces the evolution of various forms of special management, with major emphasis on the development of policies and procedures for project management in the AMC from 1962 through 1968. When the Army Materiel Command (AMC) was established, it gave this concept of management wider application than any of the armed services. The major emphasis here is on the development of policies and procedures for the operation of project management. Both the successful application and the problems involved are covered. This chapter is intended to provide a brief, overall history of the concept and operation of project management rather than a description of its application to each individual item or weapons system. Consequently, few technical details of weapons systems are given, except to illustrate their complexity. However, typical, as well as unusual, examples of the application of this form of management are covered.

Demand for Better Management

On 1 August 1962, the Field Army Ballistic Missile Defense System (FABMDS) was placed under a project manager. In early November the Department of the Army decided to reorient the project and to terminate the FABMDS Project Manager's Office. Under functional control, each separate organizational element in charge of a part of this weapon system had justified its portion of the required budget. When the project manager brought together all the facts, such as the overall cost, the technical problems involved, and the long leadtime required, the Department of the Army reoriented the project and terminated the manager's office.[1] Under the AMC management concept, the project manager had complete control of a weapon system from "the cradle to the grave."[2] Although some aspects of AMC project management were revolutionary, the general idea of system-oriented management had developed through an evolutionary process over a period of years.

Changing Nature of Warfare

Among the major factors which demanded better management were the changing nature of warfare, the complexity of modern weapons systems, the large defense budgets, and leadtime and obsolescence. Contributing to this evolution were the changes in warfare itself, particularly the technological changes of the last two decades. Progress in electronics had practically eliminated the carrier pigeons. Mechanization finally led to the elimination of the Army mule in 1957, when the last of the pack mules were sold at Fort Carson, Colorado. Horses had long ago disappeared from the battlefield. Only the intervention of Gen. George C. Marshall and President Eisenhower saved the Fort Meyer horses used in traditional military funerals, despite the findings of a survey that revealed horse drawn vehicles to be considerably more expensive than motorized hearses.[3] The development and introduction of complex weapons, capable of performing against close or distant targets, and under all

*In late 1968 there were approximately sixty project managers in the AMC. Of his project managers, Gen Besson often said: "They exercise my full authority" and "They wear the Commanding General's hat." Thus the chapter is titled: "Sixty Men With Four Stars."

[1] Interv, Raymond J. Snodgrass with Col Robert R. Lutz, FABMDS Proj Mgr, 5 Nov 62.

[2] AMC Planning Dir 24, 12 Jun 62, subj: AMC Concept of Proj Mgmt.

[3] (1) The *Evening Star*, February 14, 1957. (2) The *Washington Post*, February 20, 1957. (Wash., D.C.)

kinds of conditions, had a great impact on the changing nature of warfare.[4]

That conventional weapons would still be necessary, although nuclear weapons were available, was indicated by the Korean War, the Vietnam War, and more than twenty smaller conflicts following World War II. Nevertheless, the idea of massive retaliation, a doctrine adhered to by the U.S. Air Force, had grown up in the United States after World War II. In the words of Secretary of State John Foster Dulles in January 1954, the United States had "a great capacity to retaliate, instantly, by means and at places of our own choosing." [5]

During 1957, Dr. Henry Kissinger of Harvard University advanced the notion that limited warfare might be more rational.[6] In October of that year Secretary Dulles wrote: "In the future it may thus be feasible to place less reliance upon deterrence of vast retaliatory power." [7] While admitting that the United States should be capable of massive retaliation, Secretary of Defense Robert S. McNamara maintained that the Nation should not be forced to use that power simply because it had no other means to cope with limited conflicts.

It was almost certain that the United States would not use unlimited means to fight a war if the aims were limited. The Department of Defense (DOD), however, did not neglect the development of new weapons guided by intricate electronic devices and capable of carrying nuclear warheads with explosive power equivalent to thousands of tons of TNT.[8]

The tremendous destructive power of these new weapons in this era of rapid technological advancement dictated revolutionary changes in military tactics and in the system of logistical support to the combat forces. The Army Materiel Command keyed its material and human resources to a long-range program with emphasis on new type weapons. The changing nature of weapons systems, and their increased complexity and phenomenal costs produced inevitable managerial adjustments. Furthermore, experience in past wars made it abundantly clear that better preparation would be essential in any future war.[9]

As manifested by the development of guided missiles, supersonic aircraft, atomic weapons, and complex electronics equipment, the 1945–1965 period was an era of technological revolution in weaponry. This revolution had a profound effect on the character of the military program. The technical complexity of modern weapons, their lengthy period of development, and enormous costs posed tremendous management problems.[10]

The highly complex assemblies of some intricate guided missile mechanisms contained as many as 300,000 separate parts. The Nike-Zeus, for example, employed sophisticated acquisition and discrimination radars and had three high-speed computer systems. The radar was designed to distinguish between valid warheads and false targets or decoys. Zeus missiles fired from Kwajalein Island in the mid-Pacific successfully intercepted targets launched over the Pacific from California. By June 1963, a total of approximately $1.4 billion had been allocated to the Nike-Zeus. In addition to the prime contractor, 139 subcontractors, hundreds of smaller contractors, and numerous Government agencies participated in this program.

Large Defense Budgets

On 4 October 1957, Russia launched Sputnik I, the first artificial earth satellite ever put into orbit. This event caused considerable alarm in the United States and led to much speculation about Russian technological advancement. In his State of the Union Message on 9 January 1958, President Eisenhower declared that the threat to the safety of the Nation had become increasingly perilous. Fur-

[4] For a comprehensive discussion of the changing requirements in weapons, see Merton J. Peck and Frederic M. Scherer, *The Weapons Acquisition Process: An Economic Analysis* (Boston, 1962).

[5] Speech, John Foster Dulles, before Council on Foreign Relations (New York), 12 Jan 54.

[6] See Henry A. Kissinger, *Atomic Weapons and Foreign Policy* (New York, 1957).

[7] John Foster Dulles, "Challenge and Response in U.S. Foreign Policy," *Foreign Affairs*, vol. 36, Oct 1957, pp. 25–43.

[8] See presentations by Secretary of Defense Charles E. Wilson and Secretary of the Army Wilbur M. Brucker, before the House of Representatives, Committee on Armed Services, 28 Jan 57.

[9] Raymond J. Snodgrass, *The Concept of Proj Mgmt*, Historical Ofc, AMC, 1964, pp. 5ff.

[10] See Charles J. Hitch and Roland L. McKean, *The Economics of Defense in the Nuclear Age* (Cambridge: Harvard Univ Press, 1960).

thermore, the 85th Congress voted an appreciable supplemental defense appropriation after the launching of Sputnik I. On the other hand, the congressional appropriation committees were of the opinion that the military services should make constant reviews, looking toward better management.[11]

Unsettled world conditions and emphasis on preparedness to cope with any possible threat from a potential enemy, led to larger Federal expenditures during the post-Korean period, and Defense expenditures became a major portion of the entire Federal budget. The existing Department of the Army (DA) structure was not suitable for handling the large weapons systems programs involving phenomenal sums of money.

When compared with Federal budgets in earlier periods of American history, the more recent expenditures were colossal. For example, during the entire period of 1789–1849, total Federal expenditures amounted to slightly over $1 billion. In the next half century, from 1850–1900, the budget totaled approximately $15 billion. In contrast, the Federal budget for Fiscal Year 1964 was nearly $100 billion, of which $51.3 billion was earmarked for the Department of Defense.[12] President Eisenhower dramatized the tremendous cost of weapons by pointing out that funds for one heavy bombardment aircraft would build a modern brick school in more than 30 cities; or build two electric power plants, each serving a town of 60,000 people; or buy two fully equipped hospitals; and that it would build 50 miles of concrete highway.

President Kennedy warned that the Government would continue its scrutiny of its efficiency and called attention to his policies which demanded continued emphasis on better management. Secretary McNamara took steps toward improved management, including the initiation of a form of project management. The Government lacked the built-in mechanisms which led to increased efficiency. At Secretary McNamara's direction, the Department of the Army sought to improve management by reorganizing its decisionmaking apparatus and introducing better evaluation review techniques.[13]

Leadtime and Obsolescence

According to Lt. Gen. Arthur G. Trudeau, former Chief of Research and Development, Department of the Army, leadtime in the United States from weapons concept to operational availability was approximately 10 years, while in Russia the overall leadtime averaged 5½ years.[14] In the post-World War II period, the armed services were gravely concerned about the long leadtime. So much time was, in fact, consumed in developing and producing a weapon that it frequently was no longer sufficiently timely to be of great value when it became operationally available. In consequence, the weapons system project might be cancelled after millions of dollars had been spent on it. In some instances, the researcher's jest: "If it works, it's obsolete," was nearly true.

Obsolescence occurred through normal evolution of the technology, or it came because of a new weapon produced by a new and different technology. A Stanford Research Institute study on the life cycle of household appliances, which were less complicated than modern weapons systems, showed that the period from the time they were introduced until their sales began to decline dropped from 34 years before 1920 to an average of 8 years in the post-World War II period. Thus, long leadtime, which contributed to obsolescence, became a problem.[15]

A Rockefeller report on the military aspects of international security concluded that one of the major weaknesses of the United States in strategic posture had been the inordinately long leadtime.[16] Unlike this country's seemingly endless chain of command in the development process, Russia vested unequivocal authority in a single senior designer who became the undisputed technical manager of the project, with much flexibility and decisionmaking power. The Soviet leadership believed that, in key projects, it should trust its technical man-

[11] (1) 71 Stat 312 (1957). (2) H. *Doc.* 371, 85th Cong, 2d sess, April 16, 1958, pp. 1–12.

[12] H. *Doc.* 15, 88th Cong, 1st sess, *The Budget of the U.S. Govt, FY 1964* (GPO, 1963), p. 422.

[13] Charles J. Hitch and Roland L. McKean, *op. cit.*, pp. 4, 105–107.

[14] Merton J. Peck and Frederic M. Scherer, *op. cit.*, p. 425.

[15] Donald W. Collier, "A Civilian Looks at Govt-Sponsored R&D," *Armed Forces Mgmt*, Jan 1964, pp. 29, 32.

[16] Rockefeller Brothers Fund, Special Studies Rpt II: Intl Security—Mil Aspects (New York, 1958), pp. 6–13.

agers to make the right decisions unhampered by bureaucratic red tape.

In the United States, uncertainty in weapons development resulted from the extent to which weapons pressed the existing limit of engineering art and scientific knowledge, and the character of the demand for weapons in a cold war environment. The better performance of commercial developments may be explained by the fact that commercial products did not push the state-of-the-art and that most marketing uncertainties had been resolved before the product was developed.[17]

Background of Weapons Systems Management

Wide Variety of Techniques

The Army's project manager concept of 1962 differed somewhat from previous attempts at managing weapons systems. The Hoelscher Committee made a comprehensive study of the variations in methods used by the Manhattan Project in developing the first atomic bomb, and by the armed services in managing their big missile systems. Among the specific types studied were those directed by one man, such as Adm. William F. Raborn's development of the Navy's Polaris missile, Maj. Gen. John B. Medaris' direction of the Army's Jupiter missile program, and the practices followed by the Air Force in managing its ballistic missile program.[18]

A brief survey of various forms of project or weapons systems management practiced by the armed services reveals a wide variety of approaches. However, the basic characteristics were usually similar. There was a tendency to separate research and development from production in order to encourage progressiveness. But once the program got underway, usually these functions were combined under project chiefs to insure proper coordination. Some project groups served only as a kind of communication center for coordinating the many facets of a weapons system. Others served as a center for identifying and resolving disagreements among functional segments.

In the most common type of special management, scientists, engineers, and other specialists worked for the project director or manager. To resolve difficult problems, the power of the project chief was increased by assigning higher ranking officers to these posts or placing the office at a higher echelon. When a program was particularly urgent, the project officer was given unusual authority over agencies and functional offices, first choice of personnel, relief from normal procedures, special financial support, and direct access to service officials.

Decentralization had evolved in the decade beginning in 1950 primarily because of the obstacles of size, complexity, and communication. When technology, computer processing, data banks, uniform coding, and program packages were introduced, the scene was set for a change in the existing concept of decentralization. In the course of evaluating the new management concepts, in 1963, the AMC Board noted that the extent of this change could not then be predicted, and that it would depend somewhat upon the degree to which the old concepts had become entrenched or institutionalized.[19]

Since the project manager concept had to be compatible with the program package concept, the Hoelscher Committee studied this new way of looking at the allocation of resources among a variety of mission objectives. The decisionmaking process of the program package and project manager concepts required the fixing of responsibility and collection of management information on a systematic, comprehensive, regular basis.[20]

The adoption of the program package concept under Secretary McNamara called for changes in the types and quantity of management information for making decisions. As a

[17] Merton J. Peck and Frederick M. Scherer, *op. cit.*, pp. 6–7, 8–10.

[18] Rpt, L. W. Hoelscher to SA, 5 Oct 61, subj: Study of Army Functions, Organization and Procedures, OSD Proj 80 (Army), pt. II, pp. C1–C17. See also working papers of Hoelscher Rpt, Study Group B, 21 Aug 61, subj: Systems Mgmt in the Army.

[19] Rpt, AMC Board, 29 Nov 63, subj: Evolution of New Mgmt Concepts, pp. 20–21.

[20] Ltr, Lt Gen David Traub, Proj Director, DARPO, to Chm, MDLC Planning Group, 29 May 62, subj: Paragraph 17, AR 11–25, Reduction in Leadtime.

solution to this problem, the AMC used the project manager concept which was compatible with the Department of Defense program package concept. The functional approach did not provide the required rounded perspective. Secretary McNamara recognized an urgent need for a more definite means of identifying military cost in terms of missions, and his Comptroller, Charles J. Hitch, who had been with the Rand Corporation, devoted much attention to budgeting and accounting techniques in the analysis of military problems.[21]

Among previous experiences with special management techniques, from which the AMC learned much, was the Manhattan Project. While special techniques contributed to the success of this program, there was no doubt that its high priority helped greatly. There was no guarantee that low-priority projects, using similar techniques, would have comparable success. Nevertheless, because of the record set by this project, many techniques used by its director were examined carefully by those responsible for introducing project management into the AMC.[22]

Under the Manhattan Project, the United States developed the atomic bomb that was used against Japan near the end of World War II. On 13 August 1942, the Corps of Engineers established the Manhattan Engineering District to carry out the work, and the Secretary of War placed Brig. Gen. Leslie R. Groves in complete charge of all Army activities relating to the project.[23]

Mankind's transition to the atomic age, from a practical viewpoint, occurred on 16 July 1965 at Alamogordo, near Albuquerque, New Mexico. Here the first atomic explosion was achieved and its success was greater than the most ambitious estimates. There had never been an improvement in weapons comparable in degree and sudden impact to the atomic bomb.[24] Further proof of the success of the Manhattan Project came on 12 August 1945 with the announcement that the U.S. Army Air Forces had dropped an atomic bomb on Hiroshima on 6 August and on Nagasaki on 9 August. No other country had been able to carry out parallel developments during a war period.[25]

The focal point of success lay in the keen projection of an all-out technical effort. Dr. Vannevar Bush thought of the organization as a corporation with the military policy committee as a board of directors and General Groves as vice president in charge of operations. The project had clear-cut authority at high level in the Army, and civilian scientists were represented. Expenditures were fantastic. The fear that Germany might produce an atomic bomb made time a most important factor. According to General Groves, the specific objectives, careful supervision, positive and clear-cut direction at all levels, complete support from the Government, and the determination of thousands of men and women working for the safety of their country insured the success of the project.[26]

Each of the three armed services established special agencies to accelerate the development of the first ballistic missiles. To manage the Jupiter program, the Army established the Army Ballistic Missile Agency (ABMA), the Navy organized its Special Projects Office for the Polaris missile; and the Air Force created the Ballistic Missile Division of the Air Research and Development Command to manage its Atlas, Thor, and Titan programs.

Created at Huntsville, Alabama, in January 1956, the elite Army Ballistic Missile Agency received unusual authority over personnel, funds, and overall operation of the Army's ballistic missile program. Although ABMA fell directly under the jurisdiction of the Chief of Ordnance, the Agency's Commanding General,

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[21] Address, Charles J. Hitch, before Operational Research Society of America, Phila, Pa., 7 Nov 62. See also AMCR 11-5, 17 Oct 62, subj: The DOD Programing Sys, and C1, 10 Jan 63.

[22] (1) Henry DeWolf Smyth, *Atomic Energy for Mil Purposes: The Official Rpt on the Development of the Atomic Bomb Under the Auspices of the U.S. Govt, 1940–1945* (Princeton Univ Press, 1954), p. 41. (2) Arthur H. Compton, *Atomic Quest* (New York, 1956), pp. 27–28.

[23] Lt Gen Leslie R. Groves, *Now It can Be Told: The Story of the Manhattan Proj* (New York, 1962), p. 11.

[24] (1) *Ibid.*, p. 253. (2) Henry DeWolf Smyth, *op. cit.*, App. 6, War Dept Release on New Mexico Test, 16 Jul 45.

[25] Richard G. Hewlett and Oscar Anderson, Jr., *A History of the U.S. Atomic Energy Commission*, vol. I, *The New World, 1939–1946* (Penn State Univ Press, 1962), pp. 5–6, 45–46.

[26] Lt Gen Leslie R. Groves, *op. cit.*, pp. x, xi.

Maj. Gen. John B. Medaris, had direct access to the Army Chief of Staff, Secretary of the Army, Advanced Research Projects Agency, and National Aeronautics and Space Administration. The Department of the Army withdrew his special authority in 1960.[27]

The success of the agency was reflected in its impressive record. Specifically, it launched the Nation's first intermediate ballistic missile, boosted the first American satellite into orbit, and developed the first nose cone capable of withstanding the tremendous heat created upon reentry into the atmosphere from outer space.

Under extensive authority delegated to him, General Medaris issued instructions in his own name to all Army agencies needed in the discharge of his responsibilities. He could take appropriate procurement action, subject only to the overall availability of funds, and he had authority to obtain services needed at Government-owned installations.[28] The exercise of these special powers resulted in a striking reduction in leadtime without impairing required standards. Thus, other "crash" programs could profit from the agency's pioneering effort.[29]

In the Navy Department, the ballistic missile program challenged the existing organization more sharply than any previous Navy weapon effort. Furthermore, the Polaris missile's importance to national defense imposed the creation of the Special Projects Office, under Rear Adm. William F. Raborn to direct the effort. The Chief of Naval Operations laid down the operating requirements. Similarly structured to Manhattan District type of organization, the Special Projects Office had a relatively small military and civilian staff. Program control in terms of budget and number of weapons rested with the Secretary of Defense. The program evaluation review technique (PERT) provided a systematic method of monitoring the time-program relationship in order to identify critical schedule slippage in time for corrective action. Despite the complexity of the Polaris, the Navy Department completed the new weapon three years earlier than originally scheduled. Admiral Raborn had the authority, the priority, and the money. The Chief of Naval Operations granted what became known as Raborn's "hunting license." He could have any desired resources that he needed.

Admiral Raborn had a simplified reporting system and line of balance analysis. Milestones were met on time. They were portrayed on PERT charts which helped Raborn to visualize the flow of development. Potential trouble areas were revealed before they really materialized. The Navy Department "froze" the weapons system at a performance level which was related to a realistic completion date. This precluded costly improvements, which would have advanced the completion date by a staggering amount of time.[30]

For its big missile program, the U.S. Air Force established a special management group known as the Western Development Division, later renamed the Ballistic Missile Division of the Air Research and Development Command. In reality, this was a special adaptation of the weapons system office concept to ballistic missile management. The Air Force established a project office to exercise management control of the program.

Under command of Maj. Gen. Bernard A. Schriever, the Ballistic Missile Division operated virtually as an independent command, dealing directly with Air Force headquarters. General Schriever formulated streamlined management procedures, which provided a key mechanism for effective management. To speed the process, the Air Force established a systems office with a manager for each major system. The managers used PERT and milestone markers. On each priority project there was a "red line" running directly to the Chief

[27] Historical Monograph, "Special Powers Delegated to Commanding General of the Army Ballistic Missile Agency, 1 Feb 56—31 Mar 58," pp. 28–29.

[28] (1) Paul H. Satterfield and David S. Akens, "Govt Contract Relationships at ABMA," 1 Jul 59, pp. 1–4.

[29] (1) Study, United Research Inc. for ASA (I&L), Jan 1962, subj: The Extension of Special Organizational Patterns and Mgmt Techniques to Additional Weapons Systems, pp. 2–10. (2) James M. Grimwood and Frances Strowd, "History of the Jupiter Missile Sys," ABMA, Jul 1962.

[30] (1) Hoelscher Rpt. pt. II, pp. C1–C17. (2) Merton J. Peck and Frederick M. Scherer, *op. cit.*, pp. 82–84. (3) Ed Rees, *The Seas and the Subs* (New York, 1961), pp. 167–187. (4) H. Rpt 1121, 86th Cong, 1st sess, September 2, 1959, *Organization and Mgmt of the Missile Programs*, pp. 36–37.

of Staff and Secretary of the Air Force. The project officer determined whether any trouble spotted was serious enough to be "red-lined." The entire management system was designed to assure a standardized approach among all members of the management team.[31]

Management in the Technical Services

In the decade preceding the reorganization of the Army in 1962, the technical services established various organizations, policies, and procedures for managing weapons systems. The Deputy Chief of Staff for Logistics (DCSLOG) fostered weapons system management by requiring the Technical Services to project financial requirements across budgetary lines and into the future. The Office of the Chief of Research and Development made a similar effort. However, the Hoelscher Committee found that there was no focal point at Army staff level for looking at weapons systems as a whole, and that the Technical Services sometimes received conflicting instructions. Furthermore, when several Technical Services were involved, no one of them had control over the funds of another.[32]

With the introduction of various management techniques, opportunities arose for confusion in terminology because of lack of uniformity in terms applied. Within the functional organization, there were commodity coordinators, project officers, weapons systems managers, project directors, management teams, product managers, and project managers. These individuals or groups were identified with the functional staffs. They did not have control of the applicable funds or personnel. Much confusion stemmed from the fact that the term "systems management" had been used loosely both within and outside the military departments.[33]

Like any big business, the technical services continually sought to provide more effective management. For example, the Transportation Corps (TC) applied systems management to new weapons, equipment, and even to services. The corps charted specific actions within a set time frame as a control mechanism, especially for its new aircraft projects. Because the functional elements managed only segments of a weapon system, the Chief of Transportation felt that he needed a strong organizational element to maintain interprogram control and coordination. He believed that such a management technique would help him make vital decisions. For this he established an Executive for Programs and appointed a systems manager for each major system.[34] To assure guidance, he supported the master plan reports, charts, and appropriate visual aids. Two advisory committees coordinated this work at Office, Chief of Transportation level. In 1961, a presentation on weapons systems management in the Transportation Corps was received by the Hoelscher Committee with favorable comments from the chairman.[35]

Planning for AMC Project Management

While the traditional organization of the military departments was in many ways inadequate, there was strong resistance to special organizational arrangements. In some instances, the departments delegated major responsibility to a contractor and avoided the issue of strong in-house management. Ultimately, it was the revolution in weapons technology that reshaped the Department of Defense rather than strong personalities.[36]

[31] (1) AFR 371-1, 12 Feb 62, subj: Systems Mgmt—Mgmt of Systems Programs. (2) Lt Col Charles W. Getz, "Black Saturday in Ballistic Missile Div," *Armed Forces Mgmt*, pt. I, pp. 26-30 (Aug 1959); and pt. II, pp. 24-33 (Sep 1959).

[32] Rpt, L. W. Hoelscher to SA, 5 Oct 61, subj: Study of Army Functions, Organization and Procedures, OSD Proj 80 (Army), pt. II, p. 62.

[33] (1) Hoelscher Rpt, pt. II, pp. II-c-1-II-c-22. (2) *Ibid.*, pt. IV, vol. II, pp. 237-251. (3) TAG ltr, AGAM-P(M) 310.1 (16 Oct 61) DCSLOG, 18 Oct 61, subj: Policy Guidance on Weapons/Equip Sys Mgmt in the Army.

[34] TC GO 30, 12 Jun 59.

[35] Intervs, Raymond J. Snodgrass with Benjamin Tabarini, Chinook Proj Mgr's Ofc, 4 Feb 63; with Thomas H. Harvey, AMC, 15 Mar 63; with James E. Beach, Chinook Ofc, 12 Mar 64.

[36] Presentation, Herbert Roback, Staff Administrator, House Mil Operations Subcommittee, Committee on Govt Operations, Ft. Lee, Va., 12 Jun 1962; subj: Congressional Interest in Weapons Acquisition.

Project management had been widely accepted within major defense industries. A 1961 survey found that industry had at least three types of project management—strong, balanced, and weak. According to the survey, total funds involved was not the determining factor in establishing project management control.[37] It concluded that a balance of power between the functional and project managers was the most suitable. This, the survey concluded, was especially true where complex programs required that many smaller tasks be performed by the functional managers—a situation which most nearly described the AMC, according to a 1963 AMC Board Report.[38]

In October 1961, the Hoelscher Report concluded that the diversity and complexity of Army weapons had outgrown the bounds of technical service responsibility. It concluded that provision would have to be made for some form of project management. In July of the same year, Secretary McNamara requested that a project manager of proper stature be assigned to each major, high-priority weapons program.[39]

According to the Hoelscher Report, the proposed Materiel Development and Logistics Command (MDLC) lent itself to across-the-board project management, since it retained cognizance over items from development through the supply phases. The report concluded that this type of management would result in an appreciable saving in time and a concentration of talent and resources. The disadvantages centered around the ill effects on all items not project managed, the relative extravagance in utilization of funds and manpower, and in the disruption of normal organizational relationships. Where a number of items were project managed, the report observed that the degree of attention given each one rested on the priority between projects.[40]

In April 1962, the MDLC Planning Group incorporated the concept of project management in its preliminary implementation plan. Project managers were to exercise the full authority of the Commanding General over designated weapons systems. The manager was to plan, direct, and control all functions and resources involved. The Commanding General reserved the authority to designate project managers. When located outside the Washington area, the project manager was to have a project manager staff officer at headquarters.[41]

The AMC Activation Plan made provision for singling out particular weapon systems for special management. The Commanding General reserved the authority to designate the systems to be project managed and to name the project managers, subject to approval by the Department of Army.[42]

The philosophy governing whether a weapon should be selected for project management had been set forth by the Army Chief of Staff in late 1961. General Besson recognized this requirement in August 1962 when he requested approval of 30 projects and their charters which the Chief of Staff approved.[43]

The Activation Plan listed the six following conditions to be considered in designating a weapon system for project management: its importance to the defense of the Nation; the urgency of getting it into the hands of the user; the interest evidenced by Congress, Secretary of Defense, Secretary of the Army, and Chief of Staff; the complexity of the system, which might require participation by two or more commands; the relation of the weapon to major Army modernization objectives; and the dollar cost of the weapon. It became mandatory that system developments be project managed if rated in the BRICK-BAT category on the DOD Master Urgency List, or if estimated to require total cumulative RDTE (research, development, test, and evaluation) financing of more than $25 million, or a total production cost of over $100 million. The project managership could be terminated when the principal criteria governing the selection of the system for project management no long-

[37] Booz, Allen & Hamilton, *Field Survey Rpt on Organization Practice—Aerospace Industry*, Feb 1961.

[38] Rpt, AMC Board, 29 Nov 63, subj: Evaluation of New Mgmt Concepts, pp. 29–31.

[39] (1) Memo, SA for Army CofS, 21 Jul 61, subj: Proj Officers. (2) Memo, DSCLOG for CofOrd, CSIGO, and OCofT, 1 Aug 61, subj: Proj Officer Assignment.

[40] Hoelscher Rpt, pt II, p. v–10 and pt. IV, vol. I, p. iv–10.

[41] MDLC Implementation Plan, 27 Apr 62, p. A–30.

[42] AMC Activation Plan, Jul 1962, pp. 4–5.

[43] Ltr, CG, AMC to CofS, Army, 3 Aug 62, subj: Proj Mgrs in AMC.

er applied.[44] By the time the AMC became operational, the basic concept of project management had been outlined.[45]

Scope and Operation

A June 1962 planning directive set forth the criteria for the initial selection of 27 items to be project managed. By 1 August, three more projects had been added. This action by the AMC was the broadest application of the project management concept within the Armed Services. The 30 projects represented $2.2 billion worth of weapon developments, and gave the Commanding General, AMC, immediate control of 50 percent of the yearly funds allocated for research, development, and procurement of weapons systems. Strong emphasis on project management gave the Commanding General a standardized management system at the outset and enabled him to meet the 1 August 1962 activation date and still keep tight control over the organization.[46] By December 1968, the AMC had more than 60 project managers.

One type of project managers reported directly to the Commanding General, AMC; issued orders across the command; and dealt with all levels of authority within his approved plan and funding limits. The other managers reported through one of the commodity commanders, or a Red-line channel to General Besson. They had more authority than the commanding general of a commodity command who had to observe command channels unless he had specific delegations from the Commanding General, AMC.

The weapons systems projects covered a broad front in aviation, guided missiles, combat and general-purpose vehicles, rifles, ammunition, aircraft weapons, chemical agents, electronic communications, self-propelled guns and howitzers, personnel carriers, and special warfare weapons. Some were in the research and development phase, while others were in quantity production and had been deployed to the troops. A few projects were not readily identified in these categories. For instance, the Desert Project Manager had the tri-service responsibility for chemical-biological testing. Unlike most other project manager offices, the M13 Co-production and Main Battle Tank (MBT) projects had a mission of international character. The M113 project operated under a co-production agreement with Italy and the MBT was under a cost-sharing program with Germany for the development of a new main battle tank. There were other international and a number of multiservice programs.[47]

Direction and Control

Early in 1968, the Army revised its regulation on system/project management to implement the findings of the Department of the Army Board of Inquiry on the Army Logistics System, commonly known as the Brown Board. These findings envisioned that following initial procurement and production validation tests, a project-managed item would be returned to commodity management, under what the Brown Board called a system support manager. This revision permitted the Commanding General, AMC, to change an existing project management office to a product manager, or systems support manager, as he desired. General Besson signed a product manager's charter, while the project manager's charter had to be submitted to the Secretary of the Army for approval.[48]

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[44] (1) AMC Activation Plan, Jul 1962, pp. 4–5. (2) AR 70–17, 19 Jan 68, subj: R&D—Systems/Proj Mgmt.

[45] Interv, Raymond J. Snodgrass with Col Paul A. Feyereisen, DCS, AMC, 27 Feb 63.

[46] (1) AMC Planning Dir 24, 12 Jun 62, subj: AMC Concept of Proj Mgmt. (2) Ltr, AGAM-P(M) 310.1 (13 Sep 62) DCSLOG to CG, AMC *et al.*, 28 Sep 62, subj: Policy Guidance on Weapons/Equip Systems Mgmt in the Army. (3) Lt Gen F. S. Besson, Jr., "I Don't Expect Proj Mgrs to Keep Me Out of Trouble," *Armed Forces Mgmt,* Oct 1962, pp. 18–19.

[47] (1) Fact Sheet, by AMC Special Asst for Proj Mgmt, Nov 1963. (2) Memo of Understanding Between the Ministry of Defense of the Govt of Italy and the DOD of the U.S. of America, Relating to Coordinated Production of the M113 Series Armored Personnel Carrier, 2 Feb 63. (3) PM_2P US/FRG, Main Battle Tank Proj Mgmt Master Plans, Ofc of U.S. Proj Mgr, 15 Nov 63.

[48] (1) AR 70–17, 19 Jan 68, subj: Research and Development—Systems/Proj Mgmt. (2) Rpt, Proj Mgmt in the AMC—Scope and Operation, by Ofc, Special Asst for Proj Mgmt, 27 Nov 68.

Overall direction and control policies and procedures for project management were developed in an evolutionary process beginning with the directives of June 1962 and January 1963. These set forth a reporting plan, a system for projecting total financial resources requirements, and a time and cost trend analysis. They also introduced a network plan ranging from 40 to 60 milestones and a common basis for review of all systems as well as for rendering accountability to the Department of the Army.[49]

In the last half of 1963, the AMC published a three-volume guide for the final control system, which was based on the direct relationship of time, cost, technical performance, and the need to review the status of the weapon system. Thus, the basic policies, concepts, philosophy, and requirements of project management were established within the command. The guide identified the methods of collecting reliable data. Moreover, it provided guidance on ways and means of adapting this system to each project manager's unique situation. The output provided a means of reviewing all projects on a common basis.[50]

These project management procedures had sufficient latitude to accommodate any unique project and to provide for different phases in the life cycle of a weapon. Upon the effectiveness of the manager's planning and the reliability of his predictions, the command assessed his performance and the progress of his project. In developing phases of their projects for the application of these techniques, the project managers had the assistance of the Data Systems Office at AMC Headquarters.[51]

During the first year of operation, the AMC published a number of documents which delineated the overall responsibilities and authority of project managers. A September 1962 DCSLOG letter stated that the project manager, a personnel representative of the Commanding General, AMC, was responsible for coordination, direction, and control of all work and associated resources.[52] A January 1963 Memorandum of Understanding gave the project manager full responsibility for the maximum interchange of knowledge between the AMC, CDC (Combat Developments Command), and CONARC (Continental Army Command). Its specific objective was to achieve a high degree of coordination among the three commands.[53]

While General Besson was convinced that project management would be of great and lasting benefit, he knew that there would be areas where refinement would be needed during the pioneering period. He invited frank opinions and recommendations whenever the system needed strengthening or clarification. Every new project manager was personally considered and approved by him. He intended to obtain the highest caliber and most fully qualified officers that the Army could provide.[54]

While the project manager's staff followed the main technical, administrative, and financial problems, functional elements had some part in the process. The project manager, however, could "buy" support and assistance from in-house laboratories, installations, and through contracts. Unlike the coordinator, the project manager controlled all dollar resources allotted to his project. Nor could funds once apportioned to his project be diverted for other purposes. Finally, the project manager was effectively "wired in" to the top. He was appointed by the Commanding General, AMC. In General Besson's name he could deal directly with all elements of AMC, CDC, CONARC, DA, and others to insure progress in his weapons system.[55]

Of the original 30 project managers assigned in August 1962, eight were located at AMC

[49] (1) AMC Planning Dir 32, 27 Jun 62, subj: Interim Proj Mgmt Procedures. (2) AMCR 11-7, Jan 1963, subj: same.

[50] AMCR 11-16, vol. I, Aug 1963, subj: Planning and Control Guides for Executives; vol. II, Aug 1963, subj: Planning and Control Procedures for Proj Mgmt; vol. III, Nov 1963, subj: Master Plans and Rpts (PM_2P) for Proj Mgmt.

[51] Memo, CofS, HQ, AMC, to all Proj Mgrs, 6 Dec 63, subj: Proj Mgmt Total Decisionmaking Process, AMCR 11-16.

[52] Ltr, AGAM-P(M) 310.1 (13 Sep 62) DCSLOG to CG, AMC *et al.*, 28 Sep 62, subj: Policy Guidance on Weapons/Equip Systems Mgmt.

[53] Memo of Understanding, Joint Policy of CG, AMC, CDC, and CONARC, 25 Jan 63, subj: New Equip, Training, and Support.

[54] Ltr, CG, AMC, to AMC Directors and Staff Ofcrs and all Subordinate Comds, 4 Mar 63, subj: Operating Policies and Organizational Relationships for Conduct of Proj Mgrs.

[55] Remarks, Lt Gen F. S. Besson, Jr., CG, AMC, at General Ofcr's Course, U.S. Army Mgmt School, Ft. Belvoir, Va., 26 Apr 63, subj: Decision by Design.

Headquarters, while 22 were in the field. Colonels or lieutenant colonels headed 28 of the projects, while 2 had brigadier generals as project managers. By August 1968, the rank of AMC's project managers was as follows: 34 lieutenant colonels, 20 colonels, 4 brigadier generals, and 1 major general. The projects headed by generals were: Automatic Field Systems Command, Deseret, Main Battle Tank, MALLARD, and STARCOM. By August 1968, the AMC had a total of 60 project managers, 19 of whom reported directly to General Besson.[56]

In the first two years of operation, the command terminated 5 project management offices of the original 30, established 9 new ones to make a total of 34, changed the name of 5 projects, and relocated 2 project offices. Those terminated were the Field Army Ballistic Missile Defense System, the AN/USD-5 Drone, the Davy Crockett Weapon System, the BZ Chemical System, and the M14 Rifle project.

When more than one command was involved, when funds were large, when operational difficulties were forseen, or when urgency dictated, the manager usually reported directly to Headquarters, AMC. Only two project management offices had been moved from their original locations by the end of 1963. The command moved the Sheridan/Shillelagh office from AMC Headquarters to the Army Weapons Command at Rock Island, Illinois, for better technical support and relocated the office for the Command Control Information System-1970 (CCIS-70) from Ft. Huachuca, Arizona, to Ft. Belvoir, Virginia, in order to facilitate cooperation with the Combat Developments Command and Headquarters, AMC.[57]

Project managers had another advantage not enjoyed by the former coordinators, namely communication by means of a Red-line channel. This meant that a project manager located at a major subordinate command could communicate directly with the Commanding General, AMC. General Besson, in turn, could at any time communicate directly with a project manager in the field.

Knowing that some Army personnel were skeptical of the Red-line channel, General Besson indicated that it was to be used sparingly and that the project manager was to advise and coordinate with his commander either before or immediately after using this avenue for emergency purposes. Nevertheless, he believed that this special channel would be a partial cure for serious problems that were apt to face the top command. He anticipated that he would have many problems, but he expected to be kept informed so that he would not have "too many surprises." [58]

In August 1962, after much deliberation, the command established the Office of the Special Assistant for Project Management. Because this office had not been planned earlier, the coordinating task had been carried by the Secretary of the General Staff, Col. John M. Christensen, Jr. However, the increasing workload attributable to project management called for continuous coordination and consumed a major portion of the Secretary's time. General Besson then decided to make Colonel Christensen the coordinator for project managers. The Special Assistant facilitated the flow of information between the command elements and the project managers, coordinated administration for them, and generally acted as staff specialist in this field. The Special Assistant served as a point-of-contact for project managers and project manager staff officers on administrative and personnel matters and coordinated their inquiries and status reports. Such coordination was necessary especially when more than one directorate and several project managers were involved.[59]

Within the hierarchy of project management, the relationships with the Department of the Army were of particular interest. Therefore, in the fall of 1962, the Chief of Staff, U.S. Army, established the position of Department of the Army Systems Staff Officer (DASSO) to serve as a focal point for collecting and coordinating information on each project managed item. The DASSOs required reports on milestones developed at DA level in addition to those already established by the

[56] Directory, AMC Proj/Product Mgrs, 15 Aug 68.

[57] (1) AMC GO 40, 23 Jul 63. (2) CCIS-70 Historical Summary, FY 1963.

[58] (1) Speech, Lt. Gen F. S. Besson, Jr., CG, AMC, Seattle Wash., 5 Sep 62. (2) AMCR 11-7, Jan 1963.

[59] Memo, Special Asst for Proj Mgmt for CofS, AMC, 24 Jul 62, subj: Proj Mgr Coordination.

AMC. The project manager submitted a monthly milestone progress report.[60]

The Army Chief of Staff made it clear that he expected to have the basic knowledge available at his fingertips. The DASSOs, in effect, were executive agents employed to secure information the Chief of Staff desired from General Besson. They reflected the staff viewpoint and the project manager used the DASSO for cross-staff coordination and support. The Assistant Chief of Staff for Force Development supervised the system and usually appointed the primary DASSO coordinators. Representative of CDC and CONARC indicated a strong interest in the DASSOs and their reports.[61]

General Besson believed that his project managers accomplished excellent coordination through command liaison and close interdependence between CDC, CONARC, and the AMC. He insisted that the operating command level provide detailed reviews of project manager plans and operations and that his approach minimize time-consuming reprograming actions involving higher authorities.[62] In practice, the DASSOs helped project managers to obtain staff approval and assisted in accelerating action and formal response from other agencies.

Project managers had to determine the resource requirements as a basis for subsequent major decisions on the weapons systems. The requirements were subject to review by the AMC program directors. The long-term financial appraisal by project managers played an important role in decisionmaking and in materiel management generally. The project manager made arrangements with the appropriate commander for support financed by OMA (operation & maintenance, Army) funds. He initiated the annual program and budget requests, and reprograming actions. The Comptroller and Director of Programs and the AMC program directors provided guidance on the overall allocation of resources.[63]

The expenses of operating a project manager's office were charged to RDTE, PEMA, or OMA funds as equitable and applicable.[64] The AMC Director of Research and Development participated in the review and justification of all RDTE budget actions. In his procurement functions, the project manager utilized the procurement offices in the major subordinate commands to the maximum extent consistent with effective management.[65]

Concern in the Department of Defense over leadtime in development and production led to the application of the project manager concept to nearly all high-priority weapons systems. Most of these projects involved a guided missile, an aircraft, a transport or a combat vehicle, an ammunition item, a communications system or other electronic equipment. The Army's projects were more varied than those of the Navy and the Air Force. Project management became a permanent, though exceptional, form of management in the AMC because it was a means of adjusting to rapid program changes and because of the increasing importance of viewing weapons systems in terms of their contribution to the total defense mission.

The problems faced in the application of this technique to the cooperative development of a main battle tank, to the development and acquisition of high-priority items for special warfare, or to the testing of a chemical-biological system varied widely from those encountered in the management of a typical weapons system project. This difference in items entailed a variety of techniques and procedures in the application of the management concept.

Of the 47 project management offices in mid-1966, 7 pertained to electronics; 8 to aircraft; 11 to missiles; 8 to combat and transport

[60] (1) TAG ltr AGAM-P(M) (12 Sep 62) CofS to CG, AMC *et al.*, 12 Sep 62, subj: Establishment of DASSOs. (2) AMCR 11-16, vol I, Feb 1966.

[61] Memo, Chief, Policy Div, DCSLOG, for Chief, Air Defense Div, Zeus Ofc *et al.*, 24 Oct 62, subj: Submission of DOD Milestone Schedules and Related Monthly Progress Rpts.

[62] Ltr, CG, AMC to CofS, Army, 1 Oct 62, subj: Submission of DOD Milestone Schedules and Related Monthly Progress Rpts.

[63] Ltr, CG, AMC, to AMC Directorates and Staff Ofcrs and all Subordinate Comds, 4 Mar 63, subj: Operating Policies and Organizational Relationships for the Conduct of Proj Mgmt.

[64] AMCR 37-5, 28 Feb 64, subj: Financial Administration—Financing Proj Mgr Ofcs.

[65] (1) AMC Dir 3, 4 Sep 62, Organization and Functions: Concept for AMC Operations—Development and Engineering. (2) AMC Dir 715-18, 11 Oct 62, subj: Procurement—Appointment of Proj Mgmt as Contracting Ofcrs.

vehicles; and 4 to weapons and ammunition, while the others were varied projects, such as special warfare, testing of chemicals, and the supply of petroleum.[66] The impact of the Southeast Asia logistics workload on the AMC was a major factor in the significant extension of the project management system. For example, the command established the following project manager offices during Fiscal Year 1967: M107/M110 Artillery Systems; T53/T55 Turbine Aircraft Engines; Mortar Ammunition: Selected Artillery Ammunition; Special Mission Operations; Armored Reconnaissance Scout Vehicle; Vehicle Rapid Fire Weapons System; Utility Tactical Transport Aircraft System; Mobile Floating Assault Bridge Ferry; and Close Support Weapons System (155mm Howitzer).[67]

During Fiscal Year 1967, the CV-7A Tactical Transport Aircraft project was terminated by transfer of this responsibility to the U.S. Air Force. Another project, the European Trophosperic Scatter System, Army (ET-A), was disestablished and merged with the UNICOM/STARCOM project and became STARCOM. During that year the command also changed the names of the following three systems: MAW (Medium Assault Weapon) to Dragon, LOH (Light Observation Helicopter) to Cayuse; and Advanced Aerial Fire Support System to Cheyenne.[68]

Other project manager offices that were deprojectized over a period of years were as follows: Field Army Ballistic Missile Defense System, November 1962; Davy Crockett Weapon System, August 1963; M14 Rifles, October 1963; Chemical and Biological Warning System, February 1965; Mauler, November 1965; and MQ-58A (OVERSEER)—Unmanned Airborne Surveillance System, April 1966. The following project manager offices were redesignated or restructured: Project ADVENT was redesignated SATCOM; Missile B was redesignated Lance; Shillelagh was separated from the Sheridan/Shillelagh project in September 1964; VRC12/PRC15 Radios was designated Selected Tactical Radios; the AADS-70 Missile was redesignated SAM-D in August 1965; the Interim Air Defense System was redesignated Vulcan/Chaparral, later to be called Chaparral/Vulcan; and the Vehicle Rapid Fire Weapon System was separated from the Combat Vehicles Office and made a separate office in December 1966.[69]

The management of the U.S. Army Satellite Communications (SATCOM) System was characterized by a number of special and unusual relationships between the project manager and various levels of DA, DOD, and Defense Communications Agency (DCA). The Army was responsible for the ground communications portion of the program under the integrating direction of DCA. Under special arrangement, the Assistant Secretary of the Army (R&D) had direct access to the SATCOM manager.

Because of the international aspects of the Main Battle Tank program, this project offered challenges never before encountered. Therefore, normal plans of operation had to be modified to make them acceptable to the two nations involved—Germany and the United States. The MBT Project Manager and his German counterpart formed the Program Management Board. As the U.S. Program Manager, the MBT Project Manager was directly responsible to the Army Chief of Staff. All expenditures had to be approved by United States and German representatives. The two countries managed the tasks through a joint engineering agency. The Secretary of Defense along with the German Minister of Defense established broad policy guidance.[70]

Among the major project-managed aircraft was the LOH, a two-place helicopter, with additional space for 400 pounds of cargo or two other passengers. During March and April 1966, the then new OH-6A helicopter, called the Cayuse, established 26 world records for rotary-wing aircraft. The LOH was used primarily for observation, target acquisition, and reconnaissance. The Cayuse had an airspeed of 128 knots and a cruising range of approximately 280 nautical miles.[71]

[66] Directory, Proj Mgrs and Proj Mgmt Staff Ofcrs, 1 Aug 66.

[67] Special Asst for Proj Mgmt Historical Summary, FY 1967.

[68] AMC Review of Programs, FY 1967, by R&A Div, C/DP.

[69] Directory, Proj Mgmt Ofcs Deprojectized, by Ofc of Special Asst for Proj Mgmt, Nov 1967.

[70] Rpt, Ofc, Special Asst for Proj Mgmt, 27 Nov 68.

[71] AMC News Release, 1 Aug 66, subj: AMC Meets Added Responsibilities.

In a different category was the Chinook CH–47, a tandem-rotor, twin turbine-powered, medium-transport helicopter, with a speed of 130 knots and a cruising range of 200 nautical miles. It had an unobstructed, 30-foot long troop/cargo compartment, which was 7½ feet wide and 6½ feet high, with a rear loading ramp. It could transport weapons, equipment, or bulk liquids either internally or externally. The Chinook had 33 troop seats for transporting personnel. All models had water-landing capability, and were equipped for night instrument flight operations, and for flying in light icing conditions. The newest version of the Chinook, the CH–47C, was capable of lifting 23,000 pounds on a 10-nautical mile mission. Its maximum gross weight was 44,800 pounds.

Another important project-managed aircraft was the Iroquois, a single-rotor, turbine-powered helicopter. The Iroquois family consisted of the UH–1A used for training purposes, the UH–1B and UH–1C used for armed ground support and troop transport, and the UH–1D and UH–1H which were the mainstay for troop and resupply missions in Vietnam. The AH–1G Hueycobra, an additional version of the Iroquois, was the first rotary-wing aircraft specifically designed as a weapons helicopter and became available for field use in August 1968. Many foreign countries showed considerable interest in the Iroquois and continued to purchase UH–1s. Germany built UH–1Ds under a special co-production agreement with the U.S. Government. Special models of the Iroquois were operated by the U.S. Air Force and the Marine Corps.

One of the most significant new materiel developments was that of the AH–56A Cheyenne helicopter. The objective of the Cheyenne was to provide a stable aerial weapons platform for escorting troop carrying helicopters and to provide suppressive fire. The aerial vehicle for the system was a compound helicopter with maximum speed of about 200 knots. The system included an integrated avionics subsystem, advanced fire control, and night vision equipment.

To fulfill the requirement for airborne surveillance, the Army developed the Mohawk Surveillance System comprised of a fixed-wing aircraft, photographic and electronic sensors, and appropriate ground support equipment. This aircraft was designed to provide field commanders with day and night battlefield intelligence.

The AMC also had a project manager for Aircraft Weaponization. The mission involved the development, production, and support of a great variety of weapons, such as guns, rockets, missiles, grenade launchers, aerial dispensers, and related munitions. This project manager centralized management responsibility for all armament subsystems utilized in Army aircraft. Because of his widespread management responsibility, his relationships extended to most of the AMC subordinate commands and to numerous elements of industry.[72]

The command had a number of guided missiles under project management. Among the major projects were the following: the Hawk field Army missile for use against low and medium altitude aircraft; the Lance, a surface-to-surface division general support missile system; Nike-Hercules, a surface-to-air missile used against high and medium altitude aircraft; Pershing, surface-to-surface missile to provide fire support to the field Army; Redeye, a shoulder-fired air defense missile system; SAM-D, a surface-to-air missile to replace the Hawk and Hercules; Sergeant, a quick reaction corps support surface-to-surface missile system; Shillelagh, a self-propelled, direct line of sight, antitank missile system; TOW, a tube-launched, optically-fired, wire-guided heavy antitank assault weapon system; and the Chaparral, a mobile, low-altitude, forward area air defense missile system.[73]

In the vehicle category of project-managed items, the following were the most important: Main Battle Tank, 1970 (MBT–70), a cooperative development project between the United States and Germany;[74] M113 Personnel Carrier, a co-production project with Italy; Amphibious Lighters, consisting of the 5-ton LARC-V, the 15-ton LARC-XV, and the 60-ton LARC-LX; the M107/M110 Artillery Systems; the M578 Light Recovery Vehicle; the Ar-

[72] AMC Historical Summary, FY 1967, Proj Mgmt Chapter.

[73] Fact Sheet, 12 Jul 68, subj: Proj Managed Weapons/Equip.

[74] "How Good Is the Main Battle Tank?" *Armed Forces Mgmt*, Sep 1967, pp. 40–42.

mored Reconnaissance Scout Vehicle; General-Purpose Vehicles; GOER Vehicles; M60 Tank Series, and the Mechanized Infantry Combat Vehicle.

The principal projects in the electronics category were the Automatic Data Field Systems Command for the Army in the field; Night Vision items; Common Positioning and Navigation Systems for ground and aviation users; SATCOM, the ground communications portion of a satellite communications system; MALLARD, primary tactical communications system for the American, British, Canadian, and Australian armies in the mid-1970s. Selected Tactical Radios; and STARCOM, a global strategic communication system.

Project Deseret was established for tri-service testing of chemical-biological systems. Flat-Top, the Floating Army Maintenance Facility—a Navy seaplane tender converted to a floating depot—arrived in Southeast Asia on 2 April 1966. The inception of the Project Manager's Office for Generators (later named Mobile Electric Power) on 11 July 1966 was responsible for eliminating the diversity of sizes, types, make and models, and improving the quality of power equipment used by the Army. In November 1965, the Commanding General, AMC, appointed the Project Manager for Generators as Project Officer for Non-Tactical Generators for Southeast Asia.[75] The Mobile Floating Assault Bridge/Ferry Project Manager had responsibility for directing the program for amphibious vehicles used as mobile bridge/ferry sections.

Personnel

Unlike most other personnel, project management personnel were plagued by uncertainty about job security and what would happen to them when their assigned office was terminated. Inherent in the project management concept was the idea that any specific project manager's office would remain in existence only until it accomplished its mission. To indicate the dispersal of a manager's personnel and records upon completion of assignment, Army personnel coined the term "deprojectized."

Brig. Gen. W. H. Harris, AMC Director of Personnel and Training said: "We want to solve both the job and indoctrination problems on an individual name basis. We don't intend to give them the broad brush treatment and impersonal theory approach." [76] Providing personnel for specific staffing needs in diversified skills posed a problem. To accomplish this, the command drew from among those who were registered in existing Army-wide career programs. Furthermore, under DA direction, AMC developed a career system for staffing project management offices on a priority basis.[77]

The project manager's staff was usually small and compact. He used certain common services provided by the functional organization. In some fields, however, it was necessary to have a high level of skill within the project office, so that the manager could be immediately responsive to demands from higher echelons. Initially, there were very sketchy personnel requirements, and in some cases, they included only two or three people. For example, 13 project managers submitted requests that totaled 58 civilians and 15 officers. Following these initial requirements, Dr. Paul Cherington of United Research Incorporated presented personnel estimates that ranged from 2,172 for the "hard core" to 11,252 for all full-time personnel. By September 1962, the AMC had approved a total of 1,450 personnel for project management offices at the Missile Command alone.[78]

The overall strength of project management offices reached 3,216 by the end of December 1963.[79] By January 1963, only 10 out of 31 tables of distribution had been approved for project management offices. Most of the person-

[75] Generators Proj Mgrs Ofc Historical Summary, FY 1967.

[76] C. W. Borklund, "People and Proj Mgrs," *Armed Forces Mgmt*, Oct 1962, p. 22-23.

[77] Civilian Personnel Narrative Rpt—Summary of AMC-wide Activity, 4th Qtr, FY 1963.

[78] (1) MFRs, Col John M. Christensen, Jr., SGS, AMC, 9 and 12 Jul 62, subj: Personnel Requirements for Proj Mgrs Ofc. (2) Ltr, Brig Gen Fred P. Campbell, CofS, AMC to CG, MICOM, 5 Sep 62, subj: Activation Plan.

[79] Rpt, C/DP, FY 1963, subj: The First Year, p. 70.

nel were on detail. In some offices, there was a turnover of almost 70 percent during Fiscal Year 1963. The placement problems were caused partly by the preceding Army reorganization. However, personnel were reluctant to locate in an organization that faced the imminent prospect of termination or movement from the Washington area. But the Secretary of the Army took an interest in establishing a pilot career program for civilian personnel who could move efficiently from one project to another when project offices were disbanded.

Staffing of project manager offices received much attention over the early years of the AMC's existence. DOD executive policies on civilian personnel necessitated careful scrutiny of staffing to insure full utilization of manpower resources.[80] The Commanding General, AMC, directed that detailed schedules for terminating the project be included in the Project Management Staffing Plan.[81] The basic document for staffing project management offices was a guide published in April 1965.[82] During Fiscal Year 1964, the Department of the Army established the Army Civilian Career System for Project Management Offices.[83]

Project managers had relatively small staffs which averaged approximately 80 personnel per project. The average authorized strength during Fiscal Years 1963 through 1966 was 81 persons per project manager, while the actual strength averaged 72. On 30 June 1967, the authorized personnel spaces averaged 71 per office while the actual strength averaged 64.[84]

Concerning the caliber of project managers, in General Besson's judgment, the command had some very good ones and might have had some who were not so good. On the other hand, he said: "I have a great faith in the ability of people to expand in proportion to the jobs given them."[85] Following the OSD-sponsored Program Management Conference in New London, Connecticut, in May 1963, General Besson alerted the Deputy Chief of Staff for Personnel (DCSPER) to the new interest and great demand for civilian and military career training in project management. This subject had been discussed at the conference. General Besson believed that the Army should move ahead, and make the necessary career changes rather than wait and be directed to do so by the Secretary of Defense.[86]

In commenting on the career pattern for military officers in project management, General Besson outlined the following qualifications for project managers:

> Project Managers should be under 45 years of age, good appearance, sound judgment, aggressive, forceful, outstanding personality, able speaker, writer, and leader. The individual should have those characteristics, abilities, and background that are commonly regarded as desirable in a general officer.

He further stipulated that the manager should be in the grade of lieutenant colonel, colonel, or brigadier general and should have attended one of the service schools.[87]

In order to meet the need for training officers and civilians for key project staff positions, the command conducted a 30-day course in project management for approximately 60 persons at the Army Logistics Management Center (ALMC) in the summer of 1962. United Research Incorporated (URI) organized and presented this course, with the aid of a subcontractor, Harbridge House, Inc., and the help of AMC personnel. During the course, the Army Management Engineering Training Agency presented the interim control procedures for the project management concept. ALMC at Fort Lee, Virginia, provided housekeeping support and conducted a second train-

[80] Interv, Raymond J. Snodgrass with Col James L. Lewis, Special Asst for Proj Mgmt, 10 Sep 65.

[81] Ltr, C/DP to AAFSS Proj Mgr *et al.*, 10 Mar 65, subj: Proj Mgmt Personnel Staffing Plans.

[82] CPR P50–AMC–PMO, Apr 1965, subj: Position and Pay Mgmt—Job Evaluation Guide for Proj Mgr Organization.

[83] CPR CP2, 31 Oct 63.

[84] AMC Review of Programs, FY 1967, by C/DP.

[85] Lt Gen F. S. Besson, Jr., "I Don't Expect Proj Mgmt to Solve All the Problems," *Armed Forces Mgmt*, Oct 1962, p. 19.

[86] Ltr, Lt Gen F. S. Besson, Jr. to Lt Gen James L. Richardson, Actg DCSPER, 27 May 63.

[87] Ltr, CG, AMC, to OPO, 26 Mar 63, subj: Career Pattern for Mil Ofcrs in Proj Mgmt.

ing course in the fall of 1962.[88] Much time was given to staffing and organization. Inevitably, considerable attention was devoted to technical problems, programing, and budgeting.

Impact and Evaluation

Because of the emphasis on project management during the first year, the AMC anticipated considerable benefit from it. But the benefits derived exceeded the anticipated gains. In numerous cases, the command accelerated production beyond that which would have been possible under a functional organization. Many examples of savings in time and cost could be directly related to the close attention provided by this managerial technique.[89]

There was a general consensus in the command, DA, DOD, and among contractors that project management contributed considerably to the achievements of AMC. This technique enabled General Besson to give personal attention to a far greater number of high-level decisions than would otherwise have been possible.[90] However, there were problems. Some of them were "growing pains" which time would resolve, some were fundamental and would not "go away." Most problems concerned staffing, location, relationships with the functional elements, and personnel. With reference to this type of management, General Besson said: "Life in a project office is seldom dull. The challenges are great but the risks are high." On another occasion he warned: "I expect the commander to notify me of critical problems. . . . Project management is not the panacea for all management difficulties in AMC. I expect to have many problems—but no surprises." [91]

Another problem confronting project managers was that of too many bosses. For example, in August 1962, the Army's Chief of Research and Development indicated that the SATCOM project manager would be responsible to the Army staff and Army and Defense Secretariat, and the Defense Communications Agency. Concerning this situation, the Deputy Commanding General, AMC, wrote: "This adds up to some four bosses, in addition the Commanding General, Army Materiel Command." [92] General Besson was concerned not only with multisource guidance on this project, but with its implications for other project managers.

Early in 1963 Dr. Harold Brown, Director of Defense Research and Engineering (DDR&E), concluded that many in the research and engineering project were not controlled by the most desirable management concepts. He believed that a project manager should be designated for each such project.[93] Consequently, the Office of Research and Development, DA, requested AMC's reaction to this idea. The general consensus was that the command had gone about as far as practicable in establishing project managers. To make such assignment for each development and engineering project would have required 130 additional project managers. Furthermore, such wholesale assignment would have violated the criteria used in designating systems to be so managed. However, General Besson believed it feasible to extend project management considerably beyond the scope of its use at that time. Meanwhile, the command continued its efforts to conform to OSD guidelines.[94]

Manpower Impact

Among other problems raised was the

[88] (1) Ltr, Brig Gen Fred P. Campbell, CofS, AMC to DCSLOG, 21 May 62, subj: Training for Proj Mgrs. (2) A Rpt on the First Proj Mgr's Course at ALMC, 18 Jun—14 Jul 62, by URI.

[89] AMC Rpt, by C/DP, Oct 1963, subj: The First Year, p. 78.

[90] See Interim Rpt, by United Research Inc, 7 May 63, subj: The Impact and Implications of Proj Mgmt Within AMC.

[91] Presentation, Lt Gen F. S. Besson, Jr. to USA Electronics Symposium, Ft Monmouth, N. J., 14 Nov 62.

[92] Ltr, Maj Gen William J. Ely, DCG, AMC to Lt Gen Dwight F. Beach, CRD, 31 Aug 62.

[93] Memo, Harold Brown, DDR&E, for Asst Secretaries of Army *et al.*, 18 Jan 63, subj: Mgmt of Research and Engineering.

[94] Memo, Dir/R&D for HQ AMC Directorates *et al.*, 19 Dec 63, subj: Mgmt of R&E.

draining of top quality personnel from the functional staffs. The Commanding General recognized that he had a real problem in balancing personnel resources between project-managed and nonproject managed items. The command devoted much study to this problem.[95]

In the early days of AMC, the views of the impact of project management on manpower varied widely. For example, the editor of a technical magazine wrote:

> This will be a most interesting development to watch, especially when thirty "General Bessons" all descend on the Personnel Office demanding the best scientific officers, the outstanding production troubleshooter, the top comptroller and contracting official, and the most knowledgeable men in electronics.[96]

The project manager was under direction to use common services provided. A number of AMC administrators expressed concern about the effects of project management on the personnel situation. For example, the Director of Research and Development believed that RDTE functions should be clearly assigned to him. "Further," he added, "this will permit the most efficient utilization of highly skilled professional R&D people by consolidating projects and skills, rather than decentralize R&D manpower to each of the project-managed weapons (equipment) systems."[97] Maj. Gen. Nelson M. Lynde, Jr., Commanding General of the U.S. Army Weapons Command, believed that project management should be limited to development and production, which was similar to the Air Force concept.[98] Admittedly, project management provided a means of effectively expediting high priority items. But there was also a feeling that it caused turbulence and lowered morale in the host organizations.[99]

[95] (1) MFR, James R. F. Woods, Ofc, Special Asst for Prof Mgmt, 27 Jun 63, subj: Comments of Generals McMorrow and Lynde ref Proj Mgmt. (2) Ltr, CG, AMC to CG, WECOM, 2 Jul 63.

[96] *Ordnance* (Nov-Dec 1962), p. 322.

[97] (1) Memo, Maj Gen F. H. Britton, Dir/R&D for CG, AMC, 19 Jun 62, subj: Planning Dir 24. (2) Interv, Raymond J. Snodgrass, with William F. Hodgkinson, R&D, 3 Jun 63.

[98] Ltr, CG, AMC to CG, WECOM, 2 Jul 63.

[99] Minutes, AMC Comdrs Conf, Wash, D.C., 24 May 63.

A Standard Form of Management

The Commanding General of AMC was aware of possible conflicts between project management and functional control. At the same time he expected project managers to conform to the general policies and practices established for each functional area. But he insisted that the project managers must not be subordinate to functional chiefs.

Project management became a standard form of management in the AMC because the command recognized the concept as a means of adjusting to rapid changes in program emphasis; because of the growth in size and complexity of modern weapons systems; and because each system had to be considered in terms of a DOD mission. The managers were concerned primarily with time, cost, and technical performance, while the functional directors were concerned primarily with specialized technical areas.[100] Adjustments in project management were needed from time to time in order to preserve a balance in working relationships between the functional directors and the project managers.

The AMC staff had predicted that the broad authority of project managers would result in conflicting instructions being issued to the people in the field. General Besson believed that conflicts already existed and that the project manager would bring them into the open where they could be resolved. The second most prevalent objection was that this system was an open invitation to higher headquarters to supervise AMC programs. General Besson agreed but maintained that he knew no way to stop DA and DOD supervision. Consequently, he insisted that he preferred to indicate to them where they could supervise most efficiently. Furthermore, he believed that the project managers would keep him abreast of developments which would enable him to know where higher authority would most likely probe.

Finally, General Besson practiced the philosophy that he would get superior performance from his managers if he gave them the authority, the responsibility, and the resources. As proof of the success of his philosophy, he

[100] Rpt, AMC Board, 29 Nov 63, subj: Evaluation of New Mgmt Concepts.

called attention to the number of project managers on the promotion list to general officers. He believed that the project management system would provide a proving ground for all future general officers in the logistics field.

The basic directions and objectives of AMC project management were clear. In effect, General Besson was the "project manager." The AMC concept brought management information and decisionmaking close to top level. Even those who were somewhat skeptical of the concept agreed that it had, in many instances, succeeded in bringing problems to the attention of the Commanding General and his staff quickly and forcefully. Enthusiastic supporters claimed much for the concept.[101]

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[101] For overall policies and procedures on Proj/Product Mgmt, see: AR 70-17, 19 Jan 68, R&D Systems/Proj Mgmt; AMCR 11-16, vol. 3, Jul 1968, Army Programs, Proj Mgmt, Master Plan and Rpts; and AMCR 1-12, Nov 1968, AMC Policy Book.

AMC PROJECT/PRODUCT MANAGERS

31 December 1968

PROJECT	PROJECT MANAGER	REPORTING THROUGH	DATE ESTABLISHED
Aircraft Weaponization	COL Mose E. Lewis III	CG, AMC	20 Aug 62
*Air Defense Control & Coordination	LTC Steven Dorchak, Jr. (Actg)	CG, MICOM Pending	1 Feb 69
*Air Traffic Management System	LTC Norman J. Hughes	CG, ECOM	8 Oct 68
Armored Reconnaissance Scout Vehicle	LTC John M. Misch	CG, ATAC	23 Dec 66
Army Area Communications Systems	COL Dana S. Prescott	CG, ECOM	4 May 66
Artillery Ammunition	COL James R. Gober	CG, MUCOM	16 Oct 66
Automatic Data Field Systems Command	BG Wilson R. Reed	CG, AMC (Ft Belvoir)	23 Jul 63
*Beach Discharge and Amphibious Lighters	LTC Robert P. Jones	CG, MECOM	17 May 65
Bombs and Related Components	COL Raymond C. Costabile	CG, MUCOM	19 May 66
Chaparral/Vulcan	COL Robert C. Daly	CG, AMC (Nassif Bldg)	5 Dec 63
Cheyenne	LTC Emil E. Kluever	CG, AMC	15 Sep 63
Chinook	COL Benjamin S. Silver, Jr.	CG, AVCOM	1 Aug 62
Close Support Weapons System	COL James K. Hoey	CG, WECOM	31 Oct 67
*Common Positioning & Navigation System	LTC Frank L. Treece	CG, ECOM	8 Jul 68
*Communications Security	LTC Myron F. Woolsey	CG, ECOM	3 Sep 68
Deseret	BG John G. Appel	CG, TECOM (Ft Douglas)	18 Nov 66
Dragon	COL Kenneth C. VanAuken	CG, MICOM	7 Jul 65
Flat-Top	COL Morgan C. Light	CG, AMC (C Ch, Texas)	17 Jun 64
General Purpose Vehicles	COL Charles E. Kunkel	CG, ATAC	1 Aug 62
Goer Vehicles	MAJ Charles E. Rose	CG, ATAC	18 Nov 66
Hawk	COL John G. Redmon	CG, MICOM	1 Aug 62
Heavy Lift Helicopters	LTC Robert A. Filby	CG, AVCOM	30 Aug 65
Iroquois	COL John W. Lauterbach	CG, AVCOM	1 Aug 62
Lance	COL Arthur F. Pottle, Jr.	CG, MICOM	1 Apr 64
*Land Combat Support Systems	LTC Frank A. Matthews	CG, MICOM	10 Oct 68
Light Observation Helicopter (Cayuse)	LTC Edward M. Browne	CG, AVCOM	1 Aug 62
M60 Tank	LTC Paul W. Simpson	CG, WECOM	1 Aug 62
M107/M110 Artillery	COL William P. Gojsza	CG, AMC	17 Oct 66
*M113 Italy Co-Production	LTC Arthur L. Goodall	CG, AMC	21 Dec 62
M561/XM705 Truck	LTC James A. Check	CG, ATAC	13 Jul 64
Main Battle Tank	BG Bernard R. Luczak	CG, AMC	13 Aug 63
Mallard	MG Paul A. Feyereisen	CG, AMC	14 Jun 66
Manned Aerial Vehicle for Surveillance	COL Earl J. Cobey	CG, AMC	23 Jul 65
Mechanized Infantry Combat Vehicles	LTC Richard H. Sawyer	CG, ATAC	13 Jul 65
Mobile Electric Power	COL Joseph J. Rochefort	CG, AMC (Dwyer Bldg)	12 Mar 63
Mobile Floating Assault Bridge Ferry	LTC Frank M. Pender	CG, MECOM	14 Oct 66
Mohawk	COL Amos B. Shattuck	CG, AMC (Nassif Bldg)	1Aug 62
*Mortar Ammunition	COL William C. Hall	CG, MUCOM	13 Oct 66
*Multi-Fuel Engines	COL Clarence W. Kingsbury	CG, ATAC	20 Jul 67
*Multiple Artillery Rocket System	LTC Wayne B. Miller	CG, MICOM Pending	7 Jan 69
Night Vision	COL Arthur T. Surkamp	CG, AMC (Ft Belvoir)	23 Feb 65
Nike-Hercules	COL Morris W. Pettit	CG, MICOM	1 Aug 62
*Omnidirectional Mortar Locating Radar	LTC George R. Davis	CG, ECOM	7 Feb 68
Pershing	LTC Edwin A. Rudd	CG, MICOM	1 Aug 62
Random Access Discrete Address System & Tectical Automatic Switching System	LTC A. F. Key (Actg)	CG, ECOM	1 Aug 62

Redeye	COL John R. Covert	CG, MICOM	1 Apr 64
Rifles	COL Alvin C. Isaacs	CG, WECOM	1 Aug 62
2.75-inch Rocket	COL Winfield S. Scott	CG, MUCOM	17 Dec 65
Satellite Communications System	COL George E. Rippey	CG, AMC	15 Aug 62
Selected Ammunition	COL Sterling E. Purnell	CG, MUCOM	1 Aug 62
*Selected Avionics Equipment for Army Aircraft	MAJ William R. Corley	CG, AMC	31 Dec 68
*Selected Priority Operations	LTC Robert J. LaFlam	CG, ECOM	7 Jun 68
Selected Tactical Radios	COL Bernard J. Pankowski	CG, ECOM	8 Apr 65
Sentinel Munitions	COL Frank C. Healy	CG, MUCOM	22 Jul 68
Sergeant	LTC Arthur G. Lange, Jr.	CG, MICOM	5 Jul 66
Sheridan	COL John R. Mathias	CG, WECOM	1 Aug 62
Shillelagh	COL Robert Proudfoot	CG, MICOM	1 Aug 62
Southeast Asia Night Operations	LTC Charles R. Lehner, Jr.	CG, AMC (Alex, Va)	15 Aug 67
Special Mission Operations	COL David J. Armstrong	CG, AMC (Nassif Bldg)	6 Sep 67
Special Warfare	COL James M. Vail	CG, AMC	7 Nov 62
Strategic Communications	BG Hugh F. Foster, Jr.	CG, AMC	1 Aug 62
Surface-to-Air Missile Development	COL James C. Miller	CG, MICOM	10 Nov 65
*Target Missiles	COL Robert W. VanWert (Actg)	CG, MICOM	15 Oct 68
*Teletypewriter	COL Richard M. Lyman (Actg)	CG, ECOM	16 Dec 68
TOW	LTC Robert W. Huntzinger	CG, MICOM	7 Jul 65
Turbine Aircraft Engines	COL Robert J. Dillard	CG, AMC	3 May 67
Utility Tactical Transport Aircraft System	LTC Edward P. Lukert	CG, AVCOM	23 Dec 66
Vehicle Rapid Fire Weapons System	LTC Patrick H. Lynch	CG, WECOM	18 Apr 67

DEPROJECTIZED PROJECTS

PROJECT	DATE DEACTIVATED
AN/USD-5	14 Dec 62
AN/USD-2	30 Apr 66
Automatic Chemical Biological Warning System	1 Feb 65
BZ Weapons	18 Oct 63
CV-7A Aircraft	28 Feb 64
Davey Crookett	7 Aug 63
FABMDS	8 Nov 62
Integrated Physical Distribution System	1 Jul 68
Mauler	10 Nov 65
MQM 58A	21 Sep 65
Nike-X	15 Nov 67
Petroleum Oils and Lubricants	1 Mar 68

REDESIGNATED PROJECTS

PROJECT	NEW TITLE	DATE REDESIGNATED
AADS-70	SAM-D	11 Aug 65
Advanced Aerial Fire Support System	Cheyenne	25 Apr 67
ADVENT	SATCOM	15 Aug 65
Amphibious Lighters	Beach Discharge and Amphibious Lighters	13 Jul 67
AN/PRC-25-AN/VRC-12	Selected Tactical Radios	8 Apr 65
AR-15 Rifle (M16)	Rifles	15 Oct 64
Caribou	CV-7A	15 Sep 63
Cayuse	LOH	1 May 68

CCIS-70	ADFSC	1 Aug 65
Combat Vehicles	VRFWS	1 Mar 68
Engine Generators	Mobile Electric Power	18 Oct 67
European Tropospheric Army	UNICOM/STARCOM	30 Jun 65
Fire Support Aerial System	AAFSS	26 Mar 64
Flying Cranes	Heavy Lift Helicopter	28 Apr 67
Interim Air Defense System	Chaparral/Vulcan	24 Jan 66
Missile B	Lance	16 Jan 63
Practice Nine	Special Mission Operations	6 Sep 67
**Sheridan/Shillelagh	Sheridan / Shillelagh	15 Apr 63
STAAS	Manned Aerial Vehicle for Surveillance	21 Mar 68
UNICOM/STARCOM	STARCOM	1 Mar 67
ZEUS	Niko-X	1 Feb 64

*These were Product Managers as defined in AR 70-17, para 4, subj: System/Project Management.
**Separated into 2 projects.

SHAPING THE WEAPONS TO COME

Almost everything natural and manufactured has assumed variety and complexity scarcely imagined even in World War II. The Army's demand for modern equipment —for vehicles that roll, crawl, swim, or fly; for electronics that communicate, detect, or navigate; for weapons that shoot everything from bullets and shells to rockets and missiles—is pushing the very frontiers of today's science and technology.

GEN
~~LTG~~ Frank S. Besson, Jr.
"Meeting The Army's Materiel Needs"
Army Green Book
Oct 1966, p. 45

CHAPTER IV

SHAPING THE WEAPONS TO COME

According to the principles set forth by the Army Chief of Staff in 1962, the bulk of available funds was to be spent on projects which would provide real strides forward in terms of combat effectiveness, with emphasis on mobility, firepower, and communications. Only equipment required for performance of assigned missions, and in only absolutely necessary quantities, was to be authorized. Unnecessary technical features, over-refinement, and excessive durability were to be eliminated. The Chief of Staff emphasized that "nice to have" but nonessential features were to be excluded. According to his principles, improvements in the name of modernization had to be eliminated.[1]

Because available funds would not support all desirable research and development projects, General Besson declared that it was imperative that "we decisively amputate low yield programs." To preclude the introduction of such programs, he ordered that each research and development project be analyzed in light of certain prescribed criteria. He requested that an estimate be made of the extent to which the new items would improve existing operations. Among the factors to be applied in analyzing the projects were the following: the maintainability of the item in an operational environment; the reliability of the item; the tactical advantages of the item expressed in such factors as increased speed and range of operation; the impact on troop strength if placed into use; the impact on logistical requirements expressed in tons per day; the cost and time of development from initiation through standardization; the cost of production; and the net effect on the Army in dollars and personnel when the new item was introduced.[2]

For more than a decade the level of national defense spending has been considerably higher than nondefense expenditures. For example, in Fiscal Year 1953, a Korean War year, defense spending ran 68.1 percent of the $74 billion Federal budget. For Fiscal Years 1954 through 1967, yearly defense spending ranged from 52 to 69.6 percent of total national expenditures. This proportion was influenced by such factors as the Berlin crisis, the buildup of intercontinental ballistic missiles, and the war in Vietnam.[3]

The United States fought in Korea with units equipped basically with rehabilitated World War II-type equipment. There was no large stockpile of such equipment at the beginning of the war in South Vietnam. By the end of 1967, the United States was supporting more troops in Southeast Asia (SEA) and moving more supplies for that conflict than were moved at the height of the Korean War. Rough calculations indicated that it required over 2 measurement tons of supplies per month to support a U.S. soldier in Vietnam, while earlier conflicts required an average of only 1.3 such tons.[4]

Due to technological developments, the changing nature of warfare made the process of materiel acquisition more difficult. In the Korean War the helicopter had been a special and rare sort of weapon. In Vietnam the helicopter was more complex and costly, and became a standard workhorse for airmobile op-

[1] DF, Brig Gen Fred P. Campbell, CofS, AMC to all AMC Directorates, Ofcs, and Special Assistants, 12 Feb 63, subj: Army Chief of Staff Principles for Development and Procurement of Materiel.

[2] Ltr, CG, AMC to Major Subordinate Comdrs and all Proj Mgrs, 28 Dec 62, subj: R&D Analysis.

[3] *Hearings* before Committee on Appropriations, H of Rep, 89th Cong, 2d sess, "The Budget for 1967," January 31, 1966.

[4] Speech, A. Tyler Port, Dep ASA (I&L), before Hawaii Chapter, AUSA, Honolulu, 12 Jun 67, subj: Logistics Support of the Buildup in SEA.

erations. As an example of this complexity, the Army supplied over 120 different components to support Hueycobra helicopters in Vietnam.

Previous experience had not prepared the Army for deployment and support of sizeable combat forces in the type of environment found in South Vietnam. The problems of distance, geography, and escalating demands had to be solved. The terrain, road conditions, and tropical climate increased the demands. Unfortunately, urgent demand for critical items called for more than the signing of a few more contracts. The Army encountered the problem of late deliveries to meet requirements for complicated new items as well as for urgent requirements for large quantities of ordinary items.[5]

R&D Organization and Management

Objectives and Concepts

In his defense of the Fiscal Year 1963 Army research and development budget before the House Committee on Appropriations, Maj. Gen. Dwight E. Beach, Deputy Chief of Research and Development (R&D) testified that the funds totaled approximately $1.3 billion or about 11 percent of the Army budget—a two percent increase over Fiscal Year 1962 funds. In comparing these two budgets, General Beach noted that total funding for guided missiles continued to decrease, while funding for military sciences, combat vehicles, and other developments for limited war showed a marked increase.[6]

Later, in defending the Fiscal Year 1964 budget, General Beach declared that world events of the preceding year had illustrated the need to further improve the Army's limited warfare capability. In looking to the battlefield of the future, he explained that the Army was striving for significant rather than marginal improvements in weapons to exceed the capability of any potential enemy. In the aviation program, he commented that the Army objectives were to develop aircraft which would help win land battles and which would be responsive to the ground commander. In this connection, General Beach stated that the study by the Army's Tactical Mobility Requirements Board, known as the Howze Board, had reaffirmed these objectives and recommended increased emphasis on research and development toward achieving these objectives.[7]

Because of significant changes in technical capabilities, and the need to adjust rapidly to changing tactical requirements, the Army, and the Department of Defense (DOD) generally, devoted considerable attention to the study of R&D management during the post-World War II period. For example, prior to the Hoelscher Report,[8] which devoted a major segment to research and development, there had been numerous studies relating to this subject, such as the Hoover Commission Report,[9] the Davies Committee Report,[10] and the Roderick Board Report of 1960. A brief review of the latter report, which concerned realignment of responsibility for Army research and development, will be useful as a background for understanding the later realignment when AMC was established.

In November 1959, Secretary of the Army Wilbur Brucker appointed a seven-man board, headed by Assistant Secretary of the Army George H. Roderick, to review the Army's research and development organization and procedures. In its report in February 1960, the Roderick Board recommended closer control by the Army's Chief of Research and Develop-

[5] (1) *Ibid.* (2) Comd Information Topics, HQ AMC, 19 Oct 66, subj: Vietnam, The Land and Its Challenge to Logistics.

[6] H. Subcommittee of Committee on Appropriations, 87th Cong, 2d sess, *Hearings* of FY 1963, DOD Appropriations, pt. 5, pp. 141–142.

[7] H. Subcommittee of Committee on Appropriations, 88th Cong, 1st sess, *Hearings* on FY 1964, DOD Appropriations, pt. 6, pp. 249–250.

[8] OSD Proj 80 (Army), pt. V, R&D, Oct 1961.

[9] Rpt on the Business Organization of the DOD, May 1955.

[10] Rpt of the Advisory Committee on Army Organization, 18 Oct 53.

ment, Lt. Gen. Arthur G. Trudeau.[11] To achieve closer control, Richard S. Morse, then Director of Research and Development for the Army, proposed the establishment of a research and development command which would remove all elements in this area from the Technical Services and place them under control of General Trudeau. Early in 1960, the Research and Development Working Committee informed the Technical Services that steps were underway to carry out Mr. Morse's proposed plan.[12] However, the Deputy Chief of Staff for Logistics (DCSLOG) and the Technical Service chiefs opposed such a command and it was not established.[13]

Nevertheless, Secretary Brucker approved procedural and organizational changes designed to strengthen General Trudeau's control over Army research and development. Under the new arrangement the control of research and development in the Technical Services by Office, Chief of Research and Development (OCRD), was to parallel the control by DCSLOG over logistics. General Trudeau was to plan, coordinate, direct, and supervise all Army research, development, test, and evaluation (RDTE) funds, activities, and facilities.[14] Consequently, he requested the Technical Service chiefs to provide clear, authoritative channels down to the research and development levels.

That this new realignment would not work effectively was soon to be revealed. For example, to General Trudeau's request, the Chief of Ordnance (CofOrd) replied that he had already established clear, authoritative channels for operating control over Ordnance research and development. According to the Chief of Ordnance, this responsibility was being carried out under established Department of the Army policies and procedures, and under normal command lines of the Ordnance Corps.[15]

This alignment complicated the manpower control function of the Technical Services, because the Army's Chief of Research and Development authorized the personnel spaces for research and development, while DCSLOG continued to authorize spaces for logistical functions. This in effect meant that there were two parallel lines of authority to the Technical Services on manpower control matters. Moreover, some Technical Service personnel performed research and development as well as logistical functions.[16]

In this setting, the Hoelscher Committee conducted its study, devoting a 200-page section of its report to research and development. It directed attention particularly to overall planning, basic and applied research, and to the management of technical and scientific personnel. In the broad framework of the committee's conclusion that the interests of the Army would be best served by a materiel command, the planning group worked out the research and development organizational structure, policies, and procedures for the new command. During the first year, the command took over most of the research work previously performed by the Technical Services, organized the new program, staffed the positions, and scrutinized its resources to determine its capabilities.

The AMC Research and Development Directorate became operational in August 1962, and consisted of the Office of the Director, the Administrative Office, and four divisions: Plans and Policies, Research, Development, and Technical Intelligence. In addition, there was a small staff for the AMC Technical Committee, and the Technical and Industrial Liaison Office. The divisions were organized along both functional and commodity lines.[17]

The Research and Development Directorate

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[11] Rpt, Evaluation of Army's Organization and Mgmt of Its R&D Effort (Roderick Board Rpt), 26 Feb 60.

[12] Memo, DCSLOG Rep for R&D Working Committee, for Chiefs of Tech Services, 4 Feb 60, subj: Organization—Army R&D.

[13] Memo, Actg DCSLOG for CofOrd, 6 Jan 60, subj: R&D Organization.

[14] (1) Ltr, Secy Brucker to Dr. D. C. Furnas, Chm, Scientific Advisory Panel, 15 Aug 60. (2) Memo, Secy of the Army for CofS, Army, 30 Jun 60. (3) Release by Secy of the Army on R&D Reorganization, 15 Aug 60.

[15] (1) Memo, CofOrd for CRD, 19 Sep 60, subj: Army R&D Organization and Procedures. (2) Memo, Maj Gen C. H. Bonesteel III, SGS for DCS, COA, Ch, R&D and ACofS, 17 Aug 60, subj: Army R&D Organization and Procedures.

[16] (1) OCO Historical Summary, Personnel & Training Div, FY 1961. (2) CS Reg 616-3, 29 Dec 60, and CS Reg 616-1, 10 Jul 61.

[17] (1) AMCRD Historical Summary, FY 1963. (2) AMC Activation Plan, Jul 1962.

had staff supervisory control over research and development activities in the commodity commands and the test and evaluation program of the U.S. Army Test and Evaluation Command (TECOM) located at Aberdeen, Maryland. The commodity commands under which specified research and development work was performed, were U.S. Army Weapons Command, Rock Island, Illinois; U.S. Army Missile Command, Huntsville, Alabama; U.S. Army Electronics Command, Fort Monmouth, New Jersey; U.S. Army Munitions Command, Dover, New Jersey; U.S. Army Aviation Command, St. Louis, Missouri; and U.S. Army Mobility Command, Warren, Michigan. In addition, the following nine research laboratories and agencies reported directly to AMC Headquarters: the U.S. Army Ballistic Research Laboratories; U.S. Army Human Engineering Laboratories and U.S. Army Coating and Chemical Laboratory, all located at Aberdeen, Maryland; the Cold Regions Research and Engineering Laboratory at Hanover, New Hampshire; the Army Materials Research Agency (AMRA), Watertown, Massachusetts; the Natick Laboratories, Natick, Massachusetts; Harry Diamond Laboratories, Edgewood, Maryland; and the Polar Research and Development Center, Fort Belvoir, Virginia.

The major research and development activities under the commodity commands included Springfield Armory, and Edgewood, Rock Island, Watertown, Picatinny and Frankford Arsenals; the Tank-Automotive Center at Warren, Michigan; Fort Detrick, Maryland; the Engineering Research and Development Laboratories, Fort Belvoir, Virginia; and the Aviation Laboratories, Fort Eustis, Virginia. The agencies under TECOM included the six test boards, which were previously under CONARC; the Aviation Test Agency, Edwards Air Force Base, California; White Sands Missile Range, New Mexico; U.S. Army Electronic Proving Ground, Fort Huachuca, Arizona; Aberdeen Proving Ground, Aberdeen, Maryland; Jefferson Proving Ground, Madison, Indiana; Yuma Proving Ground, Yuma, Arizona; Dugway Proving Ground, Utah; U.S. Army Tropic Test Center, Fort Clayton, Canal Zone; U.S. Army Arctic Test Center, Fort Greely, Alaska; and the U.S. Army General Equipment Test Activity, Fort Lee, Virginia. In addition, several research and development liaison offices reported directly to AMC Headquarters, such as the office at the Parachute Test Agency, El Centro, California; the Naval Weapons Center, China Lake, California; the Air Force Space and Missile Systems Organization, Los Angeles, California; the Air Force Aeronautical Systems Division, Wright Patterson Air Force Base, Ohio; the Air Force Systems Command, Andrews Air Force Base, Maryland; and the Field Office at Sandia Base, Albuquerque, New Mexico.

Based on agreements with the Chief of Engineers, the AMC also pursued research and development activities at the Engineer Waterways Experiment Station, Vicksburg, Mississippi, and the Engineer Topographic Laboratories at Fort Belvoir, Virginia. The Director of Research and Development was also responsible for the execution of the RDTE programs of the many project and product managers. This included financial management and technical support as required.

After the establishment of the AMC in 1962, there were a number of significant research and development organizational changes. The Army Materials Research Agency was redesignated the Army Materials and Mechanics Research Center. The three laboratories at Aberdeen and the Nuclear Defense Laboratory at Edgewood were placed under a single command designated as the Army Research and Development Center at Aberdeen, Maryland. The Cold Regions Research Engineering Laboratory at Hanover, New Hampshire was redesignated the U.S. Army Terrestrial Sciences Center. The Polar Research and Development Center at Fort Belvoir was phased out. The U.S. Army Aviation Test Activity at Edwards Air Force Base, California, was transferred from TECOM to the U.S. Army Aviation Systems Command. The Engineering Research and Development Laboratory at Fort Belvoir was redesignated as the U.S. Army Mobility Equipment Research and Development Center and served as the principal laboratory of the U.S. Army Mobility Equipment Command. To further the research effort in Army aviation, the Army Aeronautical Research Laboratory at Moffett Field, California, was established.

In order to provide a better base for long range research and development plans, the U.S. Army Advanced Concepts Agency was established in 1968. This agency was located in the Washington area and was to be eventually collocated with the Combat Developments Command's Institute of Land Combat and the Threat Forecast Group, which was under the Assistant Chief of Staff for Intelligence. Another important change involved the consolidation of the Deseret Project Manager's organization with the Dugway Proving Ground to form the Deseret Test Center as a subordinate element of TECOM.[18]

The Combat Developments Command developed the doctrine, which determined how the Army was to fight and what weapons it would use. The Army Materiel Command had the mission of getting the equipment; the Office of Personnel Operations provided the people; and the Continental Army Command (CONARC) turned out the trained units for the combat forces. The Army's Chief of Research and Development had staff responsibility for planning, programing, and supervising all research, development, test and evaluation, including related policies, funds, projects, and tasks.[19] The AMC received its program guidance mainly from the Office of the Chief of Research and Development. In turn the OCRD received guidance from the Director of Defense Research and Engineering. While the AMC had leeway within the approved programs, it could not vary appreciably from Army staff guidance without referral to higher headquarters.[20]

Originally, the AMC envisaged a centralized control of materiel management with responsibility vested in the Comptroller and Director of Programs. Under that concept, the Research and Development Program would have been included in this integrated responsibility. However, the AMC Activation Plan was somewhat modified. Consequently, the Director of Research and Development became responsible for the formulation, supervision, and execution of the research and development program during the first few months of Fiscal Year 1963. As a result of these adjustments, eighteen personnel spaces were transferred from the RDTE Branch of the Program Management Division, Office of Comptroller and Director of Programs, to the Plans and Policy Division of the Research and Development Directorate.[21]

The degree of control over programing within AMC and the degree of control exercised by OCRD over the AMC Research and Development Program absorbed the attention of Maj. Gen. F. H. Britton, the AMC Director of Research and Development, during the early months of Fiscal Year 1963. He was especially concerned with the degree of control by OCRD over the field of responsibilities assigned to the AMC. General Britton believed that the source of detailed information, particularly regarding technical capabilities, should be in AMC. Furthermore, he observed that the large OCRD staff was in direct conflict with the Secretary of Defense's ideas and directives on reduction of the Department of the Army (DA) staff organizations.[22]

The Combat Developments Objective Guide (CDOG) sets forth the Army's general combat objectives grouped under eighteen major operational categories, such as infantry, armor, field artillery, and air defense operations. These objectives were used in planning the long-range effort. Objectives were projected well into the future and had to be consistent with scientific advancement that might be expected in the next decade and beyond. However, a proper balance had to be maintained between the state-of-the-art and utility as developed through cost effectiveness analysis.

Combat development studies were directed toward the determination of operational concepts and techniques leading to the establishment of small development requirements (SDRs) or qualitative materiel requirements (QMRs) for the Army. These included Army concept and doctrinal studies and special studies of general interest. SDRs and QMRs were approved statements of military needs for new items or systems, the development of which was

[18] Submission, AMCRD-E to AMCHO, 12 Dec 68.

[19] AR 705-5, Apr 1968, subj: Army R&D.

[20] Interv, Raymond J. Snodgrass with W. W. Flynn, Dep Ch, Tech Service Div, AMC, 3 Sep 63.

[21] DF, C/DP to Dir P&T, 17 Feb 63, subj: Transfer of Functional Responsibilities and Personnel from C/DP to Dir/R&D.

[22] DF, Cmt 2, Maj Gen F. H. Britton, Dir/R&D, AMC, to Ch, Organization Planning, DA, 26 Jun 62, subj: Headquarters, DA Activation Plan.

believed to be feasible. They served as a basis for the preparation of technical characteristics. QMRs did not state the general need for improved methods or for research. Such statements were listed in qualitative materiel development objectives (QMDOs). The Department of the Army assigned priorities to SDRs, QMRs, and QMDOs to indicate their importance to the future Army and to furnish a guide for the allocation of resources for research and development.[23]

Funding

During the first year of operation, Fiscal Year 1963, the total of $1.254 billion in RDTE funds available to AMC consisted of $1.157 billion in new funds, $44 million carried over from the previous year, and $5.3 million reimbursable funds from orders outside the command. Despite major changes in programing procedures, the command obligated over 93 percent of total RDTE funds for the Army as a whole, which amounted to 15 percent of all AMC funds for the first fiscal year. It is interesting to note that the Zeus missile project represented 49.2 percent of AMC RDTE funds devoted to advanced development and 33.2 percent of such command funds for engineering development during that year. Obligation and expenditure limitations at the program element level reduced the command's flexibility in managing R&D programs. Another factor that influenced the availability of funds was the practice of withholding or deferring funds by DOD and OCRD.[24] A total of slightly over $1.293 billion in RDTE funds was released to the AMC during Fiscal Year 1964. Again OCRD and OSD deferred an appreciable sum of AMC funds. The bulk of the deferrals involved missile projects. Of the funds released to the command during 1964, over half was in the engineering development category.[25]

From a Fiscal Year 1965 RDTE program of $1.299 billion, a total of $1.277 billion was released to AMC. Included in the program was $702,804 reimbursable-type funds. By 30 June 1965, the command had obligated 84 percent of the released program.[26] The program for Fiscal Year 1966 totaled $1.365 billion of which 91.8 percent was obligated.[27] For Fiscal Year 1967, the RDTE program totaled $1.702 billion of which 15.2 percent was carried over from the prior year. The initial RDTE program for Fiscal Year 1967 was increased by $89.1 million during the year primarily for support of the war in Southeast Asia. For Fiscal Year 1968, the program totaled $1.226 billion. Thus, RDTE funds remained fairly constant over these several years.[28]

For the 1968 program, support for the Nike-X missile system was transferred from AMC to the Nike-X System Office which reported to the Chief of Research and Development of the Army. This transfer involved a significant portion of the command's RDTE program. Furthermore, the command's CV-7A tactical transport aircraft project was terminated when responsibility for the aircraft was transferred to the U.S. Air Force.[29]

The program planning cycle was a continuous updating of the five-year base program. The primary controlling factor was the overall dollar ceiling assigned by higher authority. A number of important factors might result in changes of any given fiscal year program. Among these actions were the review and approval by the Defense Director of Research and Engineering, congressional action on the military appropriation bill, and the Bureau of the Budget apportionment.[30]

Personnel

Over the several years of the command's existence, individual training continued to be of considerable importance. The Directorate of Research and Development directed its efforts toward the improvement of the technical competence of its scientific personnel through Government-sponsored courses and training at

[23] (1) CDOG, ch. 10, 17 Nov 66 and ch. 11, 27 Feb 67. (2) AR 705–5, Research & Development of Materiel: Army Research and Development, Oct 1964. (3) AR 71–1, Combat Development: Army Combat Development, 27 May 66. See also, Long-Range Technical Forecast, 3d ed., HQ, DA, OCRD, ch. 8, 5 Dec 66.

[24] (1) Rpt, The Fiscal Year, Sep 1963, by C/DP, pp. 11–12. (2) AR 37–20, ch. 3, 2 Mar 62, subj: Administrative Control of Appropriations.

[25] Statistics Supplied by Current Program Sec, Programs Br, Tech Service Div, Dir/R&D, 20 Oct 64.

[26] AMCRD Historical Summary, FY 1965, p. 13.

[27] *Ibid*, FY 1966, p. 11.

[28] AMC Review of Programs, FY 1965–1968.

[29] AMCRD Historical Summaries: FY 1967; 1968.

[30] (1) *Ibid.* (2) Hearings, Committee on Appropriations, H of Rep, pt. V, RDTE, 89th Cong, 1st sess, April 5, 1965.

educational institutions. This program steadily grew both in numbers and quality of participants. An important step in training research and development personnel was the establishment of the R&D Management Orientation, and Test and Evaluation Orientation courses at the U.S. Army Logistics Management Center at Fort Lee, Virginia.

Significant achievements in management were also realized through the exchange of scientific personnel. For example, electrochemists from the Naval Marine Laboratories at Annapolis engaged in fuel cell research at the U.S. Army Mobility Equipment Research and Development Center at Fort Belvoir, Virginia. In turn, Army personnel conducted research at Naval laboratories. In this instance, closely coordinated fuel cell research and development, to avoid duplication of effort, resulted in significant contributions to both services.[31]

In assuming responsibility for research management from the Technical Services, the Directorate of Research and Development was authorized appreciably less personnel than had previously discharged this task. Furthermore, higher headquarters often borrowed AMC key personnel for extended periods of time. Over a long period during 1964, Dr. Ralph G. H. Siu, the Scientific Deputy of the Research Division, was on loan to the Army, as were several other key personnel, to conduct a review of the Exploratory Development Program.[32]

In discussing the overall research and development program, Maj. Gen. W. C. Gribble, former Director of Research and Development, AMC, referred to "the people" as the one component of the system upon which success depended most directly. General Gribble further philosophized:

> In any organization it's the people that make it work. In research and development this is particularly true. Approximately 25,000 civilian employees and 2,000 uniformed personnel are directly involved with the support and conduct of AMC's research and development program. Each individual represents a unique level of competence, based on his own knowledge, skill, and experience; each has particular strengths and displays an occasional weakness; each has emotions, pride, and opinions. A conscious recognition of the role of the individual, and the dependence of the system on his ideas as well as his services, is at once the most demanding and the most appealing of the task of management.[33]

Research

Managing Research

In the statement before the Committee on Armed Services of the House of Representatives in March 1966, Secretary of Defense McNamara maintained that our military strength a decade or more from then would depend greatly on the "skill and energy with which we conduct our current research effort." It was from this realm of ideas and theory, the Secretary explained, that new devices and inventions applicable to military requirements would eventually emerge.[34]

In addition to its own in-house laboratories, the Department of Defense supported nearly half of all academic research in the phsycial sciences and engineering being done in American universities and colleges. The Department's goal was the advancement of knowledge in a balanced manner across the entire spectrum of science and technology pertinent to defense effort. In general, the categories of research were divided among the military departments according to the primary fields of interest and competency. Electronics research by the Army and advanced microwave technology led to more efficient night vision devices. Materials research was directed toward developing such

[31] Submission, AMCRD-E to AMCHO, 12 Dec 68.

[32] (1) *Ibid.* (2) Memo, Ch, Research Div, to Brig Gen Wheeler G. Merriam, 16 Jun 64, subj: Request of ASA (R&D) for Assistance of Dr. Siu *et al.*, to complete Review of Exploratory Development Prog.

[33] Speech, before Army Scientific Advisory Panel, Wash., D.C., 16 Oct 64, subj: R&D in AMC (Integrated Nature of the Functions).

[34] H. R. 13456, *Hearings*, 89th Cong, 2d sess, March 8, 1966, p. 7506.

items as new compounds, plastics and alloys, which led to a more effective rust inhibitor, improved rocket propellant binder, better light armor, and new ferrites. Mechanics research resulted in a better understanding of target damage from air blast and ground shock. From energy conversion studies came a new fuel cell which could be operated on low cost impure oxygen.[35]

Studies on Research Management

Over a period of years a number of studies at both Defense and Army levels had pointed out the problems in research management and a general need for improvement of the in-house capabilities of Army laboratories. The overall goal was to improve the degree of excellence in research, maintain the quality of thought and creativity, and to apply these in the areas where needed.[36]

Basic research and exploratory development included all efforts of AMC toward an increase in knowledge of natural phenomena, environment, and the physical, behavioral, and social sciences. Thus, this included all basic research and that applied research directed toward the expansion of knowledge in various scientific areas. Briefly, AMC research personnel participated in the pioneering areas considered essential for maintaining the competitive technical position of the Army.[37] AMC research personnel realized that there were many divergent forces that affected the research program and that improvement would come only by an evolutionary process. Among the pertinent questions concerning the fundamental research program at the beginning of the AMC were: (1) What would be the effect of the current examination of Army tactical missions on existing materiel requirements which had been used as goals in past years, and (2) What would be the effect of the various studies that were underway?

In July 1961, the President requested a report on the use of Government contracts with private organizations to obtain scientific and technical knowledge needed for public purposes. He was concerned about whether contracts might have been used to avoid the limitations on direct Federal operations in Government research facilities. This resulted in the Bell Report on research and development.[38] A fundamental conclusion of the Bell Report, which was approved by President Kennedy in April 1962, was that the Federal Government, as a matter of national policy, should seek to enhance the capability of its in-house laboratories.

The AMC plan to strengthen and maintain a strong in-house scientific and technical capability called for the following seven-point approach: a statement of clearly enunciated policy; insuring the influx of new ideas; the development of the worldwide reputation of the AMC as a scientific institution; maintaining the pioneering spirit; improvement of work environment; development of the internal staff; and continued assessment and corrective action.[39]

As an aid in implementing the Bell Report, the Department of the Army published a regulation on the managment of laboratories.[40] The command analyzed many field reports on in-house research accomplishments and continued self-appraisal of the overall ability of the laboratories and the relative stature of AMC research activities.[41] The Assistant Secretary of the Army for Research and Development requested specific information that the intent of the Bell Report was being implemented.[42]

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[35] *Ibid.*, pp. 7508–7509. See also, ltr, Jay Tol Thomas, Dep for Research & Labs, AMC to CO, AMRA, 15 Sep 66, subj: Mission Assignment for Light Armor Materials Research.

[36] Interv, Raymond J. Snodgrass with Dr. Ralph G. H. Siu, Scientific Dep, Research Div, AMC, 17 Sep 63.

[37] (1) AMC Planning Dir No. 40, 12 Jul 62, subj: Concepts of AMC Operations—Research. (2) AMC Planning Dir No. 55, 31 Jul 62, subj: Concepts of AMC Operations—Army Research Labs.

[38] S. *Doc.* 94, 87th Cong, 2d sess, Rpt to the President on Govt Contracting for R&D, April 30, 1962. David E. Bell, then Director of the Bureau of the Budget, was chairman of the committee that made this report.

[39] (1) AMC Plan for In-house Competence, May 1962, revised Aug 1962. (2) CG's bi-weekly ltr, 30 Aug 62.

[40] AR 705-55, 11 Oct 62: Mgmt of U.S. Army R&D Labs and Activities.

[41] (1) Ltr, Dir/R&D to all Commodity Comds on Labs, 7 Nov 62, subj: Analysis of First Rpts from AMC Labs on Peak In-House Accomplishments. (2) "Army Sets Policies to Strengthen In-House Laboratory Research," *Army R&D Magazine*, Oct 1962, pp. 1, 4–5.

[42] (1) Ltr, Finn J. Larsen, ASA (R&D) CRD, DA, 6 Mar 63, subj: Implementation of the Bell Committee Rpt. (2) Ltr, Lt Gen Dwight E. Beach, CRD, to CG, AMC, 9 Mar 63, subj: same.

Among the actions taken by AMC was the utilization of competent individuals in priority research areas. Furthermore, the command encouraged the free flow of technical communication and assigned technically educated officers to areas that called for the maximum utilization of their skills.[43] The almost constant use of AMC research personnel by DA and DOD was evidence of the competence of these personnel. For example, in the fall of 1963, the Chief of the AMC Laboratory Branch served as chairman of a special DOD study group. AMC research personnel often served on such groups.[44]

After the Bell Report in 1962, many additional studies were made to determine more specifically the means for enhancing the capability of the laboratories. Among these, the most significant was the report on in-house laboratories (Skifter Report),[45] and the report on scientific personnel (Vance Report),[46] conducted by the Scientific Advisory Panel and the studies on program structure and management conducted by the Army Research Council (TARC).[47] The Skifter Report and the Vance Reports expressed concern over the existing research management structure and its effects on the Army's research and development effort. Consequently, General Besson directed that action be taken to develop a definite proposal for improvement, and an AMC ad hoc group was established to formulate the proper concept.[48]

This effort was soon superseded by a reorganizational proposal by TARC. In its report to the Assistant Secretary of Defense for Research and Development, TARC called for organizational changes and in September 1964 the Assistant Secretary of the Army for Research and Development, Willis M. Hawkins, asked the AMC, the Corps of Engineers, and the Surgeon General's Office for their views.[49] While the Hawkins' proposal was still under study, DOD represented the military departments with a reorganization plan of larger scope, with the request that "some such plan" be worked out. From this evolved General Besson's "Concept of Laboratory Management," which was approved by Dr. Harold Brown, Director, Defense Research and Engineering in June 1965.[50]

In brief, the approved concept provided for the establishment of the position of a Director of Research and Laboratories. The director was to have full management responsibility for research in the central laboratories, as well as staff jurisdication over the technical excellence of in-house research in the commodity laboratories.[51]

Director of Research and Laboratories

In January 1966, the Commanding General, AMC, selected Dr. Jay Tol Thomas as the Director of Research and Laboratories, and, with the specific concurrence of the Army Chief of Staff, Assistant Secretary of the Army (R&D), and Chief of Research and Development, appointed Dr. Thomas as the Deputy for Research and Laboratories. He exercised complete and direct line authority over the nine AMC central laboratories and over the technical quality of AMC research conducted in the laboratories of the major subordinate commands. He represented the Commanding General, AMC, in direct communications with the Army Chief of Research and Development, and with the Assistant Secretary of the Army (R&D) on all matters relating to in-house programs conducted in AMC.[52]

Dr. Thomas came to the newly created position with a broad experience in industry and educational institutions. He reported for duty

[43] (1) 1st Ind, Maj Gen William J. Ely, DCG, AMC to CRD, DA, 25 Mar 63, subj: Implementation of the Bell Rpt. (2) Ltr, Brig Gen John G. Zierdt, Actg Dir/R&D to CRD, 11 Apr 63, subj: same.

[44] Memo, Ch, Research Div to Ch, Dir/R&D, 16 Jun 64, subj: Request for Assistance of Dr. Siu *et al.* See also, Research Overview, 24 Jan 64, for period 1 Aug 62 to 31 Dec 63 and Research in the AMC, 31 Mar 64, by Research Div, AMC.

[45] Rpt of the Ad Hoc Committee on In-House Labs, ASA, DA, Dec 1963 (Skifter Rpt).

[46] Rpt of the Ad Hoc Group on Scientific Personnel, ASAP, DA, Apr 1964, (Vance Rpt).

[47] "TARC Releases Massive Proposed Research Document," *Army R&D Magazine*, Sep 1964, p. 1.

[48] Ltr, Gen F. S. Besson, Jr. to Hon Willis M. Hawkins, ASA for R&D, 31 Jul 64, n.s.

[49] Ltr, Dir/R&D to CG, ECOM *et al.*, 11 Sep 64, subj: AMC Research Ad Hoc Working Group.

[50] Memo, Harold Brown to ASA (R&D), 4 Jun 65, subj: Mgmt of Army Labs Within AMC.

[51] Memo, CG, AMC to CofSA, 20 Apr 65, subj: A Concept for Laboratory Mgmt, and incl, "Concept of Laboratory Mgmt."

[52] AMCRL Historical Summary, FY 1967, p. 1. See also, AMC Historical Summary, FY 1966, pp. 541ff.

on 17 January 1966, coming from Northrup Space Laboratories in Los Angeles, California. He was assisted by a small professional staff—the table of distribution called for 29 personnel. Brig. Gen. Tobias R. Philbin, Jr. was the Deputy Director; Col. John T. French was the Executive Officer; and Col. Harvey Sheppard was Chief of the Physical Sciences Division.[53] The Deputy for Research and Laboratories relied, to a great extent, on the Director of Development and various AMC staff elements for detailed support, including administrative, fiscal, and technical support, as required.[54]

One of the major efforts of the deputy was the formulation and implementation of a 10-year facilities plan that would effectively support Army research and development requirements and provide properly oriented and stabilized centers suitable for expansion with advances in technology. Basically, this concept involved the existing commodity organization, consolidation of like functons, and the collocation of related activities. However, only the AMC in-house facilities with RDTE missions were considered in the 10-year plan.

In close cooperation with the Director of Personnel and Training, the Deputy for Research and Laboratories made essential contributions to the structure of the table of distribution of the various laboratories in the AMC complex. Among these important actions was the study of the future of Army aviation, including plans for the establishment of an air mobility center. Another committee studied the concept of a weapons center. Based on site recommendations that reflected the AMC position, action was initated for the moving of the Harry Diamond Laboratories from the Bureau of Standards' location on Van Ness Street in Washington, D.C., to an acreage available at Naval Ordnance Laboratory, White Oak, Maryland.[55]

As a result of the establishment of the position of Deputy for Research and Laboratories, the Research Division of the Research and Development Directorate was abolished in November 1966 and the directorate was redesignated as the Development Directorate. In July 1968 the responsibility for product engineering in AMC Headquarters was assigned to the Development Directorate and the new organization was designated as the Research, Development and Engineering Directorate. At approximately the same time, the Deputy for Research and Laboratories was redesignated as the Deputy for Laboratories. The new engineering functions included advance production engineering, engineering support of PEMA (procurement of equipment and materiel, Army) procurement and production, production engineering for stock fund items, military evaluation of commercial equipment, product improvement, and post production engineering.

Dr. Thomas resigned his position as Deputy for Research and Laboratories in mid-September 1968. At that time, Maj. Gen. Richard H. Free, Director of Research, Development and Engineering, was assigned the functions of the Deputy for Laboratories as an additional duty while the command sought to recruit another deputy.[56]

AMC's Laboratories

Each of the AMC commodity commands controlled the laboratories essential for the success of its research, development, and engineering activities as enumerated earlier. For example, the Mobility Equipment Command controlled the Engineer Research and Development Laboratories (later designated as the Mobility Equipment R&D Center) located at Fort Belvoir, Virginia. The Weapons Command, which had the weapons functions, controlled the Rock Island Arsenal, Watervliet Arsenal, and Springfield Armory (inactivated 30 April 1968), and the Electronics Command supervised the activities of the Electronic Research and Development Laboratories at Fort Monmouth, New Jersey.

In addition to the laboratories associated with the commodity commands, a number of noncommodity-oriented laboratory facilities,

[53] (1) AMC News Summary, 7 Jan 66. (2) Ltr, CG, AMC to Directors, HQ, AMC *et al.*, 23 Jun 66, subj: Director of Labs, AMC.

[54] Memo, CG, AMC for Dir/Research & Labs and Dir/Development, 20 Sep 66, subj: Interfaces Between the Dep for Research and Labs and the Dir/Development, HQ, AMC.

[55] AMCRL Historical Summary, FY 1967.

[56] (1) DF, Exec Ofcr, Dir/RD&E to Dir/Mgmt Sys & Data Automation, 12 Dec 68, subj: Mission & Functions Statement for the Dep for Labs. (2) AMCR 10-2, 29 Nov 68, subj: Organization, Mission, and Functions of HQ, AMC.

previously listed, reported directly to AMC Headquarters. Because of the volume of in-house work performed in their research efforts, they received staff supervision from the Deputy for Laboratories. In general, these laboratories performed basic and applied research in areas that covered Army-wide requirements. A major portion of the Army's in-house capability was centered in these laboratories, which performed various types of work.

The Ballistic Research Laboratories (BRL) at Aberdeen, Maryland, performed basic and technical research in ballistics and the related fields of physics, chemistry, mathematics, and engineering. Also at Aberdeen, the Human Engineering Laboratory conducted basic and applied research in human factors engineering and assisted AMC design agencies in the application of human factors engineering principles to end item designs. BRL placed its emphasis on various areas of research, such as the effects of hypersonic flight, and the study of intense light beams and counter-insurgency or guerilla weapons. It used its hypersonic wind tunnel in the study of hypersonic phenomena. Together with other military organizations, BRL had embarked on an extensive laser research program.[57]

Natick Laboratories was responsible for research in the physical, biological, and earth sciences, and engineering to meet military requirements in textiles, clothing, body armor, footwear, organic materials, insecticides and fungicides, subsistence, containers, food service equipment, field support equipment, tentage, and air delivery equipage. Natick provided technical and engineering support to the major subordinate commands and associated laboratories as directed by AMC Headquarters. In addition, Natick performed a major engineering effort in support of items purchased for the individual soldier by the Defense Supply Agency. These laboratories accumulated basic knowledge in the physical sciences, the life sciences, and the earth sciences. They pursued research on the ability of the soldier to operate under various environmental conditions.

Army combat operations in Southeast Asia generated a number of requirements for materiel support in that environment. Among the most important Natick contributions were the following: a timely break-through involving the use of a composite ceramic-fiberglass material as protection against small arms fire; a direct molded sole fabrication method for boots, in which the upper portion was vulcanized to the sole, for use in the SEA jungle environment; a new ballistic and crash resistant flight helmet of laminated nylon, with shatter-resistant eye shield. A long-range combat patrol packet consisting of such items as coffee, fruitcake, sugar, toilet paper and matches, and a precooked, freeze-dehydrated main food dish, such as beef stew, spaghetti and meat, packed in a plastic bag into which water was poured to reconstitute the food; a trooper's ladder kit for carrying sections of an aluminum ladder for retrieving troops from a hovering CH–47 helicopter; an individual lightweight survival kit for downed aviators containing survival essentials such as medical items and signal equipment; a climatic Atlas of Southeast Asia; and a tunnel exploration kit consisting of a weapon, a communications system, a lighting system, and various items of personal equipment. Natick Laboratories worked on a special group of 21 items of individual clothing and equipment, such as body armor, helmets, footwear, and cold weather gear, for the purpose of significantly reducing the weight of standard items.[58]

The Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, performed research and experimental engineering in snow, ice, and frozen ground. The U.S. Army Materials Research Center at Watertown, Massachusetts, developed and adapted new materials for Army use, and evaluated and disseminated scientific information regarding metallurgy, plastics, and other materials. The Agency maintained overall cognizance of the materials research program throughout AMC. Harry Diamond Laboratories in Washington, D.C., was a central systems laboratory for physical science phenomena primarily related to the research and development of fuzes and component parts thereof.

[57] (1) AMC Historical Summary, FY 1963, pp. 275–277. (2) AMCR 10–29, 12 Feb 63, subj: Mission and Major Functions of U.S. Army Ballistic Research Labs.

[58] (1) AMCR 10–37, 2 Jul 63, subj: Mission and Functions of Natick Labs. (2) Natick Labs Historical Summary, FY 1963.

The Coating and Chemical Laboratory at Aberdeen conducted basic research on automotive chemicals, organic coatings, and cleaners. One of the newer laboratories, the Nuclear Defense Laboratory located at Edgewood, Maryland, provided technical information in the field of radiological defense and nuclear effects.[59]

Progress

Technological break-throughs were not programed nor were road maps printed for basic research. However, national policies and objectives formed a basis for plans prepared by the Department of Defense and Department of the Army. These plans, which described future needs, provided AMC with the guidance necessary to focus resources on barrier problems. From the continuous process of planning, reviewing, and evaluating, a purposeful general orientation of Army research and exploratory development effort emerged, and prompt utilization of pertinent new information was fostered.[60]

The AMC research organization had a series of noteworthy successes. Its broadly based program achieved extensive advances in a variety of scientific disciplines and made important contributions in support of operations in Southeast Asia. Among the special problems in Vietnam was that of "seeing," and a number of electronics research projects (night vision, mortar location, intrusion detection, airborne surveillance) were undertaken to better enable U.S. troops to locate the enemy in the jungles of Southeast Asia.[61] By March 1966, research and engineering in the field of surveillance electronics had reached a stage that warranted handling as a separate entity. Consequently, research and development projects in the combat surveillance-target acquisition area were transferred from the Research and Development Directorate to the Combat Surveillance Office. However, in the reorganization of 1968, the research and development in this area was transferred back to the Directorate of Research, Development and Engineering and placed under the Surveillance and Target Acquisition Office. Other aspects of the program remained with the Combat Surveillance Office. In the areas of physics and electronics, the research concerned such projects as ballistics, aeronautics, and lasers. There were projects in such areas as aircraft armament and flash blindness. Among the numerous other important electronic projects were the extensive studies on high velocities, criteria for designing guidance and homing devices, and studies for development of a digital computer for determining the vulnerability of armored vehicles. The overall program in this area encompassed long-range fundamental studies in nearly all aspects of nearly all types of Army weapons, involving research in such areas as hypervelocity impact, penetration mechanics, and guerilla warfare. This program was extended to such fields as the improved accuracy of rockets, guidance and control, and simulation and computer techniques in wound ballistics.[62]

The Harry Diamond Laboratories, originally established to work on proximity fuzes, developed an outstanding capability in the areas of micro-miniaturization and ultra high frequencies. They held a position of national leadership in the use of pneumatics and hydromatics for control and response purposes. In a continuing heart-pump program, the laboratories fabricated a heart valve of plastic material by using new techniqeus. This device could be used with the heart pump to supply blood when necessary during surgery. The laboratories also operated a radiation facility for use in the nuclear vulnerability program.[63] Their research into pure fluid systems culminated in the successful application in a programed flight of a missile employing a pure fluid yaw control device.[64]

Environmental research was concerned with the fields of earth and atmospheric sciences,

[59] (1) Submission, Natick Labs, Dec 1968. (2) Speech, Brig Gen Wheeler G. Merriam, Dir/R&D, AMC, at AG School, Ft. Benjamin Harrison, Indiana, 20 May 64. (3) Speech, Maj Gen F. H. Britton, Dir/R&D, Wash., D.C., 3 Jan 63.

[60] Speech, Brig Gen W. C. Gribble, Jr., Dir/R&D, AMC, before Army Scientific Advisory Council, Wash., D.C., 16 Oct 64.

[61] (1) Interv, Raymond J. Snodgrass with Lt Gen William B. Bunker, DCG, AMC, 26 Sep 66. (2) AMC News Release, 14 Nov 67, subj: AMC's Annual Lab Conf Focuses on Vietnam.

[62] (1) BRL Annual Rpt, 1962, pp. 5–7. (2) AMC Historical Summary, FY 1963, pp. 296–300.

[63] Harry Diamond Labs Annual Summary, FY 1963.

[64] AMCRD Historical Summary, FY 1965, pp. 27–28.

including the program of the Cold Regions and Engineering Laboratory and portions of the work at Natick Laboratories, the Corp of Engineers' Waterways Experiment Station, and the Electronics Command's Institute of Exploratory Research. Among the important environmental activities of the AMC was the Mobility Environmental Research Study (MERS) funded by the Advanced Research Project Agency. Under this study, the AMC undertook research in surface mobility in selected geographical areas, which concerned such factors as vehicle characteristics for off-road mobility. MERS was especially concerned with surface mobility research in selected areas of Southeast Asia in order to develop design data for off-road vehicles in support of military operations in SEA.[65]

Among the other environmental projects was the development of criteria for landing aircraft on floating ice sheets, studies on the relationship of food production and consumption in various parts of the world, and the development of the Army Integrated Meteorological System. A new theory of frost heaving was formulated, providing a basis for developing accurate design criteria to solve engineering problems inherent in the support of military operations in cold regions.[66]

Military operations in Vietnam demanded emphasis on research and development directed toward improving airfields and helicopter facilities. During 1966 the Army conducted an integrated engineering test of prefabricated neoprene-coated nylon fabric membrane material. In tests at Fort Campbell, Kentucky, this material, known as T–17 membrane, demonstrated the capability of supporting Air Force C–130 aircraft as well as Army fixed-wing and helicopter aircraft. In other tests, a heavy-duty aluminum honeycore landing mat was found satisfactory for use in airfield construction in Vietnam. In still further tests, the M8–A1 steel landing mat was found to be superior to the pierced steel plank mats formerly used. While the M8–A1 mat was not the structural equivalent of heavy-duty aluminum mats, it provided an adequate all-weather surface at one-fourth the cost of aluminum matting.[67]

During 1966 the Army initiated an accelerated program for developing improved dust palliatives and methods for application in Vietnam. Numerous items were laboratory tested and six were full-scale field tested. In addition, the Army awarded contracts to six private companies for research in improved methods of dust control. Meanwhile, the use of peneprime, a high penetrating asphalt, provided an interim solution, while an Army technical assistance team inspected conditions causing dust control problems in Vietnam.[68]

In the field of materials during 1965, the Army Materials Research Agency conducted a study of types of armor materials. Personnel of Natick Laboratories suggested very lightweight materials for personnel armor for the infantry. As a result of the study, modules of titanium and high hardness steel were procured and shipped to Vietnam. Such armor provided protection from .30 caliber AP ammunition. In addition, a tripartite group investigated cast metals for armor.

The program to provide protection to aircraft and aircrew, initiated in early 1963, resulted in a transparent armor, no heavier than steel armor, which afforded protection from ball ammunition. Ceramics composites were developed which gave 2½ times more ballistic protection than steel armor of the same weight.[69]

Among the other materials research projects of major interest were those concerning metallic ammunition and glass fiber. The work involved a broad screening program on materials and a series of tests to determine their application by the Army. As a part of this effort, AMRA established the Structural Ceramics Laboratory.[70]

In search of power sources, the Army demonstrated that anhydrous ammonia operated successfully in spark ignition engines. The

[65] (1) DF, Maj Gen William B. Bunker, C/DP, to Dir/R&D, 1 Feb 63, subj: Environmental Facilities Survey. (2) MFR, Ch, Environmental Science Br, AMC, 24 Apr 63, subj: Grouping of Environmental Science Activities. (3) AMC Historical Summary, FY 1966, pp. 549–550.

[66] Ltr, DCG, AMC to CRD, DA, 21 Jun 63, subj: Implementation of Proj 80 Recommendations.

[67] AMC Historical Summary, FY 1966, pp. 546–547.

[68] Interv, Raymond J. Snodgrass with John A. Copeland, Environmental Science Br, Research Div, 5 Oct 66.

[69] Submission, RDTE to AMCHO, 12 Dec 68, p. 29.

[70] Interv, Raymond J. Snodgrass with Raymond B. Koehler, Research Div, AMC, 7 Oct 66.

principal requirements were that it be introduced into the engine in the vapor phase and that 5 percent hydrogen be assured. Experiments indicated that output was 72 percent of that of a hydrocarbon type fuel. The specific fuel consumption was 250 percent when using ammonia as a replacement for hydrocarbon fuel.

In March 1966, the AMC reassigned the Army Fuels and Lubricants Research Laboratory, San Antonio, Texas, from the St. Louis Procurement District to the Army Coating and Chemical Laboratory. The laboratory managed and directed that portion of the AMC program for fuels, lubricants, and related materials, under the overall management of the AMC Research Division.[71]

In the field of explosives and propellants, the AMC restructured its program for research at the beginning of Fiscal Year 1967. The objective was to isolate the fundamental aspects in the research category in order to provide better management by scientific discipline. This conformed to the DOD established structuring for RDTE programs into specific categories. This program involved pyrotechnics, new explosives and gun propellant research. During Fiscal Year 1966, the AMC established the Army Rocket Propulsion Management and Technology Center at the Army Missile Command. The center acted as the central monitor for Army rocket and missile propulsion, and established a central Army data file on propulsion systems and proponents.[72]

Beginning in 1964, the command made considerable progress in aeronautical research, when a new research project on aircraft aerodynamics and a new exploratory development program was established. Research toward the development of a rigid rotor helicopter system, which was considered a marked improvement over the existing articulated type helicopters, was an important segment of the aeronautical research program. In February 1965, an in-house aeronautical research facility became available to the Army. As the result of an agreement with NASA, a wind tunnel at Ames Research Center was provided for support of low-speed aeronautical research.[73]

In the field of chemical research, AMC investigated potential toxic chemical agents and found new processes for production of agents and assembling munitions for antipersonnel and antimateriel use. New and improved flame, smoke, and incendiary weapons were developed, and efficient systems were devised for dissemination of chemical agents. The Army Chemical Research and Development Laboratories were concerned with detection and identification of chemical agents and with defense against the hazardous effects of these agents. Automatic alarm and detection devices were developed for the Army, Navy, Air Force, and civil defense organizations. The laboratories developed physical protection methods, including decontamination and respiratory devices, protective clothing, and mobile laboratories for rapid detection of chemical agents.[74]

Long-Range and Technical Forecasting

Management structures, fiscal controls, and organizational procedures gave the impression that research and development were stereotyped, isolated operations. Actually, the program was highly integrated and could not be conducted in a vacuum. The objective of those responsible for managing the program was to insure a forward motion and maintain an interface between research and development and the rest of the military establishment.

National policies and objectives form the basis for estimates and plans prepared by the Department of Defense and Department of the Army. AMC participated in the formulation of these plans by publishing technological forecasts and by contributing to intelligence estimates. The plans themselves, by describing future needs, provided AMC with the guidance necessary to focus resources on the problems. Thus, there was a close relationship between

[71] (1) AMCRD Historical Summary, FY 1966, pp. 20–21. (2) AMC GO 10, 11 Mar 66, subj: U.S. Army Fuels and Lubricant Lab, San Antonio, Texas.

[72] AMCRD Historical Summary, FY 1966, pp. 22–24.

[73] Submission, RDTE to AMCHO, 12 Dec 68, p. 29.

[74] Natl Science Foundation Bulletin No. 31, Jan 1966, subj: Scientific Information Activities of Federal Agencies, U.S. Army, pt. II, AMC.

research and development and the evolution of military requirements.

The technical forecast was an exceptionally critical ingredient in the formulation of research and development policy. In a sense the forecast was a feedback loop in the integrated cycle. To properly prepare the forecast, a comprehensive analysis had to be made of current technological problems. A review of history provided a measure of confidence that certain problems could be overcome. However, this problem had to be projected by inference to a future time frame. Help came from educated "guesses" of what might be possible in the future by considering progress in the past and the status of existing programs. Erroneous forecasts could adversely affect both current programs and future plans. Proper technical forecasts for planners were considered as essential as scientific theory and technical data were to the users. All three were outputs of the research and development program.[75]

To insure continuous consideration of Army planning documents, the AMC established a technical planning function in its Research and Development Directorate. The Army's long-range plan was based on a twenty-year projection of its needs for the short-, mid-, and long-range periods. The first plan was the Basic Army Strategic Estimate (BASE); the second was the Army Strategic Plan (ASP); and the third, the Army Force Development Plan. BASE projected a worldwide strategic appraisal and a strategic concept to meet a threat under cold, limited, and general war. A twenty-year forecast of technological advances was included as an annex. The ASP stated Army requirements and provided overall objectives and a broad force structure. The Army Force Development Plan provided the planning basis for the Five-Year Force Structure and Financial Program. This plan was restrained by anticipated resources limitations.

In response to Army plans, the AMC formalized a program involving technological forecasts, long-range technological objectives, and task networks into a long-range planning effort. The adequacy of the Army's Long-Range Technological Forecast depended upon the ability of Army, and particularly AMC scientific personnel, to keep in touch with world science—to interpret knowledge of the accomplishments, interests, methods, and vigor of scientific groups into estimates of the rate and direction in which technology was moving.

The AMC long-range technical objectives involved the translating of the Army's plans into an orderly research and exploratory development effort. Such tasks were organized into time-related sequential plans leading to initiation of materiel development projects to satisfy Army requirements and those in the Combat Development Objectives Guide.[76]

For several years before the activation of AMC, the technical services had published technical forecasts. In June 1963, OCRD published the first consolidated Army forecast, compiled jointly by the Army Research Office (ARO) and AMC. In 1964, AMC formulated and published a new volume for the Army Long-Range Technical Forecast which included material prepared by ARO. This forecast became an 1100-page, three-volume document which served as an important element of the Army's Life Cycle Management Model. It became widely used by the Combat Developments Command in its Army Concept Studies, by the Advanced Materiel Concepts Agency, and in support of CDC's Institute of Land Combat.[77]

Test and Evaluation

Mission

Research and development was intertwined with test and evaluation, not only financially but also in operations. AMC recognized this close relationship by utilizing a separate independent command for testing and evaluation. The AMC operated on the basic principle that design testing, at an early stage of development, might be performed either by the Test and Evaluation Command or by the developer,

[75] Speech, Brig Gen W. C. Gribble, Jr., Dir/R&D, before Army Scientific Advisory Panel, 16 Oct 64.

[76] Speech, Brig Gen Wheeler G. Merriam, Dir/R&D, at AG School Ft Benjamin Harrison, Indiana, 20 May 64.

[77] Submission, RDTE to AMCHO, 12 Dec 68, pp. 9–14. Also see last page of this chapter.

but that the final engineer and service tests had to be performed by an agency independent of the developer. TECOM was a busy organization, with evaluation boards, test stations, proving grounds, and ranges in 13 states as well as the Canal Zone. In one quarter of Fiscal Year 1964 TECOM completed 1,454 tests. As the cost of weapons rose and technical complexity increased, the demand increased for sophisticated test results and more rigorous evaluations. This required more modern test facilities and improved evaluation technology. It was well known by the Army that a piece of equipment which could not perform well in the environment of the battlefield was a liability rather than an asset.

The Army Test and Evaluation Command, with headquarters at Aberdeen Proving Ground, supervised the test and evaluation activities of AMC. In coordination with CDC and CONARC the command planned and conducted independent evaluations through engineering and service tests of materiel developed for the Army or for other agencies. TECOM also conducted and participated in troop tests under field conditions to determine the suitability of weapons, equipment, clothing, and other materiel for Army-wide use. In addition, TECOM conducted engineer design tests for developers and performed other tests in support of maintenance and procurement and production activities.[78]

In 1963, TECOM initiated a program to consolidate and reduce assigned boards, activities, and installations. Thereby, the command reduced excessive duplication of testing and made the organization more responsive to test requirements of new and sophisticated materiel. Of paramount importance were the skills and talents required to control the overall test program and to maintain quality performance in methodology, test instrumentation, and test scheduling. A lack of skilled personnel in the early days of TECOM's operation hindered the test program. One of the command's greatest accomplishments was the merging of diverse skilled personnel into a dynamic technical community to meet the testing challenge.[79]

Methodology and Instrumentation

Testing methodology embraced the elements of a number of related fields, including operations research, design of experiments, statistics, and the environmental sciences. Also involved was the review function which seeks to assure that test procedures are both pertinent and technically sound. This process identified weak areas, devised improved methods, and led to better techniques of testing. The CDC prepared the qualitative materiel requirement (QMR) which had to be translated into meaningful test criteria so that the performance under test conditions could be evaluated against the technical characteristics of the QMR.

Test plans with valid data requirements provided a basis for recommendations concerning the suitability of Army materiel. A second element concerned the question of how to insure that the test data would produce the answers required to make a valid assessment of suitability. However, there was nothing in the system which forced the test planner to consider what he was going to do with the test data, but a test plan had to set forth detailed data analysis plans.

Predicting future data requirements for long-range plans was a critical test methodology problem. Over or under estimating future data requirements could result in serious problems. Creation of test procedures was a central feature of the applied research program.[80]

When TECOM was formed, it took over the instrumentation from existing test agencies. However, requirements for testing increasingly complex and high performance Army materiel exceeded the capabilities of existing instrumentation. At the same time, developers were shortening the time period in which test data were required. To meet these requirements, TECOM established the Five-Year Instrumentation Master Plan Program (IMP). As planned, responsibility for the instrumentation planning function was centralized within the headquarters.

The object of the IMP was to summarize existing field instrumentation capabilities and

[78] (1) Natl Science Foundation Bulletin No. 31, Jan 1966, subj: Scientific Information Activities of Federal Agencies. (2) Submission, TECOM to AMCHO, 23 Dec 68, pp. 1–3.

[79] *Ibid.*, p. 3.

[80] *Ibid.*, pp. 4–7.

to describe unique future projects and instrumentation systems. Future test requirements were evaluated in terms of test support needs. Austere funding of the research and development program for instrumentation constrained the test program and occasionally necessitated the use of antiquated facilities acquired years before. A perennial problem was the long lead-time required to develop, procure, and equip test facilities.

A major portion of TECOM's instrumentation needs could be filled with off-the-shelf items. Industry had little motivation to produce certain other items with a limited market. Usually this type was required at White Sands Missile Range, New Mexico, and Deseret Test Center, Ft. Douglas, Utah. To obtain such items, data requirements and parameters were determined in-house, with design and fabrication usually being done through an industrial contract. TECOM placed emphasis on automation, decreasing time required for data reduction, and accuracy and objectivity of reported data.

Service testing was traditionally done on an operational basis, using little or no instrumentation. But the nature of materiel being tested became more complex and costly. The data provided by instrumentation enhanced the service tests. This led to more meaningful test reports and facilitated the decisionmaking process in regard to item suitability.[81]

Mission Reconsidered

The Study of Army Test and Evaluation (SATE) by the Office, Vice Chief of Staff, DA, began in 1965 and was completed in May 1966. As a result, equipment engineer/service tests, evaluation, military worth, and utility became separate functions; as producer-developer, AMC was responsible for insuring that equipment performance standards prescribed in the requirement document were met during test and evaluation; and CDC was made responsible for periodic evaluation of the overall worth and utility of Army equipment.

As a result of the SATE study, the Army Chief of Staff made the following decisions: TECOM was to remain within AMC and continue studies on improved test methodology, monitored by CDC; engineering and service tests were to remain separate; reliability and maintainability programs were to be strengthened; CDC and CONARC were to increasingly participate in test planning; coordinated test programs were to be expanded to include initial product validation of the first production run, and additional experience was to be obtained with total package procurement.

The drive for improvement in testing to implement the Chief of Staff's decisions on SATE continued during the 1967–1968 period, aided by the publication of an Army regulation.[82] In Fiscal Year 1968, TECOM test methodology was funded at $840,000 and instrumentation at $400,000. To effect better management, these funds were reoriented for Fiscal Year 1969 in order to pull all funds together under TECOM-wide objectives.[83]

Development

In identifying broad policy guidelines, in 1964 the Secretary of Defense projected means for increasing combat readiness by: (1) better management of resources; and (2) improving the balance among the various capabilities for combat. Defense management was witnessing a major revolution because rising defense costs and competition for resources was dictating increased emphasis on management. Furthermore, better management tools meant that management would become more centralized which in turn would demand more data, more analysis, and more justification.[84]

The Army's readjustment to the triple-purpose concept of ground combat (nuclear warfare, conventional warfare, and stability operations) required a proper balance in regard to both equipment and skills. According

[81] *Ibid.*, pp. 8–12.

[82] AR 70–10, 22 Dec 67, subj; R&D—Army Materiel Testing.

[83] (1) Submission, AMCRD to AMCHO, 12 Dec 68, p. 7. (2) AMCRD Historical Summary, FY 1968, pp. 88–89.

[84] *Challenge: Compendium of Army Accomplishment*—A Rpt by the CofS, Jul 1964-Apr 1968, 1 Jul 68, p. viii.

to the Secretary, firepower had distinctly outdistanced the other functions of land combat. A number of actions were indicated for restoring the balance, such as developing a responsive target acquisition system; providing a weapons helicopter which was not in conflict with discriminating close air support; and improving forward area communications systems. To forestall overreaction, the Secretary believed it important that the range of options be increased with respect to response, such as the maintenance of a mobile strategic reserve capable of rapid deployment. Deployment of large forces to Vietnam after July 1965 had tremendous impact on AMC, challenging its capability to support an Army employing new tactical doctrine and concepts.[85]

Combat Support

An accleration of AMC research and development came as a natural consequence of the war in Southeast Asia. This resulted in priority actions by the command to meet special and urgent equipment requirements created by environmental and operational conditions faced by U.S. troops in SEA. High priorities led to numerous cases of reprograming funds to support these requirements, which meant that other programs had to be adjusted accordingly. In most instances the AMC initiated action to obtain emergency funds to meet Vietnam requirements, so that other essential developments would not be unduly jeopardized, but these requests were seldom honored.[86]

After the Army buildup in SEA began in April 1965, AMC agencies developed numerous items specifically to meet the combat soldier's needs in that area. For example, new equipment included a spike-resistant combat boot for protection against a variety of penetrating devices, such as poisonous spikes, nails, and thorns; a 30-foot bridge for use with the M113 armored personnel carrier; an airborne acoustical ground fire detector; bulletproof armor for protection of aircraft and crewmen; night vision devices employing image intensification technology; and a lightweight radio set with receiver mounted on an Army helmet.[87]

New devices tested in Vietnam included low-light level television for helicopters, aerial spraying devices, lightweight flamethrowers, and new types of mine detectors. Another important research and development area for Vietnam was individual clothing and equipment designed to enhance combat effectiveness of troops in a tropical environment. Items sent to Vietnam for evaluation or use included rainsuits, tropical hats with detachable headnets, ponchos and ground cloths, collapsible canteens, jungle rucksacks and hammocks, grenade carrier vests, bulletproof body armor, and flame resistant flying helmets.

In January 1966, the Department of the Army established procedures for Expediting Nonstandard Urgent Requirements for Equipment (ENSURE) and assigned responsibility for expediting materiel requirements for nonstandard and developmental equipment for support of Army forces in combat operations. These requirements had to be validated by ACSFOR before AMC could proceed. ENSURE was designed especially to support the Army in Southeast Asia. This program was geared to the war in Vietnam. Its purpose was to expedite development and procurement of items for which field commanders had stated urgent requirements. This included equipment and items under development but not yet standardized which would provide a new or significantly improved capability for an Army unit engaged in combat.[88]

Research and development support for SEA involved a wide variety of items in such areas as mobility, firepower, riot control, survival, communications, special boots, water purification, combat surveillance, and protection of personnel. In meeting these urgent requirements, the AMC demonstrated a flexibility in its research and development capability. Specifically, in Fiscal Year 1967, the command expedited developmental work on 140 individual hardware-oriented items.[89]

AMC expedited action to provide a 420-gallon-per-hour lightweight water purification unit which weighed about 1,000 pounds and could be sling-loaded under a helicopter. This

[85] *Ibid.*, pp. ix-x.

[86] AMC Historical Summary, FY 1966, p. 584.

[87] AMC News Release, 26 Nov 68.

[88] Ltr, AGAM-P(M) (30 Dec 65) ACSFOR, 3 Jan 66, subj: Procedures for ENSURE.

[89] (1) H. R. 9240, 90th Cong, 1st sess, 2 Mar 67, pp. 944-945, 960. (2) H. R. 13456, 8 Mar 66, pp. 7510-7512.

unit was designed for water filtration and purification for small Army units. During Fiscal Year 1967, the command completed development on a light flexible food packet for use by small groups operating under conditions which precluded delivery of standard rations. The packet weighed 11 ounces and contained precooked dehydrated meat, candy, cereal, fruitcake, coffee, cream and sugar, as well as matches and toilet paper. The meat could be rehydrated in water or eaten dry.[90]

Firepower

Included in this category were artillery and infantry weapons, and such items as guided missiles, rockets, tank and antitank weapons, mines, grenades, demolition devices, atomic munitions, and various categories of ammunition. Involved were numerous items, such as howitzer projectiles, recoilless rifle cartridges, mortar ammunition, binoculars, rangefinders, self-propelled howitzers, gun tubes, fuzes, target simulators, target missiles, air defense equipment, a land combat support system, and miscellaneous explosives and propellants.[91]

Aircraft weapons included the complete spectrum of the more conventional weapons in use for several years, as well as sophisticated fire control systems and guided missiles. Major programs in this area included airborne combat surveillance/target acquisition systems, airburst fuzes for the 2.75-inch rocket and M75 grenade launcher, 30mm automatic guns for UH–1 Iroquois and AH–56A Cheyenne helicopters, and a weapons system for the AH–1G helicopter.[92] Efficient, accurate, airborne firepower required early detection, positive acquisition, and precise tracking of the target. Improved armament subsystems for aircraft included machineguns, and rocket and grenade launchers. Introduced during 1966 was a subsystem for dispensing mines from aircraft. Under development for the Hueycobra aircraft was an armament subsystem consisting of 40mm grenade launchers and 7.62mm machineguns mounted in a flexible nose turret.[93]

The Nike-X missile was the Army's largest research and development project over a period of years. In Fiscal Year 1967, the DOD budgeted $447 million for Nike-X. About 3,000 firms produced goods and services for the project. One of its radars approached the height of a 10-story building. Essentially, the Nike-X system consisted of five subsystems—three advanced phased array radars and two solid propellant, quick reacting interceptor missiles.[94]

A significant development in air defense was the decision in the fall of 1967 to deploy a ballistic missile defense system as a result of ballistic missile development by Communist China. This defense system was to use Nike-X components. Called the Sentinel System, it was placed under the Sentinel Systems Manager and the Sentinel Systems Office was established under the Army Chief of Staff. This removed the Nike-X program and support of Kwajalein Test Site from AMC control. Sentinel was to consist of five components—two radars, a data processing system, and two missiles, the Spartan and the Sprint. A subordinate command of the AMC, the U.S. Army Sentinel Logistics Command, located at Huntsville, Alabama, provided logistical support for the Sentinel project.

By 1968, SAM-D, a surface-to-air missile had reached the advanced development stage. The surface-to-air Chaparral missile, adapted from the Navy Sidewinder, was being tested while under production. By July 1968, the 20mm gun, companion of the Chaparral, was undergoing engineering and service tests. A family of weapons consisting of a man-portable missile system, a gun-type weapon system, and a vehicle-carried short-range missile system was under consideration. The tracks of the Pershing ground support surface-to-surface missile had been replaced by wheels to improve road mobility and quick reaction capability. Development of TOW (tube-launched, optically-tracked, wire-guided missile) and Dragon, companion medium antitank weapons, continued, with flight tests of the Dragon and initiation of action for limited production of TOW.

Binoculars and rangefinders continued to receive considerable attention. Another signifi-

[90] (1) AMCRD Historical Summary, FY 1967, pp. 8, 12. (2) *Army Green Book*, Oct 1967, pp. 58–59.

[91] AMC Historical Summary, FY 1964, pp. 409–410.

[92] Submission, AMCRD to AMCHO, 12 Dec 68, p. 34.

[93] AMC Historical Summary, FY 1966, pp. 421–422.

[94] AMC Historical Summary, FY 1967, ch IV, draft.

cant program was that for extension of the life of gun tubes. The service life of 175mm, M107 gun tubes using standard charges was 400 rounds. Bore-wear additives extended tube life three to fourfold. The AMC was involved in numerous projects concerning such items as howitzer projectiles, recoilless rifle cartridges, land mines and fuzes, nuclear projectiles, target simulators, air defense battery terminal equipment, and a land combat support system.[95]

Mobility

In general, air mobility items included Army airplanes and helicopters, which were used mainly for transporting personnel and equipment, including materiel that was to be airdropped, and armed aircraft for tactical support in the field. The aircraft family consisted of rotary- and fixed-wing aircraft divided into types according to their intended use. There were four types of helicopters: observation, utility/tactical, transport, and aerial crane. The AMC had only three observation helicopters under development during its first year of operation; namely, the OH–4A by Bell Helicopter Corporation, the OH–5A by Hiller Aircraft Company, and the OH–6A by Hughes Tool Company.[96] By 1966, the OH–6A Light Observation Helicopter with a gas turbine engine was in production.

In the utility/tactical category, the "Delta" model of the UH–1 Iroquois helicopter was standardized in September 1962. This 13-place helicopter was used for general utility purposes and tactical support. In March 1966, Congress approved a program for development, qualification, and production of the new AH–1G Hueycobra, which was specifically designed as an attack helicopter. Featuring a streamlined fuselage, the Hueycobra had greater speed, maneuverability, and firepower than the then current UH–1 Iroquois.[97]

The CH–47A Chinook, a medium transport helicopter was capable of carrying loads up to 6½ tons. This high-performance, all-weather, day-night, tandem rotor helicopter had a normal cruising speed of 130 knots and a range of 200 nautical miles. The Chinook, a mainstay in heavy-transport application in the Vietnam War, proved exceptionally valuable under combat conditions.[98]

Recognizing the requirement for an aerial fire support system, the Army for a number of years experimented with armed transport and utility aircraft. Rockets, missiles, and machineguns had been mounted on various helicopters since about 1954.[99] The Fire Support Aerial System (FAS) Project Manager's Office was established on 21 June 1963.[100] In April 1964, FAS was renamed Advanced Aerial Fire Support System (AAFSS), and was later called Cheyenne.[101] The ultimate objective was to develop a stable aerial weapons platform to provide supressive fire for combat forces. AAFSS was one of the most significant projects in the materiel development area.[102] The AH–56A Cheyenne helicopter made its public flight debut on 12 December 1967 and underwent flight tests in 1968.[103]

To improve the Army's surface mobility, the AMC concentrated on wheeled and tracked vehicles, including such categories as combat vehicles, cargo, personnel and weapon carriers, and fuel-handling machinery. In the wheeled vehicle category, during 1964, the Army developed and delivered for service testing the 1¼-ton XM561 (Gama Goat), the 2½-ton XM410E1, and the 5-ton XM656 for engineering and service testing before procurement. In the same year, the newly designed mobile assault bridge/ferry was placed in limited production after the test units performed extremely well. In January 1964, OCRD directed that the Armored Infantry Fighting Vehicle be expedited as a complement to the Main Battle Tank. This vehicle was in the armored person-

[95] AMC Historical Summary, FY 1966, ch XV, Development of Weapons and Equip.

[96] Interv, Raymond J. Snodgrass with Dr. Colin N. Hudson, Tech Director, Development Div, AMC, 11 Oct 63.

[97] (1) Iroquois Historical Summary, FY 1966, p. 13–15. (2) AMC News Summary, 16 Jan 67.

[98] Chinook Historical Summary, FY 1966, pp. 1–3.

[99] Fire Support Aerial Sys, PM_2P, Jan 1964.

[100] (1) AMC GO 20, 1 Apr 63. (2) AMC GO 39, 29 Jul 63.

[101] AMC GO 23, 3 Apr 64.

[102] AAFSS Historical Summary, FY 1964.

[103] (1) "Limited War Copter Unveiled," The *Washington Post*, December 13, 1967. (2) "AAFSS Rollout," *Army Aviation Digest*, Jul 1967, pp. 64–65.

nel carrier family.[104] In 1966, the Gama Goat was classified Standard A and was scheduled to replace the ¾-ton M37 and some of the ¼-ton M51 trucks in forward area units. Gama Goats had an articulated coupling between the tractor and cargo units, which permitted an unusual degree of mobility. The 8-ton cargo GOER and the XM–559E1 tanker GOER received Standard A classification in May 1966.

In 1967, the AMC took further steps toward providing a successor for the M113 Armored Personel Carrier, with completion of a parametric design-cost effectiveness study for the Mechanized Infantry Combat Vehicle program. In 1968, the search for improved vehicles to replace the M113 and the M114 command and reconnaissance vehicles continued. When completed, the XM723 mechanized infantry combat vehicle would provide the infantry the capability of fighting mounted or dismounted, while the XM800 armored reconnaissance scout vehicle would enable armored cavalry units to locate the enemy at night as well as by day.

On 1 August 1963, Secretary of Defense McNamara, through a special agreement between the United States and the Federal Republic of Germany (FRG), initiated the development program for the Main Battle Tank-1970 (MBT–70). The designation indicated that the tank was intended for production in the 1970s. Although aimed at fulfilling the basic military requirements of the North Atlantic Treaty Organization (NATO), at no time were the requirements of the U.S. Army compromised, according to Maj. Gen. Edwin H. Burba, former U.S. Program Manager of the MBT. Why the United States was interested in jointly developing the tank was perhaps best expressed by Secretary McNamara, who, in a statement to the press on 23 July 1964, said: ". . . joint development efforts of this sort with our NATO allies are important and can be highly beneficial to all concerned. The pooling of ideas and the sharing of costs should make for a better end product at lower expense." [105]

General Motors Corporation was selected to assist the Army in design and development of the new main battle tank. Many problems inherent in the joint project were negotiated satisfactorily. The basic agreement for the MBT called for an $80 million cooperative program to be shared equally by the United States and Germany, leading to a model incorporating the best of U.S. and FRG concepts, for production in both countries. By mid-1968, the first five pilot models of MBT–70 had been completed while development and production engineering continued. The tank was designed to fire missiles and conventional ammunition, and had greater cross-country capability than any predecessor. It was intended to replace the M60 series tanks.[106]

Communications-Electronics

From the time of its establishment, the AMC continued development on a series of radio sets for use in combat areas. Among these sets were lightweight transmitters and receivers for squad and platoon use, with separate receiver and transmitter weighing only 30 ounces. Other members of the family were a 5-mile manpack radio for company-level use, a 20-mile vehicular radio for division use, and an aircraft radio. AMC engineers adapted pulse code modulation multiplexing equipment that provided up to 96 channels of secure communication over radio relay links.

AMC continually pursued development in the area of surveillance and target acquisition. In 1964, an infrared aerial sensor for the Mohawk aircraft was approved for troop use. An important research and development area concerned the use of electronic computers and automatic data processing equipment. One tactical application in this field was the Command Control Information System for 1970 (CCIS–70) project, designed to bring modern computer techniques to the battlefield commander. AMC also had responsibility for developing the ground terminals for the Defense Communications Satellite Program and for supporting DOD-NASA satellite tests and experiments. In satellite communications, the Army operated the synchronous communications ground ter-

[104] (1) AMCRD Historical Summary, FY 1964, pp. 15–17. (2) For information on the 8-ton family of GOER trucks, see TIR 30.3.1.3, Sep 1964, subj: Development of 8-Ton 4x4 Trucks, XM520E1, XM559E1, and XM553, GOERs.

[105] (1) DOD News Release No. 538–64, 23 Jul 64, subj: New Weapons Sys Pressed by U.S. and FRG. (2) Briefing on Main Battle Tank, 13 Oct 64, by MBT Proj Mgr's Ofc.

[106] (1) *Army R&D News Magazine*, 6 Jun 67, pp. 32–34, "MBT-70 Development Approaches Midpoint." (2) AMC Historical Summaries: FY 1967, ch. IV; and FY 1965, pp. 321–325.

minals for the Defense Communications Agency.

Mallard was an interesting and significant international cooperative project which began in 1965. It covered joint research, development, and production efforts on a common, secure, tactical communications system for American, British, Canadian, and Australian (ABCA) armed forces, as might be required. The United States contribution was assigned to the AMC, which established a project management organization patterned after that for the U.S.-FRG development of the main battle tank.[107]

Progress

From research in Greenland to provide a basis for solving engineering problems inherent in supporting military operations in cold regions, to the study of techniques in light intensification for improved night vision, to the development of lightweight armor, the Army showed steady progress in the 1962–1968 period. An increased military effort in SEA from mid-1965 led to priority actions to meet special and urgent equipment requirements created by environmental and operational conditions faced by the troops in the field. Research and development support for SEA involved a wide variety of support in such areas as mobility, firepower, riot control, survival, communications, water purification, combat surveillance, rations, and personnel protection.

Of no less importance was long range planning to assure investigation of new technical areas to advance the state-of-the-art in order to keep ahead of development. The AMC achieved better support of the war effort in Vietnam through development of numerous improved weapons and items of equipment.

At the same time, research and development personnel strived to increase the efficiency of their operations. For example, better integration of industrial independent research and development with the work of the military laboratories stemmed from a plan adopted in August 1966. Established in 1968 was the Army Advanced Materiel Concepts Agency, as a further step toward assuring closer coordination between AMC and the Army Combat Developments Command's Institute of Land Combat and ACSI's Threat Forecast Group in evolving new materiel concepts and systems for the future. These three agencies were to be geographically collocated in 1969. With reference to the importance of research, General Besson declared: "In order to assure effective and timely response to the demands of modern warfare, we must continue our research over a wide range of technical fields." [108]

[107] (1) AMCRD Historical Summary, FYs 1963–1968. (2) CCIS-70 Proj Mgr Historical Summary, FY 1963, pp. 7–10. See also, Automatic Data Field Sys Comd (ADFSC) Historical Summary, FYs 1965–1968. (3) AMC Historical Summary, 1966, pp. 462–463.

[108] Gen F. S. Besson, Jr., "Fighting Soldier No. 1 at Arsenal of the Brave," *Army Green Book*, Nov 1968, pp. 41–45.

SHOPPING FOR DEFENSE

In short, DSA (Defense Supply Agency) operates the grocery market, dry goods emporium, drug store, and filling station, while we (AMC) operate the hardware store and fireworks concession.

GEN F. S. Besson, Jr.
Defense Supply Association
Washington, D.C.
18 October 1963

CHAPTER V

SHOPPING FOR DEFENSE

Project 60

When the Army Materiel Command (AMC) became operational in August 1962, it inherited the policies, programs, installations, and personnel of the former Technical Services. The procurement structure at the time consisted of some 71 offices in 49 cities.[1] For the initial period, desiring not to disrupt the orderly flow of materiel from the production lines, AMC kept all existing procurement regulations and directives of the former Technical Services in effect.[2] It was obvious from the beginning, however, that a restructuring and centralization of the system in line with the aims of the reorganization of the Army was of paramount importance.

As a first step, the separate Technical Services offices engaged in procurement functions in the same city were combined. The eleven Ordnance Procurement Districts were reorganized and redesignated as U.S. Army Procurement Districts. The actual revamping of the organization moved slowly though mainly because of the existing complexities and the personnel problems involved. In addition, as AMC was contemplating and analyzing plans for further evolutionary change, the Department of Defense was also conducting an overall study of contract management that would include procurement procedures of not only the Armed Services but NASA (National Aeronautics and Space Administration) as well. Known as DOD Project 60, the study would have far-reaching effects upon future DOD, including AMC, contract administration.

As fluid as the procurement situation was, General Besson could point to solid accomplishment in this area during the first year of life of AMC and looked forward to even increased efforts and improvement in the immediate months ahead.[3] In conformity with AMC goals and existing practices, and the DOD Cost Reduction Program, during Fiscal Year 1963, contracts were reduced from 46.3 to 19.1 percent of total expenditures for procurement. Though a further decrease in CPFF contracting was sought, the AMC commander cautioned that such agreements could never be eliminated entirely since contracts for research or preliminary exploration or for rebuild or modification, where the level of effort in both or similar instances is unknown, would always require the open-end instrument.

The reduction of the CPFF contracts gave rise to an increase in competitive procurements. Results in this area were especially noteworthy. Over 34 percent of AMC's procurement dollars were placed on a competitive price basis in this first year. Documented net savings amounted to $17.3 million which reflected a reduction of about 37 percent over prices previously paid for the same end items. This emphasis upon increasing competitive procurement simultaneously increased the placement of contracts resulting from formal advertising, a preferred method, from 9.7 percent under the Technical Services to 16.1 percent under AMC.[4]

General Besson also won approval from DOD for the use of "multiyear" purchases, a system of combining more than one fiscal year's procurements into one purchase. The advantages of the system are threefold: first, a more economical buy results; second, administrative costs both to the contractor and the Government are reduced; and third, the increased

[1] Speech, Gen F. S. Besson, Jr. to Defense Supply Association, Statler Hilton, Wash., D.C., 18 Oct 63.

[2] AMC Historical Summary, FY 1963, p. 373.

[3] Speech, Gen F. S. Besson, Jr. to Defense Supply Association, Statler Hilton, Wash., D.C., 18 Oct 63.

[4] *Ibid.*

quantity and dollar value results in an increase in the number of firms interested in the bidding. As a consequence of one "multiyear" buy in which bidders were required to quote single year as well as multiyear quantity and price for 8,300 five-ton trucks and repair parts, $209,825 was saved on trucks and $1,175,752 on engines for a total savings of $1,385,567.

Convened in May 1962, the work of Project 60 was involved with contract administration. Earlier, over half of the recommendations of more than 200 top Defense procurement officials who had met at Williamsburg in February 1962 called for improvements in contract administration. Then in the course of its own deliberations, concerning procurement organizations, the Project 60 staff found that more than 25,000 personnel distributed among 106 geographic organizations and 142 major contracting plants were performing contract administration functions. Wide variations and numerous instances of duplication of procedure were found. The task of Project 60 was to "propose a plan for establishing uniform field contract management covering all contract management functions such as quality control, review of subcontracting practices, property administration, industrial security review, etc. Provide alternate plans for placement of contract management and organization therefor within the Department of Defense." [5]

Headed by nine top Defense Department officials chaired by Assistant Secretary of Defense Thomas D. Morris and including Assistant Secretary of the Army Paul R. Ignatious and Lt. Gen. Andrew T. McNamara, Director of the Defense Supply Agency (DSA), a task force of 84 specialists conducted an exhaustive survey and factual analysis of the existing contract administration structure and practices of the Military Departments, DSA, OSD (Office, Secretary of Defense), and NASA. Based upon its findings, Project 60 endorsed, in principle, "the establishment of a consolidated contract administration organization to provide common services to all elements of the Department of Defense, and NASA." [6]

General Besson did not disagree with this proposal in principle, but he did have reservations concerning its impact on Army procurement operations. Therefore, he was receptive to a proposition that a pilot installation be tested first. It was the AMC position that the proposal to establish a unified Defense Contract Management Agency (DCMA) was not necessary and might even be objectionable, since it would create new organizational interfaces and could unintentionally result in serious conflicts of authority with dilutions of responsibility. AMC envisioned that a decision on DCMA could reasonably be deferred until the separate procurement instructions of the three military services and DSA could be codified into one document—an initial step proposed by the Project 60 group.[7]

On 7 November, DOD announced that a Contract Administration Service Pilot Test was to be established in the area then being serviced by AMC's Philadelphia Procurement District. The test was to begin in April 1964 and within two years, in accordance with a later DOD directive that month, similar operations were to be established for all other AMC procurement districts.[8]

Generally, it had been the practice for these eleven geographically located districts to perform not only the negotiation and award of the contract but to administer it also. However, some subordinate commodity commands performed either or both of these functions for specific commodities. The actual practice depended to a large extent upon what policies and systems had been inherited from a particular Technical Service involved. However, the Project 60 staff found that in fact AMC, in line with recent studies, was effecting a measure of separation between its own functional areas of procurement and contract administration services. These actions were being taken in coordination with the Project 60 study with certain implementation awaiting final approval of recommendations. It had been General Besson's aim to collocate the contract execution function with those organizations responsible for the related engineering function—in other words —to pull contract execution into the commodity commands. In fact, beginning in March 1964, AMC procurement districts were instructed to

[5] Rpt, Policy Committee of the Secy of Defense Proj 60 pertaining to Contract Admin Services, Aug 1963, p. 1.

[6] *Ibid.*, p. la.

[7] AMC Historical Summary, FY 1964, pp. 474–479.

[8] "Procurement," *Army*, Jun 1965, p. 61.

phase out contract execution activities to the commodity commands.

While planning for the pilot test progressed, AMC was concerned lest the eventual procurement organization would not be sound and adequate in performance. It actively participated in all functional areas during the formation of the new organization under DOD and designated points of contact, early in November 1963, and later published regulations prescribing policies, responsibilities, and procedures for AMC actions in implementing Project 60, particularly in the planning and operational phases of the pilot test.[9] In the meantime, contracting work went apace. Altogether, AMC's eleven procurement districts, handling both contract administration and execution, contracted for more than $2 billion in Fiscal Year 1963 and administered an average undelivered dollar value of almost $2.5 billion while accepting materiel and services worth about $3.5 billion.[10] The procurement figures for the following year were substantially similar. However, before the end of Fiscal Year 1964, DOD announced the nationwide adoption of the new consolidated contract administration service and directed the Defense Supply Agency to assume responsibility for national-level management.

This involved the immediate phase-over to the Defense Contract Administration Service Region in Philadelphia of the AMC Philadelphia Procurement District, with the transfer of contract administration functions and personnel spaces to the appropriate commodity commands. It was planned that the other ten AMC Procurement Districts would be phased out in a similar manner during the next two years with the exception of Los Angeles and San Francisco Procurement Districts which were retained to provide West Coast contract execution support for the commodity commands, all of which were located in the east and mid-west.

As in the earlier Philadelphia test phase, AMC participated in the formation phase of the new DOD contract administration agency. In August 1964, survey teams that included AMC people, began the task of identifying resources (manpower, money, and facilities) devoted to the performance of contract administration services in the Detroit and Boston Procurement Districts. Similar surveys were completed in all the other procurement districts by the end of September. At the same time, the transfer of contract execution functions from the procurement districts to the AMC major subordinate commands required extensive study and coordination. The reshifting and shuffling of personnel spaces required extreme care. Generally, personnel were allowed the option of transferring with their space. A major problem involved the disposition of personnel not wishing to transfer from their procurement district to the command. Initially, there were about 1,200 in this category but careful planning and adjustment reduced the number to about 200.[11]

Effective 1 November 1964, the Philadelphia Procurement District was inactivated and on 1 April 1965 the Detroit Defense Contract Administration Service Region was activated. The Director of Procurement and Production, AMC Headquarters, Maj. Gen. Henry A. Miley, Jr. followed with a request for the inactivation of the Detroit Procurement District, effective 1 May, and it was estimated that by the end of Fiscal Year 1966, DSA would have taken over contract administration functions from all AMC procurement districts.[12]

The inactivation of the Philadelphia Procurement District was followed in rapid succession by the discontinuance of eight more. By the end of February 1966, only two—San Francisco and Detroit—of the former eleven AMC Procurement Districts remained in existence. As of this date, approximately 8,200 civilian personnel had been transferred to the Defense Contract Administration Regions or other AMC activities.[13]

With the liquidation of the procurement districts, the AMC commodity commands assumed the contract execution function. It had been the intent of the Directorate of Procurement and Production to build up in Fiscal Year 1966 the capability in the commodity commands to carry this additional workload. By August 1965, however, the contract execution backlog seemed already beyond existing capa-

[9] AMC Historical Summary, FY 1964, p. 480.

[10] "Procurement," *Army*, Jun 1965, p. 61.

[11] AMC Historical Summary, FY 1964, p. 460.

[12] AMC Historical Summary, FY 1965, p. 461.

[13] (1) Semimonthly Headline Rpt to SGS, 7 Mar 66. (2) DA GO 35, 12 Aug 66.

bilities. The accelerated procurement actions resulting from expanded operations in Southeast Asia (SEA) had come at a most inopportune time. On the one hand, skilled personnel of the procurement districts were refusing to move with their spaces and functions. On the other, the commodity commands could not recruit the needed personnel, for most of the commands were located in areas lacking people with such skills.[14]

At the same time, Colonel John F. Rey, Project 60 Coordinator in AMC, visited the Cincinnati Procurement District, soon to be liquidated. Here he was confronted with a placement problem for some 70 employees who had refused to transfer. Subsequently, he also visited the Chicago Procurement District where he found some 70 people working at the Engineer Procurement Office whose functions were being transferred to St. Louis. In addition, there were some clerks at O'Hare Field whose positions were being transferred to DSA. This amounted to a total strength of 240 in Chicago. Colonel Rey proposed to retain these people and build an organization with them utilizing their skills to assist the commodity commands in their contract execution work.

When Colonel Rey returned to Washington he presented the concept to the Director of Procurement and Production and to General Besson who approved it. In consequence, on 1 October 1965, the Cincinnati and the Chicago Procurement Detachments were activated and followed one month later by the activation of the New York Procurement Detachment.[15]

In addition to these detachments, AMC also set up the U.S. Army Southwest Procurement Agency at Los Angeles and the U.S. Army Northwest Procurement Agency at San Francisco. About 590 procurement personnel from these areas were used to organize agencies for contract execution work, effective 1 December 1965. Assigned to the Deputy Commanding General, AMC for Western Operations, the agencies continued to provide West Coast contract execution support for all AMC subordinate commands located in the mid-west and the east. By these means—originally considered to be temporary expedients—the AMC procurement organization continued to meet the demands placed upon it by the Army buildup in CONUS and in Vietnam. Thus, AMC had procurement offices assisting the commodity commands in five cities: Cincinnati, New York, Chicago, Los Angeles, and San Francisco.[16] On 1 December 1966, these offices were assigned to the Commanding General, AMC, and the Office of Deputy Commanding General, AMC for Western Operations, was discontinued.

Under the New System

Lessons learned over the next couple of years proved that an AMC capability to expand rapidly its emergency operations was necessary to assure the performance of its procurement mission. By establishing the procurement detachments at Chicago, Cincinnati, and New York, and the procurement agencies at Los Angles and San Francisco, AMC was able to retain a flexible capability during the Vietnam buildup. Located to take advantage of the available experienced manpower and to make resources fully accessible to the needs of each major subordinate command, this procurement organization and capability proved to be one of the major assets in meeting the tremendously expanded SEA workload. Some 20,000 of more than 70,000 procurement work directives during Fiscal Year 1968 were made in direct support of the 1st Logistical Command in Vietnam. The detachments and agencies augmented the functions of the subordinate commands and provided needed support to other commands, agencies, and installations requiring procurement services. They handled about 15 percent of the workload, but the primary functions remained with the commodity commands, including the responsibility for research and development. The "detachments" and "agencies" rendered their services at the request of the commands and were expected to possess current information revealing the overall industrial potential in their respective geographical areas. Fearful that the AMC major subordinate commands might not fully utilize these services, in

[14] AMC Historical Summary, FY 1966, p. 636.

[15] Semimonthly Headline Rpt, Dir/P&P to SGS, 20 Sep 65, subj: Establishment of Three Procurement Detachments.

[16] AMC Historical Summary, FY 1966, pp. 636-637.

July 1967 General Besson called upon his commanders to make use of this "available procurement capability." [17]

Effective 15 January 1968, the Army recognizing the need for consistency, redesignated the procurement "agencies" and "detachments" uniformly as procurement agencies, for example, U.S. Army Los Angeles Procurement Agency.[18]

Some three years following the start of the Vietnam buildup and the establishment of the Defense Contract Administration Service (DCAS), General Besson responded to a request of the Assistant Secretary of Defense (I&L), the Honorable Thomas D. Morris, to address the DOD Contract Management Conference highlighting the critical interface between AMC and DCAS contracting functions. General Besson had been generally satisfied that AMC had well managed its procurement responsibilities—mainly contract execution under the new system—during the very difficult period of the Vietnam logistics strain. Yet, he was not overly sanguine regarding the several problem areas he discussed that day, 2 October 1968. Dedicated to making the new system work, DCAS was responsible for pre-award contract surveys and contract administration, General Besson reasoned that there would have to be a continuous dialogue between AMC and DCAS if the "honeymoon" between the two was to last.[19]

The AMC commander said that the evolution and division of responsibilities had been extremely successful, but he was concerned about the future. He was particularly vexed and had always been opposed to placing an engineering organization within DCAS, having learned from previous experience that "two engineers hardly ever agree on a matter of judgment. . . . I just know that as DCAS develops expertise, experience, and expands its base of qualified engineers, there will be more and more engineering judgments made at levels lower than that of the office responsible for design integrity." This area was not regarded as an acute problem and the general pointed to some other areas requiring immediate cover.

Among the problem areas, General Besson included inadequate data packages, remarking that "you never know whether the data package is adequate until someone new tries to use it for production." He faulted AMC for not making greater use of the DCAS pre-contract award survey. Quality assurance was lamented as a perpetual problem for "the military product has to be right when it leaves the production line." And General Besson regarded contract slippage as a real problem, one that he reminded his DOD listerners, was a DCAS responsibility, unless the slippage was caused by unrealistic scheduling which he also viewed as a major problem and one which he would seek greater coordination between AMC and DCAS to solve. He added that increased and refined use of automatic data processing equipment would minimize communication difficulties and data exchange, but he was quick to emphasize "we don't want to get so sophisticated that we never talk to each other or have our responsibilities so refined that AMC representatives never visit a production line."

To prevent this situation, AMC and DCAS working level personnel had been meeting monthly since February 1966 and bi-monthly since mid-1968 to discuss and resolve problems of mutual interest. Although it was established early that the Army would place maximum reliance upon DCAS, the Project 60 Policy Committee and AMC realized that some exceptions to centralized contract administration would be necessary. Operations involving contracts for large, highly technical weapons systems necessitating close technical direction and control by the project manager would require Army cognizance over contract administration. Other factors considered in granting exceptions were volume and value of the work, duration of the contract, and facilities investment. DCAS was not considered feasible for Army's Government-owned contractor-operated ammunition plants, for some of the major systems

[17] (1) Speech, Gen F. S. Besson, Jr., to AMC Subordinate Comdrs, 17 Jul 67, subj: Major Procurement and Production Policies, 1968. (2) Ltr, Paul E. Atwood, Actg Dir/P&P, AMC, to Subordinate Comds, 30 Aug 67, subj: Policy for Utilization of U.S. Army Procurement Agencies and Detachments. (3) USAMC Contractor's Guide, 1 Jan 68. (4) AMCPP Historical Summary, FY 1968, p. 90.

[18] AMC GO 2, 15 Jan 68.

[19] (1) Speech, Gen F. S. Besson, Jr. to DOD Contract Mgmt Conf, Dallas, Texas, 2 Oct 68. (2) Submission, AMCAP to AMCNO, 19 Dec 68.

plants, or for research and development facilities. As of September 1967, the Army had cognizance over a total of 43 plants; the Air Force over 70 plants; and the Navy over 164 plants. The primary concern for excepting plants from DCAS control was the successful and timely delivery of materiel or services.

General Besson could have gone into greater detail regarding quality assurance and his remarks could have been brutally candid concerning AMC-DCAS quality assurance interface. As visualized by the AMC commander when DCAS was under study, under the new organization, plant level quality problems which could not be resolved locality were initially referred from plant level to the DCAS regional or district office prior to involving the AMC commodity command which had technical responsibility. Consequently, for the sake of expediency, technical decisions which were normally the prerogative of the technical activity were often made by DCAS technical personnel. In addition, there was some question regarding the technical training and qualifications of DCAS quality assurance representatives far removed from the commodity command and its technical capabilities concerning AMC hardware. AMC also believed that product inspection by highly skilled hardware-oriented quality assurance representatives to verify compliance with specifications was the most essential part of the quality assurance program. At contention was the AMC belief that DCAS overly concentrated its efforts in the area of contractor system surveillance at the expense of product inspection. AMC also complained about the difficulty the commodity commands had in obtaining direct technical opinions from DCAS representatives at the plants. AMC reasoned that in too many instances DCAS opinions were actually those of the contractor and not those of the Government. Such problems, particularly in the munitions area, must be viewed in the light of the establishment of DCAS at a time when there was a tremendous increase in procurement activity resulting from the SEA buildup coupled with a great shortage of quality assurance personnel.

Prior to the beginning of the Vietnam buildup, General Besson revealed the Army's five-year procurement projection. Excluding military construction, the Army's planned procurements from industry during the next five years, years which General Besson estimated would reflect a level rate, would probably total more than $20 billion.[20] The Commander added that it was expected that spending for mobility items would increase while the expenditures for missiles would decrease. This shift in emphasis reflected the Army's goal of obtaining a flexible response capability.

Reminding the industrialist of the Nation's need for an active defense industry and citing the Army-Industry partnership as one of the oldest Government-business relationships, General Besson recalled that the Army had recently started testing a new information plan designed to take full advantage of industry's capabilities in the end item production phase. Closer liaison between industry and the Army was visualized. Through the plan, the Advanced Planning Procurement Information (APPI) form would include pertinent historical facts about each end item, current fiscal year procurement actions and the Army's planned procurements during the next six years complete with quantities, monthly production rates, and anticipated methods of procurement if available. The APPI would be released to bidders which hopefully would lead to increased competition. Nine Army-Industry Materiel Information Liaison Offices (AMILOs) had recently been organized throughout the United States at the AMC commodity commands and procurement districts to implement the program.

It was held that the making of procurement information available to the industrial community would allow the Army-Industry team to better fulfill its mission. Fortunately contrived on the eve of the massive Southeast Asia buildup, the new liaison system was viewed by General Besson as a method for achieving efficiency in Government contracting and procurement, and he cautioned "our responsibilities for wise management of the resources entrusted to us have never been greater." [21] Industrial interest in the APPI release program was keen and by the close of Fiscal Year 1968,

[20] Speech, Gen F. S. Besson, Jr. to DOD Advanced Planning Briefings for Industry, Sheraton Park, Wash., D.C., 29 Apr 65.

[21] *Ibid.*

when the program was not yet three years old, more than 1,500 items had been published.[22]

AMC believed that the AMILO program would lead not only to increased savings to the Army from increased competition, but, on the basis of advance marketing information it would provide, industry would be better equipped to plan new plant locations, initiate new products, proceed with modernization and make other decisions involving capital expenditures that would tend to lower costs.

Impact of SEA

During the early months of 1965, the last so-called normal year, AMC was receiving in its depots about $40 million worth of repair parts each month. This was peacetime. The Army's mission was economy and the battle cry was cost reduction. Then, during the last seven months of that year, there were four major decisions on deployment levels to Vietnam—each calling for increased procurement actions, the backbone of the supply effort.

In July 1965, AMC began to buy the increased quantities of repair parts required to support U.S. troops in combat and to fill the long pipeline to Vietnam. These were not end items like airplanes and tanks but were the parts required to keep the airplanes, tanks, and guns operating. Some 350,000 individual items were involved and competition for these items was intense. The civilian economy was operating at unparalleled levels of prosperity and the demand for consumer goods was at an all time high. The problem facing AMC was to superimpose an accelerated defense procurement and production program on an industry already saturated with peacetime production.[23]

One of the major problems regarding procurement at any time was leadtime, since delivery normally lagged procurement by about a year. The problem of leadtime in the first year of the Vietnam War buildup was solved only after extreme effort and scrambling. Largely, in this first year, the war had to be fought with what was already on hand. To keep the troops in Vietnam supplied, AMC borrowed everywhere: from the production line, from units in the United States, from the reserves, and industry was pressed hard.

Instead of the estimated peacetime expenditure, during Fiscal Year 1966, AMC spent almost $7 billion for new equipment, most of which was not delivered until the following year. By Fiscal Year 1967, however, deliveries increased almost 2½ times and requisitions were coming in at about 500,000 per month. In all, some seven million requisitions were received from the field between January 1966 and June 1967 of which all but about 6 percent were filled by the following October.[24] Reflecting upon the situation some three years later, and after the Southeast Asia logistics challenge had been met, General Besson said, "Our full-scale entry into the conflict in Vietnam was a far cry from the situation in World War II, when we took three years to build and stock a logistical base in Britain before we risked an invasion of the continent."[25] The General recalled that in Fiscal Year 1966, the Army had $7.5 billion to spend and that the figure doubled in Fiscal Year 1967 and leveled off at more than $15 billion the next year. Speaking graphically of a billion dollars, the AMC Commander liked to remind his listeners that it would take a stack of $1000 bills somewhat higher than the Washington Monument to make a billion dollars.

But the challenge of SEA was not one of funding so much as it was of procuring—money was available, but the civilian economy was already saturated, and there were no price controls and industry seemed well pleased with its existing market. However, industry responding to the needs of defense, as well as the civilian economy, worked in a partnership with AMC and the other defense agencies to meet the logistics crisis caused by the SEA escalation. About this partnership, General Besson said: "I do not regard our alliance as

[22] AMCPP Historical Summary, FY 1968, p. 64.

[23] Speeches, Gen F. S. Besson, Jr. to Natl Machine Builders Association, Statler Hilton, 12 May 67, and to Association of the U.S. Army, Sheraton Park, 11 Oct 67 (Wash., D.C.).

[24] Speech, Gen F. S. Besson, Jr. to Association of the U.S. Army, Sheraton Park, Wash., D.C., 11 Oct 67.

[25] Speech, Gen F. S. Besson Jr. to the Washington Chapter of the American Ordnance Association, Fort Lesley J. McNair, Wash., D.C., 15 Apr 68.

a power cartel directed *against* the country and its interest or a combine of merchants of death and warmongers to defeat the social aspirations of the people." (His reference was probably to contemporary writings and protests concerning the so-called "military-industrial complex.)

Procurement Restrictions Relaxed

Prior to Vietnam, AMC procurement actions were accomplished within the framework of DOD policies and procedures as embodied in the Armed Services Procurement Regulations (ASPR). The Army Procurement Procedure (APP), issued by the Assistant Secretary of the Army (I&L), supplemented the ASPR and other DOD publications. At the AMC Headquarters level, implementation of policy was completed by the issuance of the Army Materiel Command Procurement Instruction (AMCPI), which, together with the ASPR and APP, provided policy and procedural guidance to the major subordinate commands and other activities.[26]

Since AMC's establishment in the summer of 1962, in harmony with a basic DOD procurement policy, it had directed efforts toward increasing incentive contracting and advertised bidding. In succeeding years, the amount of procurement dollars that the command placed under contracts through adequate price competition increased steadily.[27] Under the impact of operations in South Vietnam and Thailand, the Assistant Secretary of the Army (I&L) noted, on 8 March 1965, that these "dictate that procurement actions, including expedited contract award and delivery under contracts, be fully responsive to existing and future requirements in support of that area." Although there would be emergency situations in which it would not always be possible to follow the preferred procurement procedures, such as formal advertising, he went on to point out those authorities, procedures, and techniques that were available to accomplish expedited procurement.

He directed that procurement might be negotiated under the public exigency exception in ASPR 3-202, and that letter contracts could be awarded on an expedited basis in accordance with ASPR and APP 3-408. The use of letter contracts shortened procurement and production leadtime. However, the AMC was directed to insure that all such letter contracts were supported by proper written Determination and Findings. All procurement activities were to be prepared to submit, on call, listings of procurements negotiated under the public exigency exception. Also, sole source procurements of $3 million or more negotiated under exception two were to be submitted after award for review. Finally, the Assistant Secretary of the Army (I&L) directed AMC to make certain that these emergency actions were not used to circumvent established policies. He concluded by requesting that he be advised of any other policy guidance which might be required in support of these urgent requirements.[28]

The Director of Procurement and Production, AMC, promptly distributed copies of this letter to the major subordinate commands and procurement activities in the field. In addition, he requested that they emphasize the urgency of emergency procurements for Vietnam and Thailand. In executing such emergency requirements, he advised them to make certain that existing goals on the use of letter contracts and advertised procurements did not impede expeditious action; that contract files were documented when normal procedures were not used; that a record by contract number was available for submission on call; and that extreme care was exercised to assure that procurement in no way circumvented existing provisions of the ASPR and other regulatory documents.[29]

On 26 March 1965, the Director of Procurement and Production, Brig. Gen. H. A. Miley, Jr., took further action. Addressing the major subordinate commands and procurement activities, he called attention to the fact that the principles and authorities previously identified with planned or actual operations in support of South Vietnam and Thailand extended to

[26] AMC Historical Summaries: FY 1963, p. 373; and FY 1964, p. 522.

[27] *Ibid.*, FY 1963, p. 354ff.; FY 1964, p. 501ff.; FY 1965, p. 486ff.

[28] Ltr, ASA (I&L) to CG, AMC, 8 Mar 65, subj: Urgent Procurements in Support of Operations in South Vietnam and Thailand.

[29] Ltr, AMCPP-S Cir 37-65, Dir/P&P to CG, MOCOM *et al.*, 16 Mar 65, subj: same, and incl.

those RDTE (research, development, test, and evaluation) procurement actions that were in direct support of urgent requirements; to the acquisition of materiel for depot stocks; to maintenance operations; to retrofit of equipment; and to organizational support. All procurement actions for these purposes were to be considered sufficiently compelling and urgent to warrant the use of the negotiation authority provided in ASPR 3–202. Also, the requirement for Awards Board review of proposed contracts was changed from over $25,000 to over $100,000 in value. Assigned cost reduction goals and command objectives in such areas as the use of letter contracts, increased competitive procurement, reduction of cost-plus-fixed-fee contracts, and the use of formal advertising were not to be permitted to impede expedited procurement.

General Besson also authorized considerable relaxation of procurement controls. He waived the $10 million limitation on the authority of the commanding generals of the major subordinate commands to approve awards of contracts; authorized the major subordinate commands to approve deviations to the AMCPI that affected more than one contract or procurement; and waived the requirement for Advance Planning Procurement Information.[30] Advising the Assistant Secretary of the Army (I&L) of these actions, he declared them fully warranted by the situation, and expressed confidence they would not be abused.[31]

In the meantime, General Miley invited the attention of the Assistant Secretary of the Army (I&L) to a directive which required a report of a proposed award at least 20 working hours before the award was made.[32] This appeared to be in conflict with the Secretary's instructions for expediting procurement and he requested that the requirement be waived. Subsequently, the Director also requested relief from the restrictions of administrative review embodied in Secretarial post-award review of sole source procurements over $3 million.[33]

This last request appears not to have been granted, but, in compliance with instructions received, AMC Headquarters advised that major subordinate commands and field procuring agencies that awards made in support of operations in Southeast Asia were not to be delayed simply to fulfill the 20-working-hour reporting requirement. The report was to be made as soon as possible and in some cases this might be after the award had been made. Such information was to be identified by the letter, "SEA." The contracting officers concerned were to request contractors not to release award information to the public until a date and time to be specified by them, which would be based on the regular 20-working-hours reporting period.[34]

The number of urgent procurement actions requiring approval by the head of a procuring activity was increasing daily. To lessen administrative leadtime and increase the command's responsiveness, General Miley sought in mid-July 1965 to have the Commanding Generals, Army Tank-Automotive Center (ATAC), Mobility Equipment Center (MEC), and the Army Aviation Materiel Command (AVCOM) designated as heads of procuring activities in compliance with regulations.[35] As of mid-November 1965, the Assistant Secretary of the Army (I&L), Mr. A. Tyler Port, had not granted this authorization, primarily because he considered it unnecessary in view of the outstanding performance record of AMC procurement to date.[36]

Initially, the AMC was granted broad relief from regulatory procurement restrictions but

[30] Ltr, AMCPP-S Cir 41–65, Dir/P&P to CG, MUCOM *et al.*, 26 Mar 65, subj: Urgent Procurements in Support of Operations in South Vietnam and Thailand.

[31] Ltr, Gen F. S. Besson, Jr. to ASA (I&L), 26 Mar 65, subj: Expedited Procurement in Support of SEA Operations.

[32] (1) TAG ltr, 19 Mar 63, subj: Requirement for Submitting Contractual Information to Dept of the Army for Congressional Notification (RCS–SAOAS–38). (2) AMCR 715–2, 3 May 63, subj: same.

[33] (1) 1st Ind, Dir/P&P, AMC, to ASA (I&L), 22 Mar 65, on ltr, ASA (I&L) to CG, AMC, 8 Mar 65, subj: Urgent Procurement in Support of Operations in South Vietnam and Thailand. (2) Ltr, Dir/P&P, AMC, to ASA (I&L), 31 Mar 65, subj: same.

[34] (1) Ltr, Dir/Procurement, OASA (I&L), to CG, AMC, 24 Apr 65, subj: Urgent Procurements in Support of Operations in South Vietnam and Thailand. (2) Ltr, AMCPP-S Cir 68–65, Dir/P&P, AMC, to CG, ECOM *et al.*, 12 Jul 65, subj: same.

[35] (1) ASPR 1–201.14. (2) Ltr, Dir/P&P, AMC to ASA (I&L), 15 Jul 65, subj: Request for Designation as Head of a Procuring Activity.

[36] Interv, Dr. Erna Risch with Mr. E. F. DeAtley, Ch, Plans Div, Dir/P&P, 28 Oct 65.

within a short time renewed emphasis was placed on competitive procurement. Commenting on the fact that the Department of Defense had, in the past four years, made substantial progress in increasing the amount of procurement awarded on a competitive basis, the Deputy Secretary of Defense stressed the need not only to sustain this progress but, where possible, to extend it. He called upon the Secretaries of the military departments and the Director of the Defense Supply Agency to review carefully urgent requirements in support of SEA operations in order to avoid any unnecessary use of sole source procurement. To this end, he directed that procurements of more than $1 million but not more than $10 million, involving a shift from a competitive to a noncompetitive basis, were to be approved in advance by them and a copy of each approved action was to be forwarded to the Assistant Secretary of Defense (I&L). Similar procurements of $10 million or more were to be approved in advance by the latter.[37] This information, too, was promptly relayed to the field.[38]

By August, the Office, Assistant Secretary of the Army [OASA (I&L)], provided further clarification of the areas concerned in this price competition and, in addition, extended the controls over pre-solicitation review requirements for sole source procurements. Procurements of $10,000 to $25,000, involving a shift from a competitive to a noncompetitive basis, had to be reviewed and approved at a level higher than that of the contracting officer; those from $25,000 to $200,000 had to be reviewed by the Purchase Assignment Board and approved at a level higher than that of the contracting officer; those from $200,000 to $1 million had to be reviewed by the Purchase Assignment Board and approved by the head of a procuring activity, his deputy, or his principal assistant responsible for procurement; and procurements over $1 million had to be submitted to the Director of Procurement and Production, AMC, for approval at DA or OSD levels. In instituting the commodity commands, the latter pointed out that any item, whether or not previously purchased competitively but which now could be purchased competitively, fell within the criteria of a "shift from" competitive to sole source procurement and had to be reviewed and approved in accordance with these controls.[39]

When early delivery was the critical factor, as was often the case during the Vietnam buildup, a deliberate decision to deal with only a single company could often be justified as being in the best interests of national defense. The start-up time involved in going to a new producer, for example, was a factor to be considered. Consequently, sole source procurements were made in support of Vietnam.

During the early phases of the emergency when the primary objective was to expedite contracting for the greatly increased requirements for materiel, the use of emergency procurement measures was often necessary and entirely proper. However, in Calendar Year 1968, the problem had shifted to one of sustaining the flow from production lines; a return to the preferred more economical procurement procedures was again possible. In line with this, on 6 November 1968, AMC's Director of Procurement and Production, Maj. Gen. Walter J. Woolwine, informed the procurement officials throughout the command that a reassessment of the procurement techniques being used in support of Southeast Asia was in order and that the use of emergency methods should be in the main be restricted to sudden changes in requirements or the introduction of urgently needed new items.

SEA Procurement In Retrospect

Viewed in the climate of the period, the AMC procurement experience during the years since Vietnam must be recorded as one of the Army's great success stories. It was a period when increasing Army materiel purchases had to be superimposed upon a fully employed industrial economy. It was a time when it was

[37] Memo, Cyrus Vance for Secretaries of Army, Navy, Air Force, and Dir/DSA, 20 Jul 65, subj: Procurement Support of SEA.

[38] (1) Msg, DA 72085, Dir/Procurement, OASA (I&L), to CG, AMC *et al.*, 23 Jul 65, subj: Pre-award Review and Approval. (2) Msg, AMC 7-2910, Dir/P&P to CG, ECOM *et al.*, 26 Jul 65, subj: same.

[39] (1) Msg, DA 728672, Dir/Procurement, OASA (I&L), to CG, AMC *et al.*, 18 Aug 65, subj: Procurement Policy in Support of SEA. (2) Msg, AMC 8-2909, Dir/P&P, to CG, ECOM *et al.*, 26 Aug 65, subj: Procurement Policy on Support of Urgent Requirements.

difficult to get industry interested in the precise and exacting requirements of defense work and to obtain enthusiastic response to the AMC's solicitations. One by-product of this "guns and butter" economy has been a trend toward ever-increasing prices for defense materiel which by mid-1967 ranged anywhere from a 5 percent increase for helicopter cylinders to a 54 percent increase in the cost of a collapsible 3,000-gallon tank.[40]

Of necessity, the Army depended upon industry to react quickly to its needs. Its procurement had to be in increments that were economical and in amounts that precluded obsolescence. Either overstocking or underbuying was undesirable. Yet, AMC had to procure sufficient quantities of quality materiel to assure the Army's materiel readiness. Regardless of the economic situation, only very infrequently was AMC required to resort to the mandatory provisions of the 1950 National Defense Act to persuade industry to produce the equipment needed by the Army during the SEA emergency.

In fact, General Besson believed that "rated orders," those that established defense priorities, had not been used often enough when necessary to speed up deliveries. Evidence of this was contained in the General's procurement and production policy-guidance furnished to his officials in the summer of 1967, a time when higher echelons were questioning contract performance. His directive issued on 17 July told the procurement people that on-time deliveries depended upon on-time production and that it was not so that "rated orders" need only be used as a last resort.[41]

Yet, the delivery performance was not bad. As General Besson pointed out to those statisticians who would belabor AMC with the fact that 30 percent of its deliveries were delinquent, this accounted for those contracts that were only a day late and not for deliveries that were made ahead of schedule. Admitting that there were slippage problems, General Besson maintained that industry performance had been remarkable during the Vietnam buildup. He indicated that of the most critical items of equipment, a list comprising approximately one-half the annual program, as of the end of Fiscal Year 1968, analysis showed deliveries within 2.1 percent of the schedule. This performance involved more than 1.4 million contractural actions obligating almost $10 billion.[42] Of the items that had slipped delivery dates, General Besson correctly explained that these were often first-time productions of complex equipment following completion of research and development. A basic problem in such cases had been the manufacturer's inability to convert technical data to production knowledge in accordance with agreed-upon schedules.[43]

Throughout the period of the SEA logistics expansion, operations there continued to generate major procurement problems. Measures taken early to relax the stringent procurement regulations continued year to year. General Besson and AMC steadfastly held to the premise that the combat troops came first, and procurement and production goals would be met even if by extraordinary means. Consequently, certain trends that had been set in the early years of AMC were altered and even reversed following the decision to escalate the war in Vietnam.

For instance, the rate of placing competitive contracts declined from 42 percent of $8.65 billion in Fiscal Year 1965 to 27 percent of $9.9 billion in Fiscal Year 1968. The percentage of contracts awarded by formal advertising slipped from 26.2 in Fiscal Year 1965 to 11 in Fiscal Year 1967. The sustained high level of procurements to support SEA urgent requirements meant short leadtimes and early delivery dates resulting in a greater percentage of negotiated contracts. And, though the percent of contracts placed by formal advertising continued to decline, Fiscal Year 1968 was the third straight year that the dollar amount of such contracts exceeded $1 billion.

During this same period, the number of let-

[40] Speech, Dep Asst Secy of Defense A. Tyler Port (I&L) to Hawaii Chapter, Association of the U.S. Army, Honolulu, Hawaii, 12 Jun 67.

[41] (1) Ltr, AMCPP-S to comdrs, installations, activities, and comds with procurement responsibilities, subj: Major Procurement Policies, FY 1968, 17 Jul 67. (2) Ltr, ASA (I&L) to CG, AMC, 11 Aug 67, subj: AMC Contract Placement & Contractor Delinquency.

[42] Speech, Gen F. S. Besson, Jr. to the Natl Security Industrial Association, 26 Sep 68.

[43] Ltr, Gen F. S. Besson, Jr. to Dr. Robert A. Brooks, Asst Secy of the Army (I&L), 26 Aug 68.

ter contracts and CPFF contracts increased. From a low of 14.1 percent in Fiscal Year 1963, CPFF contracts rose to 20 percent in Fiscal Year 1968 and this figure was kept down only by the most intensified efforts on the part of the procurement officers. With the rapid increase of complicated requirements such as aircraft and other highly sophisticated equipment involving many production unknowns and "short fuzes," the use of the CPFF contract had to increase, if the Army was to place its orders.

About the same thing applied to the use of letter contracts, the use of which rose during the SEA buildup from 14, worth $44 million in Fiscal Year 1965 to 670, worth $2.028 billion in Fiscal Year 1968. Under normal conditions, the use of letter contracts to initiate procurements was restricted to the most urgent type of actions where it was necessary to permit contractors to proceed immediately to furnish the Army's need. That General Besson was concerned about the use of letter contracts could be seen in his Fiscal Year 1968 statement to his procurement officials regarding major procurement and production policies. He was worried particularly about over-age letter contracts, those more than six months' old. He feared AMC would lose control over costs unless these were closed out, pointing out that such contracts have the "additional disadvantage of perpetuating the requirement for still another letter contract for the following buy." It was the AMC commander's desire to see the number and volume of such contracts substantially reduced.[44] However, as the war level of operations in Vietnam grew, AMC found itself virtually powerless to curtail to any significant degree the use of CPFF or letter contracts. In Fiscal Year 1968, while the total amount placed in procurement rose to $9.9 billion, the percentage placed by formal advertising slipped from 11 to 9 percent or to less than $1 billion. Nevertheless, the command was able to press forward with other more economically sound programs to ease the financial burden somewhat. These were the multiyear procurement and the incentive type contracts.

The multiyear procurement contract was pioneered by AMC in Fiscal Year 1963 and had been effectively utilized in the years that followed. This technique was used to consolidate two or more year's requirements into a single contract award with only the current year's portion being funded. By such contracting, the Army's orders promised to extend the contractor's production and keep his work force occupied for a greater time. This was well received by industry and resulted in competition for contracts and lowered prices for those items which could be procured by this method. However, only those items of continuing demand that were not susceptible to obsolescence and whose prices were fairly stable were appropriate for multiyear procurement contracting.

In Fiscal Year 1965, AMC let 32 multiyear contracts worth $300 million. During the first year of the buildup, the figure slipped to $96 million on 29 new contracts but rose the next year with a total of $108 million, but on 4 fewer new contacts. In Fiscal Year 1969, 50 new multiyear contracts with an impressive $600 million price tag, representing some 15 percent of the Army's equipment and missile programs, were to be let by AMC procurement officers.[45] The multiyear procurement technique reduced the need for solicitations for each new annual requirement and the time-consuming processes involved with letting contracts.

Based upon the proposition that profit is the basic motive of business, and that even in defense areas, contracts could be designed to make this motive work for effective and economic performance, AMC instituted the program of incentive contracting in the first year of its organization by letting 106 such contracts.[46] The use of incentive contracts was especially desirable during the SEA logistics expansion because contracts with incentive features, providing rewards to the contractor in the nature of increased profits for conscientious performance and cost efficiency, were the logical solution for obtaining the overall lowest

[44] (1) AMC Historical Summary, FY 1966. (2) Draft AMC Historical Summary, FY 1967. (3) AMCPP Historical Summary, FY 1968. (4) Ltr, Gen F. S. Besson, Jr. to comdrs, installations, activities, and comds with procurement responsibilities, 17 Jul 67, subj: Major Procurement & Production Policies, FY 1968.

[45] Speech, Gen F. S. Besson, Jr. to the Natl Security Industrial Association, Wash., D.C., 26 Sep 68.

[46] AMC Historical Summary, FY 1963.

cost to the Government during a period when most other factors worked in favor of cost increases.

In Fiscal Year 1965, almost 20 percent of AMC contracts worth $3.9 billion contained incentive features. Though the number of such contracts doubled during the first big year of the buildup, increasing from 73 to 148, the percent of dollar amount declined to slightly more than 16 percent, or about $1.4 billion. By the end of Fiscal Year 1968, the ratio of dollar obligations recovered to about 18 percent of total procurement, or about $1.7 billion—a 1 percent rise each year. The total number of incentive type contracts awarded had increased from 148 in Fiscal Year 1966; to 155 in Fiscal Year 1967; and to 182 in Fiscal Year 1968.[47] This relatively high ratio of incentive type contracts was considered necessary to combat the lack of effective price competition plus other economic uncertainties of the period.

Quality Control

An appraisal of "how we do our work" including such programs as quality assurance, zero defects, value engineering, and cost reduction has been described by General Besson as AMC's third method of management; the first, second, and fourth being, respectively: commodity, program, and project management.[48] These mission-oriented appraisal programs, all closely related to each other through a common need for close AMC-Industry cooperation throughout the entire materiel life cycle, were all dedicated to obtaining quality materiel at the lowest possible cost. All were viewed in AMC as indispensable to a sound procurement effort.

The AMC Quality Assurance Program had its beginning in October 1962 when the AMC commander directed an in-depth evaluation of AMC's organizations, policies, procedures, and operations concerning materiel quality assurance. At this time, quality assurance was a function of the Directorate of Procurement and Production. Following informal discussions with the National Security Industrial Association (NSIA) and a formal request for them to conduct a quality assurance review, on 30 November 1962, NSIA accepted the task. After almost a complete year of survey, study, and analysis, NSIA presented its findings to General Besson on 4 November 1963. Based upon their recommendations and to give the program authority, a Quality Assurance Directorate was established within AMC Headquarters in May 1964 and on July 24, an AMC value engineering program was assigned to the new directorate with its primary mission regarding the "Eliminating Goldplating" area of the Army Cost Reduction Program.

The reliability of its equipment had always concerned the Army. Accordingly, the quality assurance system was designed to attain improved quality of materiel and maximum user satisfaction through a life cycle program that assured that quality was designed into the item during research and development, built into the product during procurement and production, and maintained thereafter. To make certain the effectiveness of the program, AMC commanders and project managers were required to establish and maintain continuous reliability records of assigned materiel during the development, production, and operational phases and to take any necessary remedial actions and also to submit periodic status reports to the Commanding General.[49]

The aim of the system was to prevent disabling quality deficiencies through the application of sound engineering techniques and thorough testing. The early discovery of materiel inadequacies or defects and timely correction through a controlled data collection system was a major concern of General Besson, who in June 1968 directed his commodity commanders

[47] AMC Historical Summaries: FY 1966; 1967; and 1968.

[48] Speech, Gen F. S. Besson, Jr. to Armed Forces Mgmt Association (Combined Southwest Area Chapters), San Antonio, Texas, 18 Apr 68.

[49] (1) AMCR 700-6, 19 Oct 64, subj: AMC Quality Assurance Prog. (2) AMCR 702-1, 27 Jul 65, subj: Independent Product Assessment. (3) Study, AMCB 5065, subj: Optimum Reliability of AMC Materiel. (4) AMCR 720-8, 13 Nov 67, subj: Reliability Record and Status Rpt. (5) Ltr, Gen F. S. Besson, Jr. to Comdrs and Proj Mgrs, 13 Nov 67, subj: Reliability Status of AMC Materiel.

to establish field performance information systems for selected materiel systems.

Though the quality and reliability of Army materiel was a continuing concern of General Besson's, he was also concerned with the need to move cautiously with equipment design changes, especially those which had cost reduction or cost avoidance as the primary concern. His assessment of several instances of defective materiel revealed the defects to be the direct result of overly aggressive product improvement, value engineering, or other cost reduction efforts.

Agreeing that such efforts had validity, it was General Besson's view that once design configuration was fixed, technical personnel must assume conservative attitudes before undertaking significant changes. In cases where the expertise of the quality assurance personnel determined that a change would adversely affect the quality and reliability of an item, General Besson insisted that he be apprised of the full impact prior to final implementation.[50] For as the Commander informed the National Security Industrial Association in late September 1968: "As we move from the performance, time and cost pre-occupations of our peacetime fraternization with industry to the harsh realities of conflict in Southeast Asia, we find that the bedrock requirement is reliability. The guy is a foxhole or in a helicopter on the closing run of a fire support mission wants above all 'to be sure.' He wants the 'quality built in' and he doesn't want to go back to a service center to have it adjusted. After all, he may not get back." [51]

In conformity with the worldwide demands for reliability, in 1967, General Besson honored a request from General Westmoreland, the Commanding General, U.S. Army, Vietnam (USARV), to conduct a survey of the supply and maintenance operations (including subsistence) at the 1st Logistical Command. Particular emphasis on aspects relating to quality assurance was desired. An AMC Quality Assurance Team consisting of 31 technicians was dispatched to Vietnam in April 1967 for approximately 90 days to conduct the survey and to provide on-site assistance to the command. The survey uncovered a critical need for an effective system which would screen out defective materiel, provide factual information of materiel quality status, provide timely feedback reports to the source of errors, and expedite the flow of serviceable supplies. A system which was compatible with combat zone operations was developed by the team. It included a draft 1st Logistical Command regulation, detailed technical procedures and standards, and suggested organizational structure for implementing the system.[52]

In response to another request from Gen. James H. Polk, Commanding General, U.S. Army, Europe (USAREUR), a 45-day survey similar to that conducted for USARV was conducted in USAREUR by a two-man AMC team during July-August 1967. This survey, however, was limited to evaluating the quality management systems at various USAREUR commands and activities. The results of the survey indicated that an urgent need existed for improving the quality management system throughout all phases of the supply and maintenance system. Shortcomings were identified and recommendations for improvement furnished. Due to the manpower shortage existing at AMC, assistance was limited to identifying the problem areas and recommending corrective actions, rather than developing a system as was done in USARV. Copies of AMC quality assurance documents were furnished on a continuing basis as a guide by which USAREUR could internally develop an effective system.[53]

Zero Defects

An adjunct of the quality assurance program was the Zero Defects Program which was pioneered for the Army by AMC in 1964 after it was so successfully applied to the Pershing Missile program at the Martin Orlando Plant, where a complete missile system was delivered and set up to fire without defect. AMC was

[50] (1) Ltr, Gen F. S. Besson, Jr. to Gen Lollis, 9 Aug 68. (2) Ltr, Gen F. S. Besson, Jr. to Commodity Comdrs, etc., 19 Sep 67, subj: Quality Assurance Emphasis—FY 1968. (3) Ltr, Gen F. S. Besson, Jr. to Commodity Comdrs, etc., 13 Nov 67, subj: Reliability Status of AMC Materiel.

[51] Speech, Gen F. S. Besson, Jr. to Natl Security Industrial Association, Wash., D.C., 26 Sep 68.

[52] Rpts No. 1, 2, and 3, Quality Assurance Assistance for USARV, 1st Logistical Comd.

[53] Rpt No. 1, Quality Assurance Assistance for USAREUR.

convinced that the program merited wider application and set about introducing the system to all of its contractors. The aim of the program was the prevention of costly defects in equipment. Zero Defects was and is dedicated to original perfection as opposed to reworking defective production. To implement the program, AMC conducted a series of industry seminars and workshops to enlist the support of its contractors. The seminars and the program were enthusiastically received and by mid-October 1964 AMC had been notified that more than 270 major corporations had established Zero Defects programs and that the major subordinate commands were planning and implementing their own.[54] By 1965, 42 installations had adopted a zero defects program and the following year the number had increased to 64.[55]

The typical Zero Defects program uses a system of personnel awards for sustained periods of no deficiency quality reports from materiel users. The system relied upon building a sense of pride in individual perfection of performance. The end product of the system was the achievement of absolute materiel readiness whereby materiel furnished the customer, often the combat soldier, would be free of imperfection. Recognition was afforded in May 1968, when AMC's annual progress report concerning the program was selected by DOD as representing the most significant achievement within the DOD Zero Defects Program.

Value Engineering

Whereas the AMC Quality Assurance and Zero Defects programs were oriented toward the improvement of reliability of materiel, the AMC Value Engineering program was directed against costs. It was designed to assure that no item, or any component parts, were unnecessarily costly to produce, assemble or maintain. This was accomplished through uniform application of value-conscious techniques in development, engineering, testing, and production. The certainty of materiel function at the lowest realistic cost was the ultimate aim of the AMC Value Engineering Program.

Both the AMC installations and contractors were involved in the value engineering effort The greatest potential for savings came from industry, the center of engineering and production. Under Armed Services Procurement Regulations for value engineering, incentives for profit were afforded contractors submitting Value Engineering Change Proposals (VECPs). When a VECP was approved, engineering orders were issued and appropriate contract modifications expedited.

The main thrust of value engineering was directed toward the Cost Reduction Program goals of "Eliminating Goldplating" in AMC materiel. Earlier, General Besson had been extremely interested in the benefits to be derived by both industry and the Army from a dynamic and properly executed value engineering program which he believed could only result in a better and more adequate supply of materiel. His numerous directives to his contracting and engineering personnel stressed the importance of encouraging industry to seek and propose methods for obtaining quality products at reduced costs through expeditious handling of VECPs and an active liaison with industry.[56] He also emphasised the need to intensify in-house value engineering efforts, a new capability available to the commodity commands beginning in 1967.

Some measure of the success of the value engineering program can be traced in the year-to-year statistics. The number of VECPs received from contractors and approved rose from 262 in Fiscal Year 1965 to 384 in Fiscal Year 1966. In Fiscal Year 1967, the number of approved VECPs fell to 295 but with increased efforts in Fiscal Year 1968 approved VECPs returned to a respectable 383. The number of value engineering proposals initiated in-house and approved rose from 113 in Fiscal Year 1967 to 273 in Fiscal Year 1968. Reported dollar savings ranged from $25 million in Fiscal Year 1963 to a high of $156 million in Fiscal Year 1966 with a drop to $68 million in Fiscal Year 1967 and $67 million in Fiscal Year 1968.[57] The drop in dollar sav-

[54] "Quality Assurance," *Army*, Jun 1965, p. 68.

[55] Submission, AMCQA to AMCHO, 5 Dec 68, p. 4.

[56] (1) Ltr, Gen F. S. Besson, Jr. to AMC Subordinate Comds, etc., 5 Sep 68, subj: Value Engineering Emphasis—FY 1968. (2) Ltr, Gen F. S. Besson, Jr. to AMC Subordinate Comds, etc., 24 Sep 68, subj: Value Engineering Emphasis—FY 1969, with incl.

[57] (1) "Quality Assurance," *Army*, Jun 1965, p. 70. (2) "Value Engineering in Review," AMC Historical Summaries: FY 1966, p. 2; FY 1967, p. 3; FY 1968, p. 3.

ings during the latter two years reflected the modified method of validating savings that was instituted in 1967 and was not indicative of a decline in value engineering activity.

On the contrary, the opposite was the actual case. Because of an increased emphasis upon value engineering at Army and DOD level, in May 1965, AMC was allotted 258 new personnel spaces for the program. By the close of Fiscal Year 1967, however, AMC was only able to fill 18 of the positions because of a scarcity of qualified candidates for the hard-to-fill jobs. The empty personnel spaces no doubt contributed significantly to the backlog of VECPs that were more than six months old, a condition that disturbed General Besson greatly. In September 1968, the Commander informed his subordinate commanders and quality assurance officials that he was personally reviewing such cases and that they must be reduced to an absolute minimum with those lingering cases being amply justified.[58]

Granting that AMC had made some progress in the value engineering area of Quality Assurance, General Besson made known his general dissatisfaction with results when he reminded the NSIA that "it does appear that there is still a lot of gold in the value engineering hill" and he encouraged the contractors to "sharpen your engineering skills and judgment" and "it's going to take some digging." [59]

The three programs—quality assurance, zero defects, and value engineering—were closely allied. It was difficult to consider them separately. The first two aimed at the improvement of quality but contributed to economic efficiency. The third had as its main thrust the saving of dollars but contributed to improved quality. Overall, a balanced effort was what AMC sought—quality, according to Army requirements, and at the lowest cost. This effort was the life blood of AMC's Cost Reduction Program.

Cost Reduction

The AMC Cost Reduction Program was launched in March 1963 with the objective of reducing the cost of logistical and procurement activities through more efficient management. As part of the larger DOD program that had begun the summer before, it was geared to three major areas: buying only what was needed, buying at the lowest sound price, and reducing operating costs. The first year of the program was fraught with the problems that face any new program. Questions concerning responsibility, implementation, and reporting had to be answered. Actual reporting was not initiated until the latter part of Fiscal Year 1963.

To provide incentive for implementing economies, monetary goals were assigned. Each major subordinate command of AMC, each of its storage depots, and many of the separate activities and installations were assigned goals. Savings were reported quarterly and consisted of three types: carryover savings (savings brought forward from year to year on a depreciation basis); cost avoidance savings (these are dollars you would have spent had they been available, but didn't because they weren't); and hard dollar saving (dollars actually saved from a funded program). To ensure that savings were bona fide, the U.S. Army Audit Agency validated the savings. Under these ground rules, AMC compiled an enviable and outstanding record during Fiscal Years 1963 through 1966. Over this four-year period, goals rose from $228 to $619 million, while validated savings rose from $475 to $961 million.

However, events were taking place that would have a pronounced influence on the future of the program. An investigation of the Cost Reduction Program was conducted by the Subcommittee for Special Investigations of the Committee on Armed Services, led by the Honorable Porter Hardy, Jr., Representative of Virginia. The results of the investigation prompted an extensive conceputual revision of the program; however, its initial objective was retained.

The principal revisions involved the types of savings that were permitted to be validated. The carryover and cost avoidance savings were eliminated—only hard dollar savings were now

[58] Ltr, Gen F. S. Besson, Jr. to AMC Subordinate Comds, etc., 24 Sep 68, subj: Value Engineering Emphasis—FY 1969.

[59] Speech, Gen F. S. Besson, Jr. to the Natl Security Industrial Association, Wash., D.C., 26 Sep 68.

(FY 1967) permissible. In addition, only savings resulting from management decisions made in the current fiscal year were allowable. As a by-product of the investigation, an ultra-conservative auditing attitude was adopted by the Army Audit Agency (AAA). Consequently, during the first half of Fiscal Year 1967, the program was in limbo awaiting new guidance. The program was in a state of confusion that jeopardized its continued success. However, when the paper was shuffled on 30 June 1967, AMC had achieved its Fiscal Year 1967 goal of $156.6 million, 85 percent gained in the fourth quarter. The $160.0 million in savings was achieved under the most adverse circumstances.[60]

The Fiscal Year 1968 Cost Reduction Program was confronted with two carrryover problems from Fiscal Year 1967: ultra-conservative auditing and waning motivation. During Fiscal Year 1968, great attention was directed to stimulating and maintaining interest in the program.

A two pronged attack was directed against audit invalidations. First, cost reduction actions were standardized so that all were written to clearly indicate compliance with program criteria. The result was fewer invalidations. Second, DOD was made aware, first hand, of the overly stringent procedures being applied by the AAA. A series of letters from the Chief, Headquarters, AAA, instructing field auditors to use a more common sense approach to validating cost reduction actions followed. Further, a comparison of DOD Cost Reduction Program and Army Cost Reduction Program criteria revealed that the Army had too narrowly interpreted DOD instructions. DOD directed a revision that eliminated the confusion. Though these changes were not effected until Fiscal Year 1969, cognizance of the impending revision created a more congenial atmosphere between audit and program personnel. The result was $250 million in savings against a goal of $170 million in Fiscal Year 1968.

[60] Submission, AMCCP to AMCHO, 29 Nov 68.

In September 1967, the Secretary of Defense directed that the program be broadened to include management improvement areas to be measured on the basis of performance rather than dollars saved. The objectives of the new element was to alert intermediate management to those specific logistical functions in which top management expects tangible improvements, to bring a high degree of visibility to the results of efforts in these functions, and to impose the pressure of performance goals on those responsible for management improvements.

Although the Cost Reduction Program cannot be given credit for all management actions implemented in the last six years, it can be credited with creating an environment of cost consciousness. It made managers cognizant of the fact that functions could be performed more efficiently; that goldplated specifications are a luxury AMC could not afford; that the unnecessary accumulation of excess stocks represented a wasteful investment of resources; that overstated requirements resulted in unnecessary procurements; and that the retention of unneeded items in our supply system was costly and detrimental to supply efficiency.

The cost conscious attitude resulting from the program has prompted the development and introduction into AMC's purchasing operations of a number of new techniques designed to broaden and intensify competition. For example, when specification were too broad to permit formal advertising, producers were asked to submit unpriced technical proposals. Producers, whose proposals qualify, then submitted sealed bids with the award going to the low bidder. In cases where a complex end item failed to attract competition, its high value spare parts and components were broken out for separate procurement. These techniques have helped to sustain an increasing trend toward competition. In short, the Cost Reduction Program has been a major factor in attaining requisite military capability at the lowest possible cost.

Industrial Readiness and Production Base Support [61]

Industrial readiness, the state of preparedness of industry to produce essential materiel to support the national military objectives, in recent years, has undoubtedly caused greater concern to the U.S. Army than ever before in our Nation's history. In past wars, prior to Vietnam, the problem was not as acute. For instance, there was either more time to crank up the industrial machine, we had allies to call upon, or, as in the case of Korea, the war was largely fought with equipment left over from World War II. Planning for the production base now must account for the expanding diversity and complexity of weapons and equipment, the varied nature of warfare (limited or general), and the type and degree of response. Both Government and privately-owned plants and equipment are involved in the process.

Before the reorganization of the Army in 1962, industrial readiness planning was conducted by each of the former Technical Services. After the reorganization, the preparation and publication of the Army Production Planning List was assigned to the AMC Director of Procurement and Production, together with the responsibility for staff supervision over the Industrial Readiness Planning Program within AMC. AMC's Industrial Readiness Branch assisted by the Headquarters, AMC Data Systems Office, with the close liaison and support of the major subordinate commands identified items that would require mobilization production planning in accordance with AMC regulations published in October 1962. At this time the criteria for selecting items that would require formal planning with industry included those that: would be an urgent requirement in the event of mobilization, the urgency would be such that corrective action would be necessary, planning with industry would improve the situation, and the cost of planning would be reasonable.[62]

During the interim period following its organization and the Southeast Asia logistics buildup, AMC expended a great amount of effort in establishing a coordinated and unified industrial readiness program. As an initial effort, the Industrial Readiness Branch of the Procurement and Production Directorate assisted a DOD study group, Defense Project 44, in an evaluation of the contemporary industrial readiness program and a Phase II effort entitled the "Impact of New Logistics Guidance on Industrial Mobilization Planning." [63]

Early in Fiscal Year 1965, other planning efforts were coming to fruition with publication and implementation of a series of AMCRs in rapid succession concerning industrial mobilization. In furtherance of more effective industrial plant equipment management and in line with recommendations and objectives of an AMC Board Study, a plant equipment modernization and replacement program was formally established with program execution responsibilities assigned specifying uniform procedures to be followed throughout all AMC echelons. Then on 4 September 1964, the Directorate of Procurement and Production (AMCPP) established procedures for implementing a manufacturing methods and technology program and established the Army Production Equipment Agency (PEQUA) as the central point within AMC for the review and coordination of all effort in this area.[64] Major subordinate command responsibilities and reporting requirements were delineated to assure the widest application of developed processes. All elements of AMC were to report requirements for industrial plant equipment to PEQUA both for current programs and projected requirements for emergency utilization. In turn, PEQUA would compile the data received and periodically submit it to the Defense Industrial Plant Equipment Center. To assure that maximum use would be made of available storage facilities for idle industrial plant equipment, both contemporary and projected, reports concerning this were also channeled to PEQUA.

At this same time, the Plans Division, AMCPP, envisioned the initiation of a management system that would collect decision-

[61] Based upon submission, AMCPP-SR to AMCHO, 19 Dec 68.

[62] AMCR 715-20, 15 Oct 62.

[63] Submission, AMCPP-SR to AMCHO, 17 Dec 68.

[64] AMC Historical Summary, FY 1965, p. 521.

making data pertaining to current and emergency production requirements, plans, and capability. The system would eventually employ modern data processing equipment so that large amounts of basic data bearing upon the decisionmaking process would be readily available. As an initial step to attain the objective, an Industrial Readiness Assurance Program panel consisting of members from the Plans Division and all major subordinate commodity commands was organized to define policies, procedures, and responsibilities for the operation of the program within the AMC. The panel designed the program to assist commanders to achieve specific objectives related to the AMC responsibilities of industrial readiness as follows: the Production Base Support Program; the Emergency Production Planning Program; the AMC Emergency Production Planning List; the Defense Materials System (priorities and allocations); Government-owned plants and Government-owned equipment; privately-owned plants (either with or without Government-owned equipment); Procurement and Production Technical Data (drawings, specifications, bills of material, etc.); and production engineering capability.

During Fiscal Year 1966, the Plans Division fully implemented the Industrial Readiness Assurance Program. A main objective of the program was to achieve a well-balanced AMC Industrial Readiness posture that would reduce the Army's investment in materiel inventories and assure availability and capability of industry to produce materiel necessary to support Army forces under all conditions. Under the program, the subordinate commands would nominate items in their areas for which industrial readiness planning was or would be accomplished for inclusion in a consolidated AMC Emergency Production Planning List. They would also consolidate the information necessary to evaluate the readiness status of Government- and privately-owned plants and equipment.

During Fiscal Year 1963, AMC assumed responsibility for establishment, retention, and maintenance of the Army-owned industrial production base. Directive guidance limiting the size and quality of the production base to conform with peacetime and emergency requirements consistent with production capabilities of the commercial economy was furnished to the major subordinate commands. Subsequently, this guidance was incorporated in the Department of Army PEMA Policy and Guidance Document which provides a basis for preparing Army Materiel Plans. The industrial production base, under management control of AMC, had (1968) an estimated replacement value of $10 billion which included both industrial plants (with integral equipment) plus other reserves of industrial plant equipment.

Industrial plants were subdivided into two categories: (1) Department Industrial Plant Reserve (DIPR), and (2) National Industrial Plant Reserve (NIPR). NIPR plants have been sold to private concerns under the terms of a National Security Clause which permits their recapture for use in Government production in the event of an emergency. The total number of plants remained at about 10 after Fiscal Year 1963 although there were some changes in actual plants contained in the NIPR.

Of considerably more importance for AMC management responsibilities were the DIPR plants. They were subdivided into those that were Government-owned, contractor-operated (GOCO) and those Government-owned, Government-operated (GOGO). In Fiscal Year 1963 there were 51 plants in the DIPR. As of December 1968, there were 50 plants of which 38 were GOCO and 12 were GOGO. This composite reduction of one does not reflect, however, what actually occurred in the DIPR during the six-year period. For instance, the Elwood and Kankakee plants were consolidated into the Joliet Army Ammunition Plant (Joliet AAP). Similarly, the Newport Chemical and Wabash River plants became Newport AAP. There were numerous plant additions to and deletions from the DIPR during the period. Perhaps the most significant involved the excessing of Springfield Armory in April 1968 and the industrial portion of Watertown Arsenal in June 1967.

At the close of Calendar Year 1968, AMC managed industrial plant equipment (IPE) included equipment in the GOCO and GOGO plants which was reportable to the Defense Industrial Plant Equipment Center (DIPEC). It also included other IPE reportable to DIPEC which was active in production in commercial

plants, and IPE which was part of standby production packages retained for limited and/or general war production requirements. The total amounted to 138,233 items with an acquisition value of $1.4 billion. Replacement value was estimated at between $2.5 and $2.7 billion. The funds used to maintain idle facilities are listed below.

Table 3. Maintenance Costs of IPE 1963–1969

Fiscal Year	Maintenance ($ millions)		
	Plants	IPE	Total
1963	$ 14.8	$ 5.9	$ 20.7
1964	18.5	4.7	23.0
1965	24.1	4.9	29.0
1966	20.6	5.4	26.0
1967	14.5	4.6	19.1
1968	10.6	3.6	14.2
1969 (Plan)	12.3	3.4	15.7
Total	$115.4	$32.5	$147.9

After Fiscal Year 1966, the use of maintenance funds for idle plants and IPE was reduced each succeeding fiscal year due to the reactivation of idle facilities to support Southeast Asia. During Fiscal Year 1965, 14 ammunition plants were inactive. At the close of Calendar Year 1968, 9 DIPR plants were inactive—only 4 were ammunition plants. The plants activated since Fiscal Year 1965 were Badger, Burlington, Cornhusker, Riverbank, Sunflower, Twin Cities, Kansas, Volunteer, and St. Louis.

The Production Base Support program provided for capital investments to modernize or expand real and personal property at active DIPR plants, including construction at GOCO plants; the expansion of commercial facilities under conditions specified by procurement regulations and directives; modernization of approved Secretary of Defense (ASOD) production packages; layaway/redistribution/disposal of facilities when production ran out; production engineering including development of prototype production equipment for end items and components; and production engineering to upgrade or modernize production processes.

The magnitude of the Production Base Support (PBS) Program during the period Fiscal Years 1963 through 1969 is shown by the tabulation below. The figures include totals for facilities, layaway, and production engineering. They reflect updated releases by AMC to the major subordinate commands for all fiscal years as of the second quarter, Fiscal Year 1969.

Table 4. Cost of PBS Program, 1963–1969

Fiscal Year	PBS (PEMA) ($ millions)
1963	$ 120.4
1964	80.6
1965	85.8
1966	271.0
1967	354.9
1968	405.4
1969 (Plan)	334.5
Total	$1,652.6

The increase in the PBS program after Fiscal Year 1965 reflects the modernization and expansion of facilities to support SEA. Each major subordinate command with the exception of MICOM submitted late start facility projects during the period Fiscal Years 1966 through 1968 for the performance of mission procurement/production responsibilities for SEA. The largest need for additional facilities by far was for ammunition production with aircraft being next. The facilities funding for expansion and modernization is listed in table 5.

Table 5. Cost of Modernization and Expansion of DIPR and POPO Plants, 1966–1969

Fiscal Year	($ millions)						
	DIPR		POPO*		All		
	Mod	Exp	Mod	Exp	Mod	Exp	Total
1966	$ 17.3	$111.3	$ --	$ 83.5	$ 17.3	$194.8	$ 212.1
1967	18.5	225.6	--	32.6	18.5	258.2	276.7
1968	52.7	169.7	6.8	78.1	59.5	247.8	307.3
1969 (Plan)	137.4	57.1	10.4	5.7	147.8	62.8	210.6
Total	$225.9	$563.7	$17.2	$199.9	$243.1	$763.6	$1006.7

*Privately-owned, privately-operated plants.

AMC's prerogatives under the Production Base Support Program have always included a delegation of authority to approve projects within specified limits. This authority was delegated by ASA (I&L) through Deputy Chief of Staff for Logistics (DCSLOG) to the Commanding General, AMC, who was empowered to redelegate authority to his Principal Assistant for Procurement and to the commanders of the major subordinate commands. Initially, the delegation of authority was merely of token quality. AMC could grant execution approval for individual projects after receiving program approval by individual project from or through DCSLOG. Additionally, there was a limited authorization to change the value of approved projects. In February 1965, a new delegation was received which permitted AMC to add projects costing less than $200,000 to the current year program, and confirmation by AMC of DCSLOG project approvals was eliminated. This delegation was modified in July 1965 by withdrawal of the authority to add facility projects. At the same time, however, authority to approve layaway projects and production engineering measures was increased from $200,000 to $2,000,000.

In April 1967 AMC Headquarters was severely criticized by DCSLOG because a number of major subordinate commands had provided facilities to contractors without benefit of an approved PBS project. DCSLOG cited Public Law 89-213, the Fiscal Year 1967 Appropriation Act, which contained language to the effect that expenses necessary for providing facilities for production of equipment and supplies would be provided at the discretion of the Secreatry of the Army. The Director of Procurement and Production, AMC, immediately directed the commanders of the major subordinate commands to incur no further expenses relative to providing facilities to contractors without the prerequisite of an approved PBS project. He then asked DCSLOG to delegate authority for adding facilities projects with a value of less than $1 million to the program. DCSLOG and DA did not grant the full authority requested, but in June 1967 limited delegation was received which again permitted AMC and the major subordinate commands to add facilities projects to the program.

The exercise of the delegations of authority had to be accomplished within available obligational authority and program tolerances. This usually meant that the delegations could not be exercised unless program savings were made available through reductions in approved projects costs or deletion of approved projects from the program.

In April 1967, DA called attention to deficiencies in AMC project costs estimates involving construction, and suggested criteria for correcting these deficiencies. This information was transmitted to the major subordinate commands. In July 1967, the Director of Procurement and Production also apprised the field commanders that the inadequacy of construction cost estimates contained in PBS projects continued to reflect on the credibility of AMC Headquarters and directed their compliance with the established criteria.

One instance of poor cost estimating involved Gateway Army Ammunition Plant, St. Louis, Missouri. This GOCO installation, formerly known as the St. Louis Army Tank-Automotive Steel Foundry, was transferred to the U.S. Army Munitions Command (MUCOM) in May 1967 for conversion to the production of metal parts for 175mm and 8-inch projectiles. To accomplish this conversion, a PBS project was submitted by MUCOM and approved by OSD in Fiscal Year 1967. The initial approved amount was $9.0 million. Even before the work on conversion was started, it became evident that this amount would be completely inadequate. There were six requests to increase PBS funding for the Gateway project and its cost has ballooned to a staggering $41.5 million.

Gateway was the worst example, but there had been others. A project for a continuous TNT facility at Radford Army Ammunition Plant, for instance, went from an initial cost estimate of $16.8 to $25.9 million. On the other hand, not all project cost estimates were bad. It was not at all unusual for projects to be accomplished for less than the original estimated cost.

Two factors accounted for poor construction cost estimates. One was the inadequacy or absence of design criteria. The other stemmed from estimating construction costs on the basis of single line sketches rather than on a de-

sign detailed to the point where accuracy of the estimate was reasonably assured. Alarmed over the problem, General Besson directed that lateral coordination between AMC Headquarters and Chief of Engineers be maintained relative to construction estimates contained in PBS projects.

DOD directives pertaining to the Industrial Facility Expansion and Replacement Program required that the provision of industrial facilities to contractors would be held to the absolute minimum. This policy was strictly enforced during Fiscal Year 1965, and no facilities were furnished to contractors to initiate or expand the $141,000 production-involved PBS fund. Additionally, AMC plans for replacement of active Government-owned equipment in privately-owned plants had to be abandoned.

Under the buildup for SEA, however, the DOD policy temporarily slipped into the background. By the end of Calendar Year 1968, a total of $182.5 million was used under the PBS program to provide facilities for SEA production at POPO plants. Yet, the DOD policy to reduce Government ownership of production facilities was not dormant. In a Defense Procurement Circular, dated 10 June 1968, the Assistant Secretary of Defense (I&L) reaffirmed that facilities would not normally be provided to contractors except under restrictive conditions. Consistently, Armed Services Procurement Regulations were changed to assure implementation of this reaffirmed policy.

The extent and degree to which proper management of the production base could be realized depended on the amount of OMA (operation and maintenance, Army), PEMA, and MCA (Military Construction, Army) funds programed for maintenance, modernization, and expansion. During the period from the end of the Korean War until late in Fiscal Year 1965, plant maintenance effort was established at a low level. Additionally, little was done during this time to upgrade or modernize production processes. Reactivations of GOCO plants and of ASOD packages for SEA production dramatically highlighted processes that were antiquated, working conditions that caused employee morale to suffer, and the fact that much of our IPE was in poor condition and/or of ancient vintage. To emphasize one deficient area, the following tabulation shows the percentage of active IPE which will have exceeded estimated useful life during the period Fiscal Years 1968 through 1970.

Table 6. Life Expectancy of IPE Equipment, 1968–1970

IPE major groups	Useful life (years)	Percentage beyond useful life	
		FY 1968	FY 1970
Meat Cutting	18	30.6	65.5
Welding	18	10.3	29.2
Metalforming	22	13.4	11.0
Heat Treating & Ovens	18	24.6	47.0
Electrical Test & Measure	7	50.0	49.7
Mechanical Test & Measure	8	74.6	74.7
Weighted Average	15.8	34.1	55.8

With the exception of Gateway AAP in St. Louis, parts of Radford AAP at Radford, Virginia, and the plant being installed at Newport, Indiana, for manufacture of bag and propelling charges, the MUCOM GOCO plants were constructed during World War II and expanded during the Korean War. They are outmoded and, in cases, tending toward obsolescence. However, though they had many drawbacks, they were at least available.

It is suggested that these plants will not be available again to meet another SEA type or greater emergency unless they are extensively rehabilitated and modernized prior to and after being laid away following the termination of SEA hostilities. In Fiscal Year 1968, MUCOM proposed a multiyear program to upgrade and reconstitute the ammunition/chemical-biological-radiological production base. The concept was accepted and recorded in the Department of Army Defense Program—an OSD-approved document—as a five-year plan with a tentative price tag of $2.3 billion. Probably the most important of the MUCOM recommendations was a proposal for replacement for outmoded and inefficient production processes with modern manufacturing techniques emphasizing automation.

The Fiscal Year 1970 PBS budget included $310 million for modernization of the ammunition base. Of this amount, $229 million was programed for upgrading production processes.

The figure was somewhat lower than was recorded in the Department of Army Defense Program, but represented a much larger figure for modernization than was ever included in any previous budget. The magnitude of the total budget, amounting to $481.6 million, was evidence that the need to improve the MUCOM production base was recognized throughout the Department of Defense. As Calendar Year 1968 closed, there was cause to hope that an optimum readiness posture would be achieved, provided that funding levels for modernization in Fiscal Years 1971 through 1974 remained at least equal to the level proposed for the Fiscal Year 1970 President's Budget; and that future funding for maintenance would be at a level to prevent deterioration of idle facilities. As AMC and the Army looked beyond Vietnam and into the future, the orderly achievement in the shortest possible time of an industrial production base matched to the reduced consumption of the postwar Army and its customers, but one that may be expanded readily upon short notice to meet the demands of future emergencies, was of primary concern. But, the immediate concern was with Vietnam and in General Besson's words:

> We will continue to work together as we have in the past in our mutual endeavor to provide an 'ARSENAL FOR THE BRAVE'—an arsenal worthy of the all out contribution of those kids at the end of the line—soldiers, marines, airmen, and sailors. . . .[65]

[65] Speech, Gen F. S. Besson, Jr. to Natl Security Industrial Association, Wash., D.C., 26 Sep 68.

MATERIEL: MOVE

In the guise of swamps, mountains and deserts or as blizzards, fogs and blinding heat, it is Mother Nature who is the true immobilizer of armies. Military history is replete with examples of the potency of natural forces in the scales of battle. The efficiency of our lethal weapons has outstripped our ability to find the enemy and then to close with him.

GEN F. S. Besson, Jr.
National Defense Transportation Association Annual Transportation and Logistics Forum
Washington, D.C.
14 October 1968

CHAPTER VI

MATERIEL: MOVE

In his testimony before a Senate subcommittee in 1966, Secretary McNamara outlined the relation of our military strategy and plans to any threat to the Nation. He explained that the Joint Chiefs of Staff annually prepared the documents which reflected how the plans were related to the potential threat over a period of years and into the future. All of these plans were annually updated to provide adjustments to changing situations. The forces to be acquired and maintained under this scheme were then related to the strategy and plans. These forces also must be adequately supported, not only with men, equipment, and facilities needed in peacetime, but with war reserve stocks for sustained periods of combat. The acquisition process, plus a war reserve, had to meet the logistical standards incorporated in the contingency war plans.[1]

Supporting the military effort in Southeast Asia (SEA) required a substantial increase in procurement over that of the previous years. These increases were required to equip and supply new forces. No provision was normally made for combat attrition of major weapons systems because of the great cost involved. In addition, war reserve stocks provided only those quantities of combat consumables needed to support the forces until additional stocks could be acquired from new production. This meant that as soon as the Nation started to consume significant quantities of war reserve stocks in combat, procurement of replacement stocks had to begin. The key to adequate logistical support of a contingency plan was to have available sufficient essential materiel to tide the Nation over until stocks could be replenished by production.[2]

The acid test of a logistical planning system was the ability to support combat forces in the field. The rapid deployment and support of 328,000 U.S. forces in Vietnam by October 1966 clearly indicates that a responsive logistical network existed.[3]

The U.S. Army annually prepared three planning documents which were consistent with the programs of the Joint Chiefs of Staff. A Basic Army Strategic Estimate (BASE) guided all other Army planning efforts. The time span of this document ran from the current year to twenty years in the future. The Army Strategic Capabilities Plan (ASCP) stated more specifically what equipment, manpower, broad force structure, and deployments the Army needed to carry out BASE strategy. An Army Force Development Plan (AFDP) adapted BASE and ASCP whenever feasible but without considering a dollar ceiling. AFDP identified the risk to the Nation and established priorities and alternatives to be used if dollar ceilings prohibited filling all of the Army's needs. This plan forecasts (by item, by quantity, by description, and by estimated cost) in which year the Army must buy equipment, organize and train active and reserve units, and construct facilities so that each is available when needed to do the job.[4] The plans stated and refined our force objectives, that is, the required strength, organization, and equipment. Programs specified how much, at what time, and at what cost the planned objectives would be reached, if ever.

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[1] *Hearings* before a Subcommittee on Appropriations, H of Rep, 89th Cong, 2d sess, pt. 1, A, *Approach to the FY 1967–1971 Program and FY 1966–1967 Budgets*, SECDEF Robert S. McNamara.

[2] (1) AMC Historical Summary, FY 1966, pp. 15–16. (2) Submission, AMCMR to AMCHO, 17 Dec 68, p. 7.

[3] AMC News Summary, 14 Oct 66.

[4] RB101–3, CONUS Logistics and Combat Service Support, USA Comd and General Staff College, Ft. Leavenworth, Kansas, 1 Apr 66, pp. 5–11.

The Army Materiel Command entered the Southeast Asia crisis while operating under peacetime conditions. The emphasis was on economy. A possible battle cry during this early period was "cost reduction." The small number of American troops in Vietnam posed no significant challenge to the Army's logistical system. Funding limitations severely curtailed the procurement of supplies and the depot system's repair or care and preservation activities were restrained by austere funding.

At the beginning of the crisis supply pipelines to Southeast Asia and Europe were operating under peacetime conditions. With the increased tempo of activities and the array of Army units assigned to Vietnam, the logistics network was called upon to respond to a wholly new situation. The requirements generated by this new situation forced AMC "to borrow everywhere—from units in the States, from the Reserves, and from the production lines—we pressed industry to the hilt, and somehow the Army's logistical system kept pace with the buildup." [5] Of more immediate concern was AMC's ability to react with the means available to achieve vastly increased materiel support on a timely basis. The impact of this increased demand for SEA came at the very beginning of the new fiscal year. This was fortunate, for AMC had just received and had available its funding for the entire fiscal year. This programed allotment of funds was spent in about four months. These immediately available funds and their rapid application to burgeoning requirements provided the means of meeting the logistical requirements and provided a brief period of time to prepare for and justify the necessary supplemental funds required. The timing of this emergency led General Besson to quip: "The moral of this story is that wars should always start at the beginning of a fiscal year!" He further stated that the availability of these funds was "the only thing that saved us logistically in those early months." [6]

The end product of the AMC programing effort was an approved long-range program extending over a five-year period and was revised annually. This effort assured balanced program development and application of resources, coordinated program execution, effective expenditure of resources, and timely accomplishment of command objectives.[7]

The command's reaction to the reprograming action to support SEA began with identification of PEMA (procurement of equipment and materiel, Army) unprogramed requirements and a special effort to project these requirements to provide a firm procurement program. AMC's attempts to firm up the early SEA support requirements were unsuccessful. In consequence, the command was responding to a constantly changing logistical support program which required redistribution of assets, reprograming of resources, and, in some cases, revamping of procedures.[8]

The five-year base program represented the approved program for the future as conceived and authorized at the time of preparation and publication. This program emphasized tasks. Programing included the process of determining what must be done, how these tasks should be done, relative priorities of tasks, who would accomplish the tasks, and the requirements for resources.

The Comptroller/Director of Programs was responsible to the Commanding General for coordinating responses to Department of the Army staff requests for programing assistance and for exercising centralized control of AMC program development and maintenance. Primarily responsible for accomplishing these tasks were the AMC Program/Budget Advisory Committee and the Program Control Division.[9] The Director of Materiel Requirements was charged with staff responsibility for complete management, control and execution of the AMC logistics management activities, from determining requirements through procurement and

[5] Speech, Gen F. S. Besson, Jr., CG, AMC to Armed Forces Mgmt Association, San Antonio, Texas, 18 Apr 68.

[6] Speech, Gen F. S. Besson, Jr., CG, AMC to Conf of Newly Nominated General Ofcrs, Pentagon, 18 Sep 68, p. 10.

[7] Rpt, AMCCP, 13 May 63, subj: Know Your Prog, p. 21.

[8] Proj "Crystal Ball," AMC Historical Summary, FY 1965, p. 410.

[9] Rpt, AMCCP, 13 May 63, subj: Know Your Prog, p. 24.

distribution to rebuild, and, ultimately, disposal.[10]

A better comprehension of the coverage, of PEMA and OMA (operation and maintenance, Army) funds, and asset reporting procedures and requirements determination, can be obtained by separating them into discrete categories. Their essential interrelationship will be shown following the description of quantities and functions.

The level of PEMA appropriations for the first two fiscal years of AMC's existence was slightly over $3 billion per year. The third year, Fiscal Year 1965, appropriations of $2.8 billion reflected the economic climate in Congress and the Administration. Under the impact of the SEA buildup, the Fiscal Year 1966 appropriations level more than doubled to $8.633 billion. The succeeding years reflected increasing support to SEA: $8.796 billion for Fiscal Year 1967; $10.025 billion for Fiscal Year 1968; and an expected $12 billion for Fiscal Year 1969.[11] Significant trends by activity for Fiscal Years 1962 to 1968 indicated that ammunition funding increased by 532 percent, aircraft by 381 percent, and communication and electronics by 96 percent. Missiles, however, primarily a non-SEA requirement, reflected a downward trend during that period.[12]

The Fiscal Year 1965 procurement program and the projected programs for succeeding fiscal years did not include provisions for a major commitment of U.S. forces to Vietnam. The deployment of additional troops to Vietnam in February and March 1965, and the prospects of more deployments to come, presented AMC with the problem of meeting unprogramed materiel requirements. The question, in brief, was how to identify these requirements and incorporate them into the PEMA procurement program in time to assure effective logistical support to Vietnam.

The supply support situation was further complicated by a number of factors which produced a constantly changing logistical picture. In addition to changing operational concepts and an unstable force structure, there was the complex organizational structure in Vietnam, which meant that a number of commands and agencies participated in the process of determining requirements. As a consequence, the review and approval of both military assistance programs (MAP) and U.S. troop requirements became complex and tedious. Decisions were slow in coming and were subject to many revisions. Not infrequently, they became known to AMC only when implemented by the Department of the Army.[13]

Under the circumstances, AMC could not afford to wait until firm requirements were placed on the supply system. Therefore, in March 1965, General Besson requested his Director of Materiel Readiness and Comptroller and Director of Programs to undertake, as a special project, an analysis of this problem, and to recommend procedures for anticipating requirements and converting them into timely PEMA programs.[14]

The analysis of this problem led to a recommendation that the AMC liaison effort with the Commander, U.S. Military Assistance Command, Vietnam, be increased to provide AMC with existing and projected up-to-date information on materiel requirements in Vietnam. This led to a further recommendation that a special office be established within AMC Headquarters, to use this information, together with information concerning projected troop strengths and MAP requirements, as a basis for forecasting materiel requirements.[15] The Ad Hoc Group, Project "Crystal Ball," created to meet these requirements, served until 1 July 1966, at which time these functions were transferred to the appropriate elements of the Operational Readiness Office and the Directorates of Supply and Materiel Readiness.

As early as Fiscal Year 1964, General Besson was concerned over the question of how AMC, from a conceptual and operational point of view, could provide for better replacement factors in the future. An AMC ad hoc committee's survey quickly disclosed that the establishment of valid consumption factors and procedures for their computation was a problem of long-standing.[16] Materiel planners in the Army service forces and the Technical Services had been

[10] Submission, AMCMR to AMCHO, 17 Dec 68.

[11] AMC Review of Programs, by fiscal year, C/DP.

[12] Submission, AMCMR to AMCHO, 17 Dec 68.

[13] AMC Historical Summary, FY 1966, p. 187.

[14] Memo, Lt Col Owen R. Grogan, Jr., and Frank T. Bailey to AMCMR and AMCCP, 31 Mar 65, subj: Proj "Satisfy," with incls.

[15] AMC Historical Summary, FY 1966, p. 190.

[16] AMC Historical Summary, FY 1964, pp. 428–431.

largely preoccupied with this problem throughout World War II. Policies and procedures for computing replacement factors in 1963 were little changed from those used in World War II and in the Korean War. The AMC study group concluded that existing publications and directives relating to development of replacement factors were outdated and required revision. The approved replacement factors included some for ordnance items that were based on replacement factors published in a supply bulletin for 1956, reflecting Korean War experience. That supply bulletin, in turn, was based on an analysis of U.S. Army and British experience in World War II, as published in a supply bulletin in 1947. Wartime attrition factors for Army aircraft in 1963 were based on a staff study made by the Office of the Chief of Transportation in 1955. For newly adopted items that could be related to like items of an older model, the World War II and Korean War factors were frequently duplicated or extrapolated. For new items lacking such relationship, "judgment tempered by engineering estimates" was applied to the establishment of replacement factors.

Before the SEA crisis, Army logisticians recognized that existing procedures required revision. These new computations had to be based on modern concepts of military operations, doctrine, and technology. A basic deficiency stemmed from a lack of detailed up-to-date guidance concerning the nature of future combat operations in which Army materiel could be expected to be consumed.[17] Although AMC was aware of existing deficiencies in the computation of requirements, the initial impact of operations in SEA on requirements determination occurred in Fiscal Year 1965. This first reaction came when requirements for deployment and Army buildup plans were submitted by the Directorate of Materiel Readiness to DA for approval. The deployment requirements were after-the-fact, which concerned reconstitution of units in continental United States (CONUS) to replace forces already deployed to SEA.[18]

Air Mobility

Requirements

In his February 1965 appearance before a congressional committee, the Secretary of Defense noted numerous and extensive recent changes within the U.S. Army, which increased the Army's capabilities for both conventional and guerilla warfare. These changes gave the Nation a wider range of military response than previously available. There was a need, he said, for time to digest and consolidate these changes, and this was reflected in the proposed program for Fiscal Year 1966. For example, tests of new air mobility concepts by a provisional air assault division were nearing completion, and time would be needed to study the results. In any event, the Secretary believed that the Army's critical shortcomings in air mobility had been remedied and that caution should be exercised in proceeding with any further expansion. A comprehensive review of Army aircraft needs was to point the way, but the results of this review would not be known for some months to come. In the meantime, an austere program of aircraft procurement was planned for Fiscal Year 1966—about 21 percent less than in the previous fiscal year. The largest single item in this category was UH–1D Iroquois helicopters, which were to be bought to replace older helicopters and certain fixed-wing aircraft. As for the CH–47A Chinook transport helicopter, logistics objectives had already been met and this procurement was to be lowered somewhat from the level planned earlier.[19]

One of the most complicated tasks assigned to the AMC ad hoc committee (Project Crystal Ball) in 1965 was the provision of nonstandard items to units being deployed under the new airmobile concept, and the computation of follow-on support requirements. Several complicating factors were involved, including changing requirements, funding restrictions, and the fact that many items required long procure-

[17] *Ibid.*

[18] Submission, AMCMR to AMCHO, 17 Dec 68, p. 7.

[19] *Hearings* on Mil Posture and H.R. 4106 before Committee on Armed Services, H of Rep, 89th Cong, 1st sess, pp. 264–265, 316–317.

ment leadtime. Still another was the lack of a basis for computing repair parts and combat attrition requirements.

Planning for the reorganization of the 1st Cavalry Division under the airmobile concept got under way at the end of March 1965. At a meeting in the Pentagon, Army personnel decided to draft a new table of organization and equipment (TOE) for an airmobile division, and to prepare a shopping list for the nonstandard items involved.[20]

The TOE, which was published on 10 July 1965, listed 178 nonstandard items, which were not yet approved for procurement by the Department of the Army. These included 33 items still under development by AMC, six items managed by the Surgeon General, and 139 commercial, depot fabricated, or specially procured items. These were mostly lightweight, helicopter-transportable items. Some not readily available commercially required a long procurement leadtime.

In June 1965, the Supply and Maintenance Command (SMC) submitted a nonstandard items shipping list to Deputy Chief of Staff for Logistics (DCSLOG), together with a request for authority to procure. On 8 June DCSLOG authorized the Deputy Commanding General for Support, AMC, to procure nonstandard materiel for the 1st Air Cavalry Division with PEMA funds. This authority was limited to the extent of AMC's reprograming authority, or a maximum of $2 million per line item.

During the next two months, AMC furnished $21 million worth of nonstandard items to the 1st Cavalry Division, and initiated procurement action on items not immediately available. In a letter dated 21 September, however, the Department of the Army approved a number of changes in authorizations for both standard and nonstandard items. This caused AMC to defer procurement actions on nonstandard items, pending publication of a change to the TOE and the receipt, from the 1st Cavalry Division, of information concerning the additional quantities of nonstandard items which the division expected to requisition as a result of these changes.[21]

Although Fiscal Year 1966 plans had anticipated a stabilization of aircraft procurement, the unanticipated events of this year led to an increase in the number of aircraft purchased. Fiscal Years 1966, 1967, and 1968 witnessed a significant growth in the Army's aircraft inventory. Although this growth was reflected in actual numbers of aircraft procured, it also was affected by total aircraft costs which increased appreciably as the number of heavy lift Tarhe CH–54 and Chinook CH–47 helicopters increased. Usage rates, or flying hours per aircraft also increased to a yearly average of 530 in Fiscal Year 1968. This increase in flying hours necessitated an increase in the inventory of secondary items required to maintain the aircraft.

The total number of Army aircraft increased from 7,167 to 10,600 in the Fiscal Year 1965 to Fiscal Year 1968 period; the number of large complex aircraft (OV–1, CH–47, CH–54) with a value of over $1 million each, more than doubled during this period. Flying hours for these aircraft increased by a factor of 400 percent and secondary items required to support them multiplied by 500 percent. Flying hours increased from 69,539 in Fiscal Year 1965 to 294,522 in Fiscal Year 1968. Secondary item value went up from $40 million to $218 million. Further increases in all three categories were programed for Fiscal Year 1969.

The inventory of UH–1 and AH–1G medium helicopters totaled 4,414 in Fiscal Year 1968 whereas only 1,905 were available in 1965. This category was represented by 2,480 aircraft overseas. The flying hours in Fiscal Year 1968 were four times the hours flown in Fiscal Year 1965. The cost of secondary item support totaled $489 million in Fiscal Year 1968.

[20] This meeting was attended by representatives of the Department of the Army, AMC, Combat Developments Command, Continental Army Command, and the 11th Air Assault Division (Provisional).

[21] (1) Chronology of Pertinent Facts Leading to Decision to Procure Required Items and Repair Parts to Bring the 1st Cavalry Division (Airmobile) into Readiness Category, C1, with full backup support, incl to Command Decision Fact Sheet, Project Manager for Aircraft Weaponization, 11 Aug 65, subj: Procurement of Nonstandard Items for 1st Cavalry Div (Airmobile). (2) Semi-monthly Headline Rpt, Dir/R&D, 5 Feb 66, subj: Status of Type Classification on Nonstandard Items in TOE of Vietnam Deployment Units.

AVCOM Mission Workload

The management of large scale increases in aviation materiel and concurrent rapid development in Army air mobility doctrine posed a major challenge to AMC's Aviation Materiel Command (AVCOM). The typical Army aircraft changed from the relatively simple O–1 Birddog or OH–13 Sioux to the turbine powered new generation of the Iroquois, the Chinook, and the Light Observation Helicopter (LOH). The mission of light aircraft escalated from the relatively modest spotter, reconnaissance, and exceptional communication and evacuation roles of World War II to expanded combat and evacuation support roles in Korea and to principal troop and cargo carrier, fighting ship, and expanded reconnaissance and communications roles in Vietnam. Clearly, the management of Army aviation equipment became a major enterprise.

The Army aviation materiel agency organized by the Chief of Transportation from a number of predecessors received major responsibility for a growing workload after the 1961 assignment of responsibility for procurement of off-the-shelf aircraft. This procurement assignment and the responsibility for supply support of fielded aircraft constituted the workload basis when the Aviation Materiel Command became a subordinate command of AMC Mobility Command in 1962. In 1963 AVCOM assumed Department of Defense (DOD) cognizance over the Bell Aircraft Plant, a major producer of light aircraft. To the enlarged procurement mission, AVCOM added a research and development mission with the assignment of the Aviation Materiel Laboratories at Fort Eustis, Virginia, in 1964. In 1966 the Army assumed full responsibility for the development, engineering, and procurement of its own aircraft, and AVCOM was accorded a full range of commodity management responsibilities.

AVCOM's new status was acknowledged late in 1966 by its designation as an AMC major subordinate command. At that time AVCOM was assigned responsibility for the Army Aviation Test Activity at Edwards Air Force Base, California. This facility provided a means of obtaining in-house aircraft flight standards and certifications. The Army Aviation Depot Maintenance Center at Corpus Christi, Texas, and responsibility for the funding and workload of aircraft maintenance shops at four Army depots (New Cumberland, Sharpe, Atlanta, and Red River) were also assigned to AVCOM.

In 1968, under the Ownership and Accountability of Selected Secondary Items in Supply (OASIS) Program, oversea ownership and accountability for selected critical air items were reassigned from theater supply agencies to AVCOM. Thus, in a short three years AVCOM evolved from a subordinate activity to a separate command with a burgeoning worldwide commitment for the entire life cycle management of Army aviation materiel.

Late in 1968 AVCOM began implementing a new concept of systems management. This approach emphasized integrating support of all aircraft armament, engines, avionics, and ground support systems throughout the life cycle of an aircraft end item.

Fielding and Support—Selected Major Items

The major air mobility items consisted of aircraft and aircraft engines. UH–1 Iroquois helicopters had been operational since 1959. These were single-rotor, turbine-powered helicopters for transporting personnel, equipment and supplies, performing medical evacuation, disseminating smoke, illuminating battle areas at night, and performing other utility missions.[22] In addition, some Iroquois were armed with machineguns, rockets, missiles, and/or grenade launchers and were used to deliver suppressive, point target and area fire, and to escort unarmed helicopters. The AH–1G Hueycobra, the first helicopter specifically designed as a weapons helicopter, was fielded late in the summer of 1967 and was to assume the mission performed by the armed UH–1 Iroquois. Special Iroquois models had been adopted by the Marine Corps and the Air Force.[23]

During Fiscal Year 1967, the total number of Army UH–1 Iroquois helicopters increased from 2,103 to 3,428. The number of UH–1s in Vietnam also increased by 35 percent. They played a vital role in the Army's air mobility capability in the support of Army operations in Vietnam.

The AH–1G Hueycobra was designed as an attack helicopter. It had higher speed, more

[22] Iroquois Historical Summary, FY 1967, Preface.
[23] AMC Review of Programs, FY 1967, R&A Div, C/DP.

maneuverability, and greater firepower than the UH–1 Iroquois, and was capable of performing search and target acquisition missions, multiple weapons fire support, and troop helicopter support.

During Fiscal Year 1967, the Army established procedures to standardize the transmissions for most of the series of Iroquois helicopters which would permit interchangeability among the various models. This universal transmission program was expected to result in a reduction of grounded Iroquois helicopters in the field because of nonavailability of spare transmissions.[24]

Among the significant problems encountered with UH–1 helicopters were the following: ingestion of sand and grass through the air inlet, which caused engine erosion; aft fuselage longeron failure; marked increase in tail rotor crosshead bearing failures; and a number of failures in the tail rotor yoke. Immediate steps were taken toward modifications to correct the cause of these failures. Among the technical developments was the increase of the engine by 300 horsepower. Lycoming Division of AVCO Corporation started this program in 1965 and delivered the first T53–L–13 engine in August 1966.[25]

In October 1966, General Besson directed the Iroquois Project Manager to restructure his organization and transfer the bulk of his supply and maintenance activities from the Washington, D.C., office to the St. Louis Field Office. The procurement and production activities of Project Iroquois were already concentrated in St. Louis. A plan to accomplish the directed transfer was approved by the Deputy Commanding General, AMC, on 28 October 1966. The transfer of spaces reduced the Project Manager's Washington Office authorized strength from 7 to 5 military offices and from 32 to 20 civilian employees. The St. Louis Field Office personnel authorization increased proportionately.

The objective of the Cheyenne helicopter was to provide a stable aerial weapons platform for escorting troop carrying helicopter formations and to provide suppressive fire. The system included a new integrated helicopter avionics subsystem and advanced fire control. When completed, the Cheyenne was to be the fastest, most accurate in navigation, most lethal, and least vulnerable of any rotary-wing aircraft in the 1970–1980 time frame.[26]

The Army's AH–56A Cheyenne, formerly known as the advanced aerial fire support system (AAFSS), underwent a series of system tests leading to its first flight scheduled for late in Calendar Year 1967. Fabrication and assembly of prototypes by Lockheed Aircraft Corporation continued during Fiscal Year 1967 as planned. The ground test vehicle was completed on 17 April 1967 at the contractor's facility in Van Nuys, California; component testing was begun, and various tests, including wind tunnel tests, were completed in May.[27]

On 6 October 1966, negotiations for production models of the Cheyenne were completed and firm ceiling prices for various alternatives were incorporated into the engineering development contract.[28] The Secretary of the Army requested approval for $1.506 billion to support the total program. The Secretary of Defense disapproved this request, but he did approve $31.4 million for Fiscal Year 1968 to exercise the production option of December 1967 for the minimum quantity of 375 aircraft. This decision remained unchanged at the end of that fiscal year. The AH–56A Cheyenne made its public flight debut on 12 December 1967 and was scheduled to undergo flight tests.

The Cayuse (a version of the LOH) was basically a two-place, light observation helicopter with additional space for 400 pounds of cargo or two other passengers. Its cruising speed was 120 knots with a range of 280 nautical miles. During March and April 1966, the new OH–6A helicopter established 23 world records for rotary-wing aircraft. These records

[24] (1) *Ibid.* (2) Iroquois Historical Summary, FY 1967, pp. 1–3. (3) Maj Gen Robert F. Seedlock, Comdt, U.S. Army Engineer School, "Construction Power and Air Power," *Aviation Digest*, Dec 1967, pp. 2, 3–5, 29–30.

[25] *Ibid.*

[26] AMC Review of Programs, FY 1967, R&A Div, C/DP.

[27] Cheyenne Historical Summary, FY 1967, pp. 4–5.

[28] Contract DAAE 11–66–C–3667(H), Modification No. P002, 6 Oct 66, with Lockheed Aircraft Corp for Development of AAFSS.

were for speed, distance, climbing, and sustained altitude.[29]

The OH–6A Cayuse, powered by the Allison T63–A–5A turbine engine, was introduced into the Army inventory during Fiscal Year 1967. A total of 66 OH–6As equipped with XM27 machineguns were accepted by the Army during this fiscal year. The Cayuse was the first Army aircraft procured with a multiyear contract and the first Army aircraft contract with maintainability and reliability guarantees.[30]

The Army awarded Hughes Tool Company a contract for 714 OH–6As on 26 May 1965, with first delivery to start in June 1966. At the beginning of Fiscal Year 1967, the company had not delivered the first helicopter as required by the contract. The contractor attributed the slippage to technical problems which delayed FAA certification, without which the aircraft could not be accepted by the Government. At the request of the Army, Hughes presented a detailed account of the problems associated with delayed delivery.[31] These problems were summarized as manpower shortages, late deliveries by subcontractors, defective Government-furnished equipment, and engineering problems. The contractor stated that the basis for the majority of the problems was escalation of the war effort.

Because of production slippage and an impasse reached with Hughes on price when attempting to negotiate a follow-on contract for 121 additional aircraft, the Chairman of the House Armed Services Committee authorized a special subcommittee to investigate the program. Since the Secretary of the Army was to be the principal Army witness, the Office of the Chief, Research and Development, DA, was designated to coordinate and prepare necessary information for the Secretary. In the third quarter of Fiscal Year 1967, the LOH Project Manager briefed the Army Policy Council on OH–6A accomplishments and problems. This briefing immediately preceded the initiation of hearings by the Special Investigations Subcommittee of the House Armed Services Committee on 25 January 1967. The report of the subcommittee had not yet been released at the end of Fiscal Year 1967.

The Army accepted the initial production increment of three OH–6A helicopters on 2 September 1966. Thereafter, delivery proceeded at a very slow pace so that at the end of December of that year only 12 OH–6As had been delivered against a cumulative contract delivery requirement of 68.[32]

By the end of Fiscal Year 1967, the manufacturer had delivered a total of 66 OH–6As to the Army, against a contract schedule requirement of 185. In the third quarter of that fiscal year, an Army production specialist concluded that Hughes predictions for future deliveries were, at best, an educated guess. During the fourth quarter, however, it became evident that the company was solving many problems that were interfering with timely deliveries. Nevertheless, it was apparent that the company needed to devote more time improving an integrated production planning and control system with a supporting cost accounting system.[33]

The CH–47 Chinook was a medium-transport, all-weather, tandem rotor helicopter powered by two T55 turbine engines. The aircraft had water landing capabilities and was equipped for day/night instrument flight operations. A rear ramp permitted rapid loading and unloading, and an integral cargo hook was provided for carrying external sling loads. The Chinook could be used for transporting personnel, weapons, equipment, bulk liquids, or other cargo in both combat assault or logistical support roles.[34]

The CH–47A Chinook was capable of carrying 6½ tons. This helicopter's maximum gross weight was 33,000 pounds. Its normal cruising speed was 130 knots with a cruising range of 200 nautical miles.[35] The CH–47B was capable of carrying up to nine tons. Its maximum gross weight was 40,000 pounds and its normal cruising speed was 155 knots with a range of 290

[29] (1) AMC News Release, 1 Aug 66, subj: AMC Meets Added Responsibilities. (2) Address, Gen F. S. Besson, Jr., before AUSA, Wash., D.C., 11 Oct 67.

[30] (1) AMC Review of Programs, FY 1967, R&A Div, C/DP, (2) Cayuse Historical Summary, FY 1967.

[31] Ltr, Hughes Tool Co., Aircraft Div, Culver City, Calif., to CofS, Army, 26 Jul 66, subj: Delayed Delivery —OH–6A Contract DA 23–204–AMC–03389(T).

[32] LOH Historical Summary, FY 1967.

[33] (1) *Ibid.* (2) Fact Sheet, Brig Gen Walter J. Woolwine, Dir/P&P, AMC, to CG, AMC, 17 May 67, subj: History and Current Status of the OH–6A Helicopter Prog. (3) Ltr, CG, AMC, to Maj Gen Robert R. William, Aviation Ofcr, HQ, USARV, 15 Jan 68.

[34] Chinook Historical Summary, FY 1967, p. 1.

[35] CH–47A Model Specifications 114–X–501, 1 May 64.

nautical miles.[36] The first delivery of the CH-47B was in May 1967. The CH-47C, an advanced version of the CH-47B, received DA approval on 10 June 1967.[37]

The Chinook was a mainstay in medium-transport application in Southeast Asia. It proved very valuable under combat conditions, providing both logistical and operational support. In Vietnam, the Chinook was used for fuel supply, movement of artillery and ammunition, transporting troops and refugees, and retrieval of downed aircraft.[38] An analysis of statistical data for Fiscal Year 1967 reveals the extensive use of the Chinook. For example, Chinooks were flown a total of 71,787 hours for 196,400 sorties. They transported 545,600 personnel and 473,500 tons of cargo, and retrieved 1,189 fixed-wing aircraft and helicopters. the aircraft availability rate averaged approximately 64 percent and the utilization rate averaged slightly over 46 flight hours per aircraft per month.

During Fiscal Year 1967, the number of Chinooks in the Vietnam theater increased by 104. A significant aspect of the Chinook's performance was its ability to sustain combat hits without serious damage to the aircraft. During this fiscal year, 151 Chinooks were hit 250 times, 130 of which were considered significant hits. Only three aircraft could be considered as possible combat losses.[39]

In July 1966, the Army established a new supply procedure for selected CH-47 repair parts. Requisitions were forwarded directly from Vietnam to the Army Aviation Materiel Command in St. Louis, Missouri. In April 1967, this procedure was extended to all Chinook items. AVCOM, the central distribution point for all requisitions, broke out and assumed monitorship of the status of all requisitions.[40]

Another major item category was that of aircraft engines. The mission and functions assigned to the Project Manager for T53/T55 aircraft engines were embodied in the charter signed by the Secretary of the Army on 25 February 1967. In summary, the charter gave the project manager the responsibility of insuring that the quantity and quality of these engines, associated components and repair parts, were responsive to worldwide requirements. This included control of development, procurement, production, distribution, logistical support, and applications of engine production in support of Chinook, Iroquois, Hueycobra, Mohawk, and other aircraft systems.

A conference held at AVCOM on 26 July 1966 concluded that a shortage of repair parts for overhaul of T53 engines was a serious problem. In view of the increasing backlog of engines awaiting overhauling, in November 1966 the Commanding General, AMC, directed that an ad hoc group be established to review the situation. After a review of the ad hoc group's findings, General Besson decided to appoint a project manager for T53 and T55 engines, related components, and repair parts. He established this office on 20 January 1967 with Brig. Gen. John J. Hayes as Project Manager and Col. E. L. Snapp as Deputy Project Manager. General Besson approved the charter on 27 January 1967. On 25 February, this charter was superseded by a charter signed by Secretary of the Army Stanley R. Resor.[41] This program had the following goals: to improve the T53 and T55 engines so there would be a greater time span before overhaul was required; to increase the horsepower; and to reduce the failure rate. The supply system established by the Department of the Army and Department of Defense dictated that the economic inventory practices established between the Korean War and the SEA situation be continued. With the Vietnam situation, logistical support was inhibited by the increased flying hour programs and engine failure rates.

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[36] CH-47B Model Specification 114-PJ-602, 22 May 66.

[37] Memo, Stanley R. Resor, SA for Army CofS, 10 Jun 67.

[38] Chinook Historical Summary, FY 1967, pp. 1-2.

[39] Chinook Historical Summary, FY 1967, p. 7-14.

[40] (1) *Ibid.*, pp. 16, 29. (2) For information on the Chinook improvement program, see Truxton R. Baldwin, "The Improved Chinook," *Aviation Digest*, Dec 1967, pp. 22-27.

[41] (1) Special Asst for Proj Mgmt Historical Summary, FY 1967, p. 1. (2) Turbine Aircraft Engines Historical Summary, 3 Mar-30 June 67, pp. 4-5.

Trends in Materiel Requirements

The modern Army was challenged by a wide variety of conflict situations, from subversion and insurgency to major operations. The key to the capability of meeting this challenge was mobility.[42]

In support of the Army's needs for flexible mobility, the U.S. Army Tank-Automotive Command (TACOM) teamed up with industry in a continuing effort to create a wide range of vehicles which would provide a versatile fighting force with the means to traverse virtually any terrain in varied climates. Certain equipment such as tactical vehicles must be capable of long periods of trouble-free operation in all conceivable types of terrain and climate from the swamps and jungles of Southeast Asia to the muskeg and tundra in the North. With more than half of every tax dollar contributed yearly to national defense, the complex weapon systems of modern warfare must be procured at the least possible cost. Finally, in an age of exploding technology, weapons must be developed within the shortest possible time or new equipment may be obsolete before it is issued to the combat soldier.

With the advent of AMC emphasis on quality, TACOM established its quality assurance element on a par with the other operating elements of the command. This organizational structure provided the managerial environment needed to foster and implement the quality assurance requirements and actions necessary for the control of the quality of tank and automotive products. The submission of additional production vehicles to tests conducted at Government proving grounds and the increase of test mileage on vehicles during production provided the data required for reliability and maintainability.

Soon after AMC was established, new techniques in defense contracting procedures were introduced. These techniques had the following goals: attainment of accelerated development cyles with concurrent development of the technical data package; healthy competition for procurement; and early delivery of quality production hardware at the lowest sound price.

From 1963 through 1968, there was a trend toward increasing the use of two-step formal advertising, incentive contracts, and multi-year buys for various types of vehicles and automotive components. The most far-reaching changes were those in contracting procedures for volume procurement of items, as the requirements for military equipment during this period were greatly accelerated by the war in Vietnam.

The three types of materiel management control—functional management, commodity management, and project management—practiced by the Army Materiel Command gave the Commanding General the flexibility that was required. Over a period of years, TACOM increased the use of the project manager concept to achieve desired results. In 1962, only general-purpose vehicles were under project management. The XM561 cargo truck, known as the "Gama Goat," came under a project manager in July 1964, and during the following year that project manager also became responsible for managing the XM705 utility truck. The addition of project managers for GOER vehicles, multifuel engines, the armored reconnaissance scout vehicle, and the mechanized infantry combat vehicle, made a total of six project managers located at TACOM and reporting through its commanding general to AMC.

Fielding and Support—Selected Major Items—Combat Vehicles

Among the most important project managed items in the combat vehicle category was the M113 family of vehicles which was transferred from the Army Weapons Command (WECOM) jurisdiction to the Army Tank-Automotive Command early in 1967. The M113 armored personnel carrier (APC) was a lightweight, low silhouette vehicle designed to transport personnel or cargo. The low net weight enabled it to be transported by aircraft and parachute-dropped to using forces. The vehicle accommodated a driver, troop commander, and eleven passengers. It was the first vehicle to be constructed of aluminum plate. The power plant consisted of a Chrysler V–8 water-cooled engine and a standard Allison heavy duty type transmission. Steering and braking were accom-

[42] This section is based on submissions, CG, TACOM to AMCHO, 11 and 17 Dec 68.

plished by means of a control differential.

The M113 was the first vehicle to successfully use a flat tracked type suspension system. The use of this system decreased its silhouette by almost two feet below that of its predecessor. A hydraulic adjuster was used to maintain track tension. The first production model of the M113 was delivered to the Army in February 1960. The M113A1, an outgrowth of the M113, met the Army's need for dieselization. Its cruising range was increased from 200 to 305 miles by use of the diesel engine. The M113A1 was placed in production in September 1964.

M113 and M113A1 APCs were included in the combat vehicle fleet of most friendly countries. The first M113A1s were deployed to U.S. Forces in Vietnam in the early part of 1967. In April, 73 percent of the APC fleet in Vietnam were gasoline-engine driven. To reduce the hazards of gasoline fires and explosions, an intensive effort was put forth to dieselize the total U.S. Army, Vietnam (USARV), APC fleet. By 1 July 1968, the changeover had been completed despite the fact that the total authorized USARV APC fleet was increased by 38 percent during that same period.

In May 1963 a development program was initiated for the design of a thin-skinned aluminum tracked, six-ton cargo carrier, capable of continuous cross-country operations, swimming inland waterways, and being transported in Phase II of airborne operations. This vehicle, designated the M548 cargo carrier, was developed specifically as an accompanying and resupply vehicle for the self-propelled artillery weapons, M107, M108, M109, and M110. In this accompanying role, the vehicle would transport ammunition and excess weapon crew members as required for minimum sustained combat.

The M548 cargo carrier employed the same suspension and power package as the M113A1 vehicle. In addition to a six-ton payload capacity, the vehicle was equipped with a front mounted winch, either a .50 caliber or a 7.62mm ring mounted machinegun, and a dismountable materiel handling hoist. This cargo carrier was a new item and was not intended to replace current comparable equipment within the Army. May marked the initial deployment of the M548 to Vietnam. A three-man team from TACOM's new vehicle school conducted maintenance training for the units in Long Binh and Qui Nhon areas. By the middle of July, these carriers were released to the troops, and the AMC representative witnessed their use for ammunition transport near Camp Bearcat.

In 1968 the M548 entered its third year of production. The FMC (Food Machinery Corporation) received a contract for production of 3,661 vehicles. Approximately 2,000 had been delivered to the Government and were in service in U.S. Army units stationed within CONUS, South Vietnam, South Korea, and West Germany.

Interest in the commercially developed Commando Armored Car (XM706 Commando V–100, 4X4 Light Armored Car) began in December 1962 when a single vehicle was purchased by ATAC (later TACOM) for testing, and two were bought for evaluation by the Advance Research Projects Agency in Vietnam. The Commando V–100 had a 16-inch ground clearance and swimming capability. It had a liquid-cooled engine and a top cruising speed of 62 miles per hour. The missions performed by this vehicle were generally the same as those for armored machinegun jeeps. Its primary advantages were greater firepower, protection for personnel, and ability to carry a squad-size reaction force.

In 1965 a contract was placed with Cadillac Gage for the delivery of 190 Commando V–100 vehicles, along with concurrent repair parts, for the Government of South Vietnam. Production was temporarily halted in May 1966 due to cracked armor and suspension deficiencies reported on the vehicles operating in Vietnam. Actions by a V–100 task force which was appointed to resolve the problems, resulted in improvements in the manufacturing processes.

In the self-propelled category, M107/M110 self-propelled artillery vehicles were engineered to provide an improved lightweight, self-propelled gun carriage for heavy artillery weapons. This carriage was capable of mounting the three major heavy artillery weapons—175mm gun, 155mm gun, and 8-inch howitzer—and meeting Phase III air transport requirements. The vehicles were designed to replace the GMC (General Motors Company)

M43, M41, M55, M53, and towed artillery pieces, which could not be air-transported because of size and weight. Although some deficiencies and shortcomings were encountered during engineering and service tests, the M107 and M110 self-propelled artillery vehicles met the military characteristics for heavy artilery vehicles.

In October 1965, the first M107 and M110 units arrived in Vietnam to give artillery support to USARV. Their value was immediately apparent; most field units gave praise to their effectiveness. Because of the adverse environment and excessive firing demands, however, many mechanical and hydraulic problems developed. Failure of the power, elevation, traverse, ramming, and spade systems, not previously encountered in engineering and service testing, deadlined vehicles at a rate up to 50 percent, causing great concern as to the future of M107/M110 vehicles in Vietnam.

An ad hoc committee, through a study of the problem reports and interviews with military personnel in and from Vietnam, isolated the component failures and proposed 37 improvements to overcome the immediate problems. Sufficient quantities of improved parts to modify 100 vehicles were delivered by October 1967 and additional requirements were met through a direct exchange of vehicles—one modified for one unmodified. As a result of this program, deadlined vehicles were eliminated.

Selected Major Items—Tactical Vehicles

In the tactical vehicle category, the M561, 1¼-ton, 6X6 cargo truck, had a special coupling which gave it an unusual degree of mobility. The M561 was the first of a new fleet of high mobility trucks to be developed, type classified, and placed under procurement. The requirement for this truck was generated by a study completed in 1961 entitled "Motor Vehicle Requirements, Army in the Field, 1965–1970—MOVER."

The M561 was designed for high mobility over submarginal terrain. It also had floating or swimming capabilities, and could be airdropped. The unique articulated two-body, cargo and tractor design permitted loading of the six wheels on all types of terrain, and significantly improved the performance over previous military trucks. It featured ease of maintenance, reduced fuel consumption, six-wheel drive, and maximum utilization of standard military parts.

The M561 truck was developed and type classified within a four-year period after the award of the development contract to Ling-Temco-Vought in March 1963. A three-year multiyear contract for production quantities of 15,274 M561s was awarded in June 1968 to Consolidated Diesel Electric Company of Old Greenwich, Connecticut. Of the total number, the Marine Corps requirement was 2,224 trucks. The first production deliveries were scheduled for October 1969. The first Army unit was to be equipped with the Gama Goat by 30 April 1970.

In October 1963 the program to replace spark-ignition engines in the 10-ton series vehicles with compression-ignition (diesel) engines was initiated. A technical data package for competitive procurement of the M123A1C 10-ton truck tractor with diesel engine was released and on 29 June 1965 the contract was awarded to Consolidated Diesel Electric Company. Concurrently, a contract was awarded Mack Trucks, Inc., for engineering support. This 10-ton truck tractor, without winch, was conditionally released for operations in Vietnam in August 1967 and formal release was made in November of that year. Currently, two production contracts fulfilled the vehicle requirements of the users. By December 1968, over 1,800 vehicles had been procured and fielded. Approximately 500 M123A1C truck tractors were operating in support of the troops in Vietnam.

In October 1967 TACOM was advised of firm requirements for container systems (modular intermodel transport system: containerization). Due to time limitations, a leasing contract was executed with the Strick Corporation to satisfy the urgent military needs for the roll-on/roll-off mission with the *Admiral Callagham*. Basically this system consisted of two 20-foot containers, semitrailer mounted, with coupling capabilities for conversion to a single 40-foot module. By coupling both containers and semitrailer chassis, loading and off-loading was facilitated, reducing the requirement for trucks and drivers.

A large quantity of these container systems was needed in addition to those which were

leased. Specifications were drafted, an industry review was conducted, and a presolicitation conference was held in August 1968. As a result, eight manufacturers responded and by December 1968 had presented vehicle samples for performance tests to be conducted by the Army Test and Evaluation Command.

Selected Major Items—Missile Support Vehicles

The original contract for the development of Pershing P1 missile support vehicles was awarded to the Martin Company by the Missile Command in March 1958. A decision to transport the firing equipment, consisting of the erector launcher, countdown control and checkout equipment, and power supply and communication equipment, on four tracked XM47E2 vehicles brought the Army Tank-Automotive Center into this project in early 1962. These vehicles, consisting of a modified version of the M113 armored personnel carrier chassis, were produced by FMC, San Jose, California, and delivered to USAREUR (U.S. Army, Europe) and CONUS Pershing P1 units from 1962 through 1966.

An improved Pershing (wheeled version) was developed in 1966 to increase Pershing's ability to shoot, move, and communicate in support of its "Quick Reaction Alert" role. The new ground support equipment was mounted on three wheeled vehicles—M656, truck, 5-ton; XM757, tractor, 5-ton; and XM791, van, 5-ton—and designated the Pershing 1A. The conversion of tracked ground support equipment to wheeled ground support equipment was designated Project SWAP. By December 1968, the Pershing 1A system had progressed through advance production engineering and type classification, into production. The contract for all body types of the three wheeled vehicle, M656, was awarded by the Project Manager, General-Purpose Vehicles, to the Ford Motor Company on 17 January 1968.

Selected Major Items—Automotive Components

Among the most important automotive components were diesel engines. A change in the Army fuel policy permitted the use of diesel engines in combat, tactical, and logistic vehicles. The diesel engine series of the Detroit Diesel Engine Division of General Motors Corporation was selected to implement this change. The 6V53T and 8V71T engines were selected for use in tracked vehicles. The 210-HP 6V53 engine was used in the M113A1 vehicle and the up-powered aluminum 6V53T in the M551 Sheridan vehicle. These were liquid-cooled, V–6 configuration engines with the capabilities of operating on compression-ignition turbine engine fuel as well as diesel fuel. The 8V71 engine was a turbocharged version of the Detroit Diesel Engine Division, GMC, 8V71 commercial truck engine. The engine used by the military was rated 390 HP at 2300 RPM. This engine was used in the M107, M108, M109, M110, and M578 vehicles.

The Army's experience with LD465 and LDS465 multifuel series engines was not altogether satisfactory. These were Government designed, standard automotive compression ignition engines, as defined in Logistical Directive 115–715 issued 13 April 1961. The design of both series was basically identical with the Continental LDS427 multifuel engine, with an increase in displacement from 427 to 478 cubic inches. The LDS465 was turbocharged for air induction, while the LD465 was naturally aspirated.

There were several reasons for the problems with these multifuel engines. In April 1967, when the failure rate was very high in Europe, the Army launched a program in CONUS to find out what was causing the failures. This program revealed that the engine was being overworked. The users were expecting too much horsepower out of a small displacement, lightweight engine. Admittedly, there were problems with the cooling system and there were parts shortages, but basically the engine was overworked.

In the fall of 1967, AMC began derating the engine to a lower power level. This reduced the heat, and it was hoped that this would increase reliability and give the engine longer life. AMC made an effort to improve repair parts support and provided technical representatives from the production engineering contractor.

Both of these multifuel engines could operate on various liquid hydrocarbon fuels, including diesel fuel, and 86/95 octane gasoline. The

ability of the engines to operate on fuels of many grades came from the application of the MAN system, a hypercycle multifuel combustion system, which was invented by Dr. Muerer in Germany. The LD465 replaced the LDS-427–2 as the standard engine for the 2½-ton truck family. The LDS465 was the standard engine for the 5-ton truck series. These engines were deployed to CONUS, USAREUR, USARPAC, and Vietnam. In 1966 and 1967, four production contracts for multifuel engines were awarded—one to Hercules Division for 191 LD475 and 3,589 LDS465 engines and three to Continental for a total of 1,307 LD475 and 2,250 LDS465 engines.

Unanticipated heavy SEA demands for the LDS465–1 engines in Fiscal Year 1967 depleted the inventory and exceeded the available commercial capacity. The Tank-Automotive Command coordinated with AMC and industry for procurement of rebuild parts and the establishment of an engine rebuild capability at Red River Army Depot. Within an unusually short time, engines were being rebuilt at the rate of five per day. Fleet testing for both the 2½-ton and 5-ton truck series was initiated in Fiscal Year 1965 and 200 5-ton trucks were tested at Red River. The objectives were to measure the reliability of the multifuel engine, the durability of the vehicle, and the design corrections in the multifuel engine technical data package. One hundred M44 2½-ton trucks were also tested.

In May 1967, a special task force was activated at TACOM to solve engineering problems with the multifuel engines. The principal areas under consideration were heat rejection, vibration, and quality control. TACOM also initiated a field campaign to instruct operating and maintenance personnel through the media of driver and field maintenance bulletins. In August 1967, the Commanding General, AMC, appointed a project manager for multifuel engines. Prior to Fiscal Year 1969, PEMA funds were authorized to the Project Manger for General-Purpose Vehicles for the procurement of multifuel engines within these vehicle programs. On 1 July 1968, PEMA funds for this purpose were authorized by the AMC Comptroller directly to the Project Manager for Multifuel Engines. These funds were for procurement, production engineering, and testing of the LD465–1 engine for 2½-ton trucks. Funds were also authorized for production engineering and testing of the LDS–2 engine for the 5-ton M656 truck.

After several years of experience, General Besson believed that there was a better way of meeting the multifuel engine problem. In 1968 he concluded that the problem could be solved by buying off-the-shelf commercial diesel engines—engines that had been proved by many miles of satisfactory service to truckers. Accordingly, in Fiscal Year 1968 AMC began procuring Mack diesel commercial engines. Meanwhile, sufficient military designed multifuel engines had to be procured to maintain the old fleet.[43]

Selected Major Items—GOERS, High Mobility Logistical Trucks

The GOER family of vehicles provided a high degree of cross-country mobility for tactical and logistical support elements commensurate with the concept of widely dispersed operations. These vehicles had an inherent swimming capability and were air transportable. Each had a front-mounted 10,000-pound capacity winch. GOERs were extremely rugged vehicles and were easily maintained due to the simplicity of their design. The prime movers were interchangeable within the series. The principles of large earthmoving equipment were adapted to the designs of the GOER family of vehicles. The vehicles were characterized by large diameter, low pressure tires, torque proportioning axles, four-wheel drive, positive wagon-type steering, exoskeletal body construction, and were articulated on the longitudinal plane.

On 18 October 1967, the Commanding General, AMC, named a project manager for Goer vehicles. The GOER family consisted of three members, one of which was the M520, 8-ton, 4x4, cargo truck, designed for use over all types of highways, roads, and terrain. It could be used in fording or swimming operations, fully loaded, in inland waterways without special preparation or special kits. This vehicle

[43] For a discussion of the problems with the LD465 and LDS465 multifuel engines, and recommended solutions, see: Speech, Gen F. S. Besson, Jr., CG, AMC to USAREUR and 7th Army Logistics Seminar, Weisbaden, Germany, 20 Jul 68.

was designed for carrying ammunition, rations, equipment, and personnel for combat operations. A second member was the M559, truck, 4x4, 2500-gallon fuel servicing tank. This tanker was equipped with three hoses with a 300-gallon per minute outlet and a 300-gallon per minute water filter separator, and carried various lubricating oils and greases which enabled it to quickly service fighting vehicles or Army aircraft. This versatility reduced the hazardous period of immobility to a minimum. The M559 truck was used as a distribution vehicle in the combat zone and rear areas to refuel and service several tactical vehicles or Army aircraft simultaneously and for transferring liquid fuel to other bulk dispensers or containers. The third member of this family, the XM553, 10-ton wrecker, was designed to service the other GOERs as well as other vehicles. It was equipped with a 10-ton capacity crane, outriggers, rear winch, and other equipment for use as a wrecker and a recovery vehicle. Sufficient cargo area in the trailing unit bed was provided to carry an engine and transmission assembly for the M60 series tanks, or comparable spare parts for replacement under field or combat conditions.

In troop tests conducted in Europe in 1964 and 1965, GOER cargo trucks, tankers, and wreckers traveled a total of over 66,000 miles. During the testing these vehicles were used in units varying in size from company to division and under conditions varying from autobahn to tank trails to cross-country, and in changing weather from unseasonably dry to wet, cold, semi-frozen conditions. Their cargo included ammunition, rations, tentage, diesel oil, gasoline, lubricants and various other commodities required for both garrison and field support of Army units.

As a result of the troop tests, it was recommended that the GOER vehicles be accepted for field Army use. After the USAREUR GOER Troop Test Final Report, the Commanding General, USAREUR, summarized his views on the GOER family of vehicles as follows:

> It appears to me that the introduction of an 8-ton class (GOERs) of vehicles into our divisions and other combat and combat support units will more than pay for the likely increase in initial procurement costs. This payoff will most likely be realized by the capability of having the ammo and fuel at the right place and in sufficient time. My support of the 8-ton class of vehicles in USAREUR can be assured.

At the request of the Commanding General, U.S. Army, Vietnam, the Department of the Army directed that the available troop tests GOERs be refurbished and shipped to Vietnam. Two vehicles, a cargo truck and a tanker, were reconditioned at TACOM and delivered to Cam Ranh Bay in June 1966. Following successful operation on and off the beaches, they were loaded on an LST (landing ship, tank) and delivered to Qui Nhon, then driven to Pleiku. In August 1966, they were joined by seventeen vehicles from Germany which had been refurbished at the Kaiserslautern General Depot.

In Pleiku, a provisional GOER transportation company was formed and the vehicles were put to work carrying ammunition, fuel, and rations to outlying bases of the U.S. Army's 4th Infantry and 1st Air Cavalry Divisions. The cross-country travel included operations in mud and water up to three feet deep, which immobilized all rubber tired vehicles except the GOERs. Prior to the arrival of the GOERs, the standard procedure had been to tow the rubber tired vehicles and some track type units through the bad spots with crawler tractors. The "mudability" of the GOERs made this practice unnecessary.

When the 1966 monsoon season ended in Pleiku, the GOERs were used for handling supplies over rough pot-holed trails with steep grades and switch backs. The cargo units consistently carried 10 to 14 tons of artillery and small arms ammunition in addition to fuel and other supplies to outposts along the Cambodian border.

After three months of operations, the following comment was received from USARV along with the request for additional GOER vehicles: "The vehicles will be used in direct support of tactical units during operations in severe climatic and geographic conditions encountered in Vietnam." Excellent reports concerning GOER operations were also received from the AMC Customer Assistance Office located in Saigon. The Commanding Officer, 4th Infantry Division Support Command, stated the GOERs were a "godsend" during the severe monsoon season in the Pleiku area.

Prefabricated Piers

Before the buildup, the only deep-water port in South Vietnam was Saigon, and it was apparent that any large influx of U.S. Forces would require additional port facilities. By early April 1966, the United States had embarked on a multimillion dollar program of developing 12 deep-water ports along the South Vietnam coast.[44] Since prefabricated, self-elevating barge piers of the type developed by the DeLong Corporation of New York City offered a much more expeditious means of providing additional ship berths than new construction, AMC promptly prepared a rundown on the disposition of DeLong piers procured over the years by the Army. Of the total past Army procurement, 15 large piers and 6 tramway tower platforms, all that remained in the Army inventory were two large piers (300x90x15 feet) and two small 45x55-foot platforms. These were in storage at the Charleston Army Depot.

During a routine inspection in April 1963, the Supply and Maintenance Command found that there were DeLong pier components at the Charleston Army Depot, but that no records were kept on this equipment and it received no maintenance. When SMC asked for guidance, AMC referred the matter to its Mobility Command. The Mobility Command asked the Chief of Transportation for assistance in making a reply. The Chief of Transportation replied that while existing planning documents contained no requirements for prefabricated piers, such piers could be towed overseas, and areas of potential use were worldwide. The Chief of Transportation recommended that they be placed in permanent storage and kept available for immediate use.

AMC pointed out that self-elevating pier barges could be operated at nearly any location and within a short time as compared to fixed pier construction. This made these piers immeasurably valuable and an item that should be retained in the inventory. Thus, a self-elevating pier was available for movement to Vietnam in the summer of 1965.

When the story about port construction for Vietnam appeared in the press, one of the two large pier barges in storage at Charleston, South Carolina, was already committed for lease to the Italian Government for use in a joint program for launching space vehicles from near the equator. AMC promptly asked if the other components available for issue were needed in Vietnam. At first, the reply from Vietnam was that there was no need for the DeLong pier. AMC dispatched a further message emphasizing the advantages over permanent pier construction. At the same time, AMC directed the Charleston Army Depot to overhaul this equipment by 1 July 1965.

Later, on 28 July 1965, AMC asked the Commander in Chief, U.S. Army Pacific (CINCUSARPAC) for a projection of requirements for barge piers, together with justification, to provide a basis for further procurement. Inexplicably, information from Vietnam continued to indicate no requirement for these items, but CINCUSARPAC overruled that assessment, and arrangements were made for the existing pier to be moved to the theater from Charleston. Movement required a large, oceangoing tug, which was obtained by commercial contract. The tug left Charleston on 11 August, and arrived at Cam Ranh Bay some 81 days later. Within 45 days after its arrival there, the prefabricated pier was installed and in operation.

To AMC, the dispatch of one DeLong pier to Vietnam was only the beginning, and the Transportation Division, SMC, briefed DCSLOG representatives on the need for additional self-elevating pier barges at Cam Ranh Bay, Qui Nhon, and Vung Tau. The total requirement was put at six 300-foot and eight 150-foot barges, and costs were estimated at $11.5 million if procured in Japan. Early in October three more 300-foot piers were added to the proposed program in response to a USARPAC requirement for such piers at White Beach in Okinawa. AMC estimated the total requirement at $18.29 million if the prefabricated piers were procured in Japan, or $23.9 million if they were built in the United States.

Foreseeing the complexities of this program, and the widespread coordination required in such an offshore procurement, the Commanding

[44] The *Washington Post*, April 7, 1966.

General, AMC, hired Brig. Gen. James Glore, a retired Tranportation Corps officer, to serve as his Special Assistant for Prefabricated Piers. General Glore, who was given complete responsibility for the prefabricated pier program, reported for duty on 2 November 1965 and initiated a round of conferences with various Army and defense agencies, and with representatives of the DeLong Corporation in New York City. Following the conferences, on 1 December, he went to Vietnam to determine bottom conditions, engineering requirements, and priorities of delivery at various sites. He then journeyed to Japan to determine if resources there were adequate to support a DeLong contract. Preliminary planning called for the barge hulls and caissons to be bought offshore, and for jacks, compressors, valves, and other mechanical items to be procured in the United States. All items were to be "married" at port site in Vietnam by the prime contractor, with no local Army support being required.[45]

On 6 December 1965, the Secretary of Defense approved $18.3 million for the procurement of DeLong-type piers and necessary ancillary equipment. This included approval to award a sole source letter of intent to the DeLong Corporation, with hull construction to be done in Japan, and the remaining items purchased from U.S. firms. Apart from the monetary savings involved, buying hull structures in Japan would cut towing time to approximately 18 days from Japan to Vietnam, compared to approximately 80 days from the west coast of the United States.

A letter contract was signed with the DeLong Corporation on 6 December 1965, thus enabling DeLong's Japanese subcontractor to get the necessary steel from the December 1965 rolling schedule. The contract called for the delivery of 7 pier barges measuring 300x 80x13 feet, and 14 units which measured 150x 60x10 feet, together with all required ancillary equipment. The delivery schedule which finally evolved with the Japanese shipyards provided for completion of one set of piers in March, another in April, two in May, and three in July 1966.[46]

[45] (1) AMC Historical Summary, FY 1966, pp. 218–228. (2) AMCMR Historical Summary, FY 1966, pp. 61–62.

[46] (1) *Ibid.*, pp. 62–63. (2) Of these seven sets, six were for Vietnam and one was for Okinawa. (3) Army Buildup Progress Rpt, 17 Mar 66, pp. 39–40.

By early March 1966, it was evident that additional funding would be required. AMC estimated these further costs at $20.25 million, of which half represented new requirements, principally at Qui Nhon. The rest was for items unforeseen and not included in the original estimates, such as wooden decking, lighting systems, towing costs, trestles, and additional jacks.[47]

The additional funding requests prompted a number of questions by the Secretary of Defense about the prefabricated pier program—questions which indicated a concern over balance of payments. He questioned the need for three additional piers at Cam Ranh Bay, and, if needed, whether they were required as early as July 1966. He wanted to know why lighterage operations could not continue at Qui Nhon, and asked if it was possible to supply Qui Nhon overland until a U.S. produced DeLong Pier could be obtained.

In reply, Army and AMC representatives pointed out that the $10.25 million requested for ancillary equipment was based on detailed, on-site inspections, and represented items not included in the original estimates. As for four piers at Cam Ranh Bay, they were needed to meet an annual deep-draft shipping requirement expected to stabilize at 1.4 million tons a year, and to provide one passenger berth and a ten percent contingency factor. The target dates were based on troop deployments and expectations for large shipments of construction materials.

The tonnage requirements at Qui Nhon were estimated at 750,000 short tons annually. There was a 7 or 8 month time differential between offshore and CONUS procurement which meant that American-made self-elevating piers could not be installed at Qui Nhon before the monsoon season. During bad weather, which was especially prevalent from October through January, lighterage operations would become sporadic and unsafe, and tonnage discharged could be cut in half. Furthermore, self-elevating piers at Qui Nhon would permit savings equivalent to approximately four medium boat companies.

To undertake to supply Qui Nhon through Cam Ranh Bay until a U.S.-produced pier could be installed presented problems. Use of

[47] Ltr, AMCMR to DSCLOG, 11 Mar 66, subj: Revised Prefabricated Pier Prog.

coastal shipping would involve extra handling and transshipment costs. Land transportation was not practicable since rail and highway routes were impassable at points beyond Na Trang. Furthermore, trucking units necessary to move approximately 2,500 short tons a day at distances of about 150 miles were not available.[48]

In April 1966, the Secretary of Defense approved the reprograming of $18.8 million for the prefabricated pier program. This included $10.2 million to complete the original DeLong pier program, $8.6 million for four new "A Units" for Qui Nhon, and two new CONUS-procured pier sections for Cam Ranh Bay. CINCPAC subsequently decided, in July 1966, that modification of planned Vietnam installations could eliminate requirements for the two CONUS-procured pier sections at Cam Ranh Bay, thus making two "A Units" available for Okinawa where tonnage requirements were increasing.[49]

Jungle Clearance Machinery

With the buildup in Vietnam, establishment of base camps and defense perimeters demanded machinery to clear large areas of jungle. Jungle clearing machinery could also be widely used in blocking infiltration routes.

The most likely commercial item for this purpose appeared to be a plow-like device for use on crawler tractors produced by the Rome Plow Company. In commercial ventures, Rome plows had proved effective for clearing jungle vegetation. By using 25 crawler tractors equipped with Rome K/G blades to cut vegetation, and another 25 tractors to pile it for burning, it was estimated that a swath 600 feet wide and 7 miles long could be cleared in a 14-hour day.[50] Once cleared, the area could be kept cleared by defoliants applied by aircraft at seven to nine month intervals.[51]

The first six of these land clearing tools and machinery arrived in Vietnam in July 1966, together with a technical representative from the manufacturer, and were put to work by engineer units. In the meantime, further tests conducted at Alexandria, Louisiana, indicated that Rome plows offered considerable long-range potential for other problems being encountered in Vietnam, and AMC learned that it would be able to procure plows at the rate of 60 a month, if given a three-month lead-time.[52]

Rome plows proved to be effective in the theater, and in August 1966 USARV asked for 56 more for use by engineer battalions in clearing base camps and perimeters.[53] The Department of the Army program authority for these blades was released to the AMC on 19 September, and on 28 October a contract with the Rome Plow Company was signed. It called for deliveries to begin on 1 March 1967 at the rate of nine sets per week.

Both AMC and the contractor made every effort to accelerate production, particularly after 31 January 1967 when the USARV asked for immediate airlift of 18 Rome plows to Saigon, where they were urgently needed to support Operation Junction City and to expedite clearing operations at Long Binh. In response to this request, one plow was dispatched almost immediately and the other 17 were airlifted to Vietnam during the period 25 February–2 March 1967 as they became available from production. The Deputy Commanding General, USARV, congratulated the AMC for furnishing these items, approximately 133 tons of cargo, by special airlift to Vietnam.[54]

By mid-June 1967, AMC had supplied 175 Rome land clearing blades, including 21 for maintenance float, to USARV. All were designed for mounting on the D–7 tractor. This quantity met USARV's immediate requirements, but, anticipating further needs, AMC continued to investigate the possibility of a broader based land clearing capability. The most promising possibilities, should more equipment be needed by the USARV, were the modification of the existing dozer blade kit

[48] AMCMR Historical Summary, FY 1966, pp. 67–69.

[49] (1) Memo, SECDEF to SA, 25 Apr 66, subj: DeLong Pier Procurement. (2) Rpt, Army Deployment and Support Problems—Vietnam (U), supplement to RCS-CSOCS-74, Army Buildup Progress Rpt, 1 Aug 66, p. 10.

[50] (1) CofS, AMC, Working Files, MAC 4846, 13 Jun 66. (2) CofS, AMC, Working Files, CVP 257, 22 Apr 66. (3) CofS, AMC, Working Files, GVP 404, 17 Jun 66.

[51] CofS, AMC, Working Files, GVP 627, 13 Sep 66.

[52] (1) CofS, AMC, Working Files, MAC 7326, 23 Aug 66. (2) CofS, AMC, Working Files, MAC 8089, 16 Sep 66. (3) CofS, AMC, Working Files, ARV 104, 10 Oct 66.

[53] (1) CofS, AMC, Working Files, GVP 805, 4 Nov 66. (2) CofS, AMC, Working Files, WDC 13675, 18 Nov 66.

[54] CofS, AMC, Working Files, ARV 385, 27 Feb 67.

for the M48A3 tank or the development of a larger Rome blade for this vehicle.

Project Power Float

In the spring of 1966, Dr. Lester Goldsmith, retired Chief Engineer of the Atlantic Refining Company, made an imaginative proposal for taking up some of the power slack in Vietnam. He had designed the prototype of the World War II electric-drive T–2 tanker, and he suggested that some of these ships be withdrawn from the mothballed reserve fleet and positioned off Vietnam as floating power barges. The ships' engines could be converted into generators, and each tanker could carry more than a year's supply of fuel.[55]

AMC accepted this proposal as a partial solution to the Vietnam electric power shortage problem for which no other solution had been found. There were tankers in the reserve fleet, each capable of furnishing 5,500 KW of power. The concept involved operating the tankers as barges rather than as seagoing vessels. Each could carry a three-year supply of operating fuel and the first could be on site in Vietnam in about 120 days after program approval. At that stage of the proposal, cost estimates for such power were still purely guesswork. The costs of any worthy prospective solutions needed further consideration.[56]

When compared with large nontactical generators, which has a procurement leadtime of seven to eight months, the use of T–2 tankers as power sources, by virtue of their early availability, offered considerable promise. In a letter of 22 March 1966, Gen. Harold K. Johnson, Army Chief of Staff, endorsed General Besson's power barge proposal, terming it an imaginative approach that would both satisfy current requirements and provide a backup source for emergencies and possible expansion. He promised the full support of the Department of Army staff in getting this program underway.

With Chief of Staff approval of the concept, AMC drew up plans for the activation of 11 T–2 tankers, their conversion into power barges, and for construction in Vietnam of five land distribution systems for the power thus supplied.[57]

AMC designated Lt. Col. Charles E. Hoskin III as its Project Officer for "Project Power Float." USARV stated a firm requirement for seven ships at the three locations of Cam Ranh Bay, Nha Trang, and Qui Nhon. In addition, Vung Tau and Long Binh were considered as possible sites, and by December 1968 a possible requirement for a fourth ship at Cam Ranh Bay was under consideration. These ships were to be considered as permanent power plants to meet the increasing USARV requirements. USARV also recommended that action be taken to award a contract for design and procurement of land distribution system materials, and initiated transfer of funds from USARV to AMC for that purpose.[58]

AMC promptly awarded letter contract to the Vinnell Corporation of Alhambra, California, for the activation of T–2 tankers and for the design and procurement of materials for a land distribution system at Cam Ranh Bay.[59] Vinnel began work on the tankers *French Creek* and *Lone Jack* at Seattle in April 1966, and both vessels arrived at Cam Ranh Bay the following June.

To administer the program for engine generators, the AMC had established a project manager's office in St. Louis, Missouri, in 1963. On 1 July 1967, that office was superseded by the Mobile Electric Power Project Manager's Office located in Alexandria, Virginia. The mission of the new office was expanded to include the management and standardization of mobile electric power generating sources for all of the Department of Defense. Through coordination among the military departments, an agreement was reached to reduce the number of makes and models of gasoline and diesel engine-driven generator sets in the inventory from approximately 2,000 to 69 configurations. Also, the armed services developed joint operating procedures to con-

[55] Gen F. S. Besson Jr., Remarks to Natl Defense Association, 21st Annual Transportation and Logistics Forum, Dallas, Texas, 20 Sep 66.

[56] CofS, AMC, Working Files, GRP 107, 24 Feb 66.

[57] CofS, AMC, Working Files, GOF 0297, early Apr 1966.

[58] Msg, CG, USARV, to CG, AMC *et al.*, RUMSVC 088, 5 April 66, subj: Proj Power Float (from CofS, AMC, Working Files).

[59] See Contracts DA–23–195–AMC–00536 (T); and DA 23–195–AMC–00772 (T), respectively.

trol the introduction of makes and models of generator sets into the DOD inventory.[60]

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[60] (1) MIL STD 633B; 21 Nov 67. (2) AR 700-101, AFR 400-50, DSAR 4120.7, Apr 1968, subj: Logistics Joint Operating Procedure: Mgmt and Standardization of Mobile Electric Power Generating Sources. (3) NAVMTINST 4120.100, 3 May 68.

MATERIEL: SHOOT

Our needs are not centered around a few weapons systems. The hardware needed to effect prompt and sustained combat operations must be effective in a variety of geographic and climatic conditions. . . . Above all, the equipment and tools of war must provide the Army a flexibility of response.

GEN F. S. Besson, Jr.
DOD Advanced Planning
Briefings for Industry
Chicago, Illinois
1 April 1965

CHAPTER VII

MATERIEL: SHOOT

Considered either chronologically or in operational sequence, the military need to move came before the need to shoot, yet for several centuries improvements in military flexibility of response depended more on developments in weaponry than on developments in transport. World War I saw the acceleration and merging of the two streams of development when desperate efforts to break the Western Front stalement brought mobile weapons, the tank, the airplane, the railway gun, to prominence. By the time of the Army Materiel Command's (AMC) advent, several technological generations later, flexibility of response demanded a vast and ever changing arsenal ranging from World War I types of ammunition to complex, electronically controlled, nuclear warheaded missiles. There was pressure in every area for greater flexibility, more mobility, more firepower, more versatile control, and more reliability.

The three AMC commodity commands, U.S. Army Weapons Command (WECOM), U.S. Army Munitions Command (MUCOM), and U.S. Army Missile Command (MICOM), which assumed responsibility for maintenance and improvement of the Army's "shoot" capability were the successors of three Ordnance subordinates, respectively, Weapons, Special Weapons-Ammunition, and Missile Commands. Like their sister commands, WECOM, MUCOM, and MICOM were each assigned the full range of commodity management, encompassing research and development, procurement and production, materiel cataloging and standardization, supply control, stock control, and maintenance. Despite the common heritage and the like assignment of responsibilities, each of the three commands had individual problems of adjustment and contributions to AMC's centralized logistics system. Differences in commodity areas made for differences in command structure and specific methods of operation. MICOM, for example, charged with some of the largest, most expensive, and most advanced of AMC's weapons systems, tended to work more than the other commands with the new and burgeoning aerospace industry; its in-house capability consequently stressed management more than operation. WECOM, working with more conventional systems and longer established technologies (except in the field of fire control), placed a somewhat greater emphasis on in-house operational capability, primarily as a means of preserving know how. MUCOM, largest of the commodity commands in terms of number of employees, installations, and, often, expenditures, maintained a commodity center establishment and a Government-owned production complex with an extensive in-house capability.

Weapons

In the years since its establishment as an AMC commodity command, WECOM has concentrated on developing conventional weapons with increased firepower, greater mobility, and extended ranges suitable not only to full scale warfare but also to limited warfare such as in Southeast Asia. This concentration has involved improving old and developing new individual and artillery weapons, providing weapons for the armament of light aircraft, and de-

veloping combat vehicles such as the increasing variety of self-propelled guns.[1]

Commodity Management

Weapons commodity management procedures continued along well established lines at the time of WECOM's establishment. Some initial variations were required to accommodate to enlarged responsibilities in the combat vehicles area where AMC project managers were designated in the first year. Project managers were also designated for the Davy Crockett weapon system and for two rifle projects. With the initiation of the Army Supply and Maintenance System (TASAMS) in 1964, the fire control NICP (national inventory control point), formerly at Frankford Arsenal, was consolidated with the WECOM Headquarters NICP. In 1965, when General Besson directed the standardization of commodity management procedures, WECOM created a Commodity Management Division to replace its Materiel Management Division. Two years later the command consolidated the commodity management and aircraft weaponization elements to establish its Commodity Management Office and transferred other headquarters commodity management functions to this office.

The new Commodity Management Office, reporting directly to the WECOM Commanding General, exercised, in a pattern illustrative of procedures in other commodity commands, specialized management of mission items, including artillery weapons, weapons systems for utility, observation, cargo and assault helicopters, optical and electronic fire control systems, small arms weapons, and combat vehicle weapons systems. Another very significant function of the office was to provide AMC representatives for the introduction of new equipment into the Army system.

Commodity management is an item-oriented management technique and does not involve full-line authority, but it does serve to coordinate various functional activities and provide an item or system focus. The WECOM Commanding General designated commodity managers who were responsible for a single item or a group of items.

The objectives of commodity management were to provide a degree of integrated life cycle management for major and secondary items, to coordinate the diverse functional efforts relating to particular items or systems, and to provide the commander with a management focal point and an overview of all activities relating to particular items or systems. The basis of selection of items for commodity management was dollar cost, urgency, or particular interest. The need for appointment of a commodity manager was considered as early as the feasibility study (initial assessment of materiel requirements) phase, and under normal circumstances, was continued until the materiel was fully fielded.

The major activities of a commodity manager were to plan or see that planning was done, review results, suggest necessary actions, and to coordinate activities of various functions and groups. He acted as the focal point within the command on major actions pertaining to his assigned commodity or commodities. Action included contacts with other AMC elements, with Department of the Army (DA) elements, with Combat Developments Command, and with field or user commands. It also included cognizance of complaints about performance or support of a managed item.

The commodity manager reported to the WECOM Commander, usually through the Chief of the Commodity Management Office. The commodity managers were supported by a permanent team of functional specialists designated by the functional directors. Although the team members were not under the commodity manager's direct authority, he was designated and accepted chairman of the team and, as such, exerted considerable influence. The Commodity Master Plan was the primary instrument used by the commodity manager for planning, coordinating, and assigning commodity effort.

AMC Field Representatives for New Equipment were designated by the WECOM Commander, and their objective was to establish a special high-speed channel for the flow of new equipment deficiency information to the Commanding General, AMC, and to the AMC elements having responsibility for the correction of the deficiencies. These representatives were usually military personnel with the rank of major or civilians of equivalent civil service grade. Representatives accompanied initial dis-

[1] Unless otherwise noted, this section is based on submissions, WECOM to AMCHO, 11 and 17 Dec 1968.

tribution of new equipment to oversea theaters and remained with the equipment during its introduction to field use. They reported any major deficiencies to the responsible command as quickly and completely as possible and helped to resolve these deficiencies. After the introductory phase, the representative maintained surveillance over the equipment until one year after the date of initial introduction. There was no need for him to physically remain in the oversea theater, but only continue as the point of contact for the deficiency reporting during this period. In actual practice, the AMC new equipment representative became the responsible command's field representative on almost all matters pertaining to the system or item during its introduction and distribution.

Under normal circumstances the computation of requirements for weapons procurement, production, distribution, and overhaul was subject to the problems usually associated with commodity management. In weapons, as in other commodities, requirements were determined according to the size, composition, and mission of the Army force in being or planned. The gross requirement was then factored against estimates of weapons wearout and obsolescence, against overhaul capabilities, and against the existing inventory. Net requirements for each weapon, as stated in the Army materiel plan (AMP), formed the basis for programing and budgeting. As in other commodity areas, weapons requirements for the Southeast Asia buildup created unusual requirements problems.

The draft AMP submitted to DA in May 1966 contained a number of weapons increases. For example, the net requirement for the M14 rifle, then being introduced as the standard rifle, multiplied more than fivefold over that of the June 1965 AMP. Unanticipated demands for mortars and carbines had already drastically reduced depot stocks. In all, a recomputation and rejustification of requirements for about 30 weapons items was required. But these initial requirements were only the beginning. Warfare in Southeast Asia continued to increase demands for old items and accelerated demands for new or modified items with greater firepower, more mobility, greater range, and more versatility. These demands are demonstrated by examples of weapons fielded and supported in Southeast Asia.

Fielding and Support—Selected Major Items

In the area of individual weapons (small arms), the M79 grenade launcher was developed and used to effectively fill the gap between the range of the hand grenade and mortar. To further increase the individual infantryman's firepower, the grenade launcher attachable device (GLAD) was developed to enable the M16 rifle, introduced on an accelerated basis, effectively to serve its second purpose as a grenade launcher.

In the area of artillery, the M102 howitzer was developed to increase the firepower of combat units operating in difficult terrain. This weapon, along with the WECOM developed and produced Air Mobile Firing Platform, was indispensable throughout the Vietnam war zone.

The only heavy artillery currently in Vietnam was the M107/M110 system. This system included the 175mm and 8-inch gun and howitzer. Along with artillery must be included the increased firepower provided by the M109 howitzer. This weapon was perhaps the most popular employed in Vietnam. It was not only used to provide close support fire, but also was used in cooperation with mechanized combat operations.

But, perhaps the best examples of firepower developed specifically for the Vietnam War were the various helicopter armament subsystems. Though these subsystems initially utilized only single types of weapons, they evolved into multiple weapon systems that provided suppressive fire to cover landings and reconnaissance operations.

WECOM significantly increased weapons mobility. Perhaps the best example of this gain in mobility was the M102 howitzer. This weapon was designed specifically for helicopter operations, and it could easily be transported with its crew and ammunition in a single load. The Air Mobile Firing Platform further enhanced its mobility.

Though extended range has been a goal for development of most weapons used in Vietnam, perhaps the most striking example of range improvement was reflected in the M109 howitzer program. Although the weapon was already the most widely used artillery system

employed in Vietnam, extended range for the M109 was a most significant consideration. Initially extended range was achieved through development of the XM123 propelling charge, but use of the new charge without other modification resulted in M109 vehicle damage, excessive maintenance, and crew discomfort. Acceptable extended range was then achieved through the use of the XM123 propelling charge along with the recently developed "long tube" barrel for the howitzer. Utilization of the new charge and barrel provided an 18,887 meter range, with elimination of blast problems and minimization of crew discomfort.

A further review of each of these and other examples of fielded and supported weapons demonstrates that conventional weapons improved by old and new technologies have their firm and significant place in the arsenal.

Among individual weapons, the M79 40mm grenade launcher is the infantryman's lightweight shoulder weapon used to launch a grenade. It was widely deployed in Vietnam beginning in 1963 to provide the foot soldier with protection and offensive capability in that range between approximately 50 meters, as far as he can throw a hand grenade, and 400 meters, the minimum for mortar fire. A weapon of proven reliability and accuracy, the M79 was used extensively by infantry squads in jungle and rice paddy operations where mortar and artillery support were restricted because of adverse terrain.

In the late fall of 1963, the M79 program was in serious difficulty because of the failure of commercial producers to deliver weapons as scheduled. A task group was subsequently formed and spent approximately two months reviewing the technical data package (TDP), making engineering changes, and reviewing procedures and controls. Production and procedural problems were resolved with and for the contractors by the close of the fiscal year.

Infantry experience in Vietnam indicated the M79 grenade launcher had one distinct disadvantage in that the grenadier could not carry the launcher and an M16 rifle; the rifle was for his personal defense. To overcome this disadvantage, contracts were let for the development of a 40mm Grenade Launcher Attachable Device for the M16 rifle. In addition to Infantry Board, Ballistics Laboratory, and other tests, WECOM was instructed to form a task force to evaluate the GLAD device, the results of which were presented at an in-process review in August 1968.

The need for a project manager for the AR–15 (M16) rifle developed when DA decided to develop a very lightweight, small-caliber individual weapon for special combat roles such as counterinsurgency operations. A project managership was established on 6 March 1963 to operate in conjunction with the WECOM Project Manager for the M14 Rifle. The M16 Project Manager's Office was established at WECOM on 21 October 1963 to exercise full-line authority over planning, direction, and control of tasks and associated resources involved in providing the rifle to the using units. All phases of research, development, procurement, distribution, and logistical support were included in the project manager's scope.

The AR–15 (M16) rifle was a proprietary item of the Colt Patent Fire Arms Company. This fact made sole source procurement necessary. Another procurement complication was the fact that the Army, Navy, and Air Force ordered their rifles together. This otherwise orderly procedure was disrupted by dissimilar designs for the Army's model of this rifle. These modifications were not acceptable to the other two services. The rifle was designed by the Armalite Division of the Fairchild Aircraft Corporation, but the production rights were subsequently purchased by Colt. The first military adoption of the weapon was for the Air Force in 1960, with subsequent Air Force and South Vietnamese experience indicating the weapon's potential effectiveness in counterinsurgency operations.

The Vietnam War vastly increased requirements for the M16 rifle; a significant factor in this increase was the decision to arm the South Vietnamese Army with this weapon. The U.S. Government accordingly purchased the weapon's manufacturing rights from the Colt Company, thereby making additional supply sources available. Four producers responded to the Army's request for proposal for the weapon. Discussions were held with the producers to clarify technical and production difficulties, and contracts were awarded to the Hydramatic Division of General Motors Corporation, and Harrington and Richardson Incorporated in April 1968. Accelerated deliveries required by these contracts were to result in

M16s becoming available for Vietnam approximately six months earlier than under normal procedures.

One of the artillery examples, the M102 howitzer, is a lightweight 105mm weapon designed for helicopter-borne operations which occurred extensively in Vietnam after February 1966. This weapon is easily transportable to any tactical position by Chinook helicopter with a basic supply of ammunition and the crew in a single load. The M102 design included dry film lubricants, which greatly reduced maintenance operations, and a wishbone shaped lower carriage trail which facilitated 360-degree on-carriage traverse capability. This capability, coupled with new and more accurate fire control, provided for quick adjustment in defeating a target in any direction from the original position. The feature best liked by the using troops was the variable recoil mechanism which eliminated the need for digging a recoil pit to accommodate high-angle firing. The weapon's lightweight, ease of handling, and speed of emplacement made it extremely useful and contributed to the successful employment of artillery in combat missions.

The Air Mobile Firing Platform developed for use with the M102 enabled the weapon to be used in marshy, wet terrain where the use of artillery would otherwise be impossible. After the Vietnam requirement for the platform was received, six prototypes were delivered for combat evaluation in October 1967. These platforms provided an added advantage to artillery, because standard artillery pieces could now be employed in areas that were heretofore inaccessible to such operations.

Another artillery example, the M107/M110 weapon system, was the only heavy artillery employed by U.S. forces in Vietnam. These were lightweight, long-range, air-transportable, self-propelled systems, with interchangeable weapons that provided heavy artillery support in combat operations. Units could interchange the M107 175mm tube assembly with the M110 8-inch tube to fit a given combat situation. From the very outset of hostilities in Vietnam, the M107/M110 was used with remarkable success against hostile bunkers, field works, and in counterbattery fire, especially in the I Corps area around the demilitarized zone.

In WECOM, the Special Assistant to the Commanding General for the M107 and M113 family of combat vehicles for several years exercised full-line authority, direction, and control of tasks and associated resources in providing the using forces with the M110 8-inch howitzer, the M107 175mm field artillery gun, and other weapons. The Office of Special Assistant discontinued in Fiscal Year 1967 because of the transfer of the M107/M110 Project Manager to the U.S. Army Tank-Automotive Command (TACOM).

Guidance and funding for a new artillery system, the 155mm Close Support Weapons System (CSWS), was initially provided to WECOM during Fiscal Year 1965. This funding provided feasibility studies of the system which included a self-propelled, medium (lightweight, unarmored), 155mm howitzer (XM138); a rocket assisted projectile (XM549), and XM164 and XM123 propelling charges. Funding guidance was again received during Fiscal Year 1966, which provided for continued work on the XM549 rocket assisted projectile, the XM164 and XM123 charges, and components common to both armored and unarmored versions of the weapon.[2] During Fiscal Year 1967, AMC chartered a Project Manager for 155mm Close Support Artillery Weapon Systems at WECOM headquarters. This office exercised full-line authority over all planning, direction, and control of tasks and associated resources involved in providing the system to the using units.

Lt. Col. John B. Hanby, Jr., was appointed project manager for this system which was expected to cost approximately $100 million to field. At the close of Fiscal Year 1967, this weapon system was in the advance phase of formulation. During the last half of the fiscal year, the following significant events occurred in the program: A DA-approved qualitative materiel requirement was issued in January; the project manager's charter was approved by DA in April; and a draft technical development plan for the XM138 howitzer was forwarded to AMC in April and distributed in June.

In March 1968, responsibility for the howitzer, self-propelled, M109 was additionally as-

[2] WECOM Historical Summary, FY 1966, pp. 260–261.

signed to the Project Manager for the 155mm Close Support Artillery Weapon System (PM-CSW). This final transfer of Project Manager, Combat Vehicles, items of responsibility eliminated that project managership. Accordingly, AMC approved a new and expanded charter for PM-CSW, and Col. James K. Hoey replaced Colonel Hanby.

The XM138 weapon remained in the formulation stages of development with three proposed design concepts under study. A design study was performed on these concepts by the Cornell Aeronautical Laboratory, Incorporated, to provide the project manager with information necessary to assess the three concepts. During Fiscal Year 1968, various XM138 component developments studies were also conducted at Watervliet, Rock Island, and Frankford Arsenals, and at TACOM. The major components studies were: use of a stub-cartridge case in the cannon; design of a new XM181 cannon; and study of two loader-rammer concepts. A preliminary evaluation of design concepts was conducted by the U.S. Army Artillery Board, while two proposed designs (full scale wooden models) were constructed, and an initial human engineering study was undertaken. Thus, in the midst of the Southeast Asia support effort, important work on a revised concept of artillery systems was carried on.

Probably the most important problem encountered in organizing WECOM was that of developing an acceptable statement of authorities, procedures, and responsibilities pertaining to combat vehicles. Assumption of this mission made it necessary for WECOM to establish clearly defined lines whereby the U.S. Army Mobility Command (MOCOM) retained responsibility for "non-combat" and tactical vehicles such as cargo carriers.

On 20 July 1962, General Besson assigned Col. Jerome S. Jeffords as Project Manager for the following combat vehicles: M114 Command and Reconnaissance Carrier; T195E1 (M108) Light Howitzer; and T196E1 (M109) Medium Howitzer. Colonel Jeffords was authorized to exercise full-line authority over all planning, direction, and control of tasks and associated resources involved in producing and delivering the vehicles to the using units.

Confirmatory and troop tests of the M114 vehicle were completed and Type II tests were planned for the T195E1 (M108) vehicles. The M114 vehicle was type classified Standard A in February 1963, and the T195E1 and T196E1 vehicles were type classified Standard A in June 1963 and redesignated M108 and M109 respectively.

During Fiscal Year 1965, the Mechanized Infantry Combat Vehicle and the interim vehicle rapid fire weapon system were assigned to the Project Manager for Combat Vehicles for management responsibility. Also, the M108, 105mm, full-tracked, self-propelled, light howitzer, which had been the responsibility of the Project Manager for Combat Vehicles, was disestablished as a project-managed item and all item activities reverted to normal WECOM functional control. In the next fiscal year, the XM723 mechanized infantry combat vehicle, the XM733, full-tracked amphibious assault vehicle, and the XM729, lightweight amphibious counterinsurgency, full-tracked, combat tank were assigned to the Project Manager for Combat Vehicles for management responsibility. And in the same year, several foreign governments, i.e., Canada, Switzerland, and the Netherlands, issued orders for the M109 howitzer with delivery dates in Fiscal Years 1967 and 1968.

Such a range of system responsibilities, in addition to a Fiscal Year 1966 M109 procurement program for Army and other customers larger than $65 million, created a management situation incompatible with the concepts of project management. The question of the appropriate assignment of combat vehicle tasks had also arisen anew as a result of studies on MOCOM's organization and mission. An interim answer to these questions was provided by realloting item and system responsibilities to other project managers, and, as noted above, the eventual discontinuance of the project managership for combat vehicles. AMC provided a more definitive answer in May 1968 with the precise assignment of vehicle and component management missions and interfaces between WECOM and the newly established TACOM. Generally, WECOM retained responsibility for any vehicle whose primary objective was firepower and for weapons components of other vehicles, while TACOM retained or assumed responsibility for any vehicle whose primary objective was mobility and for mobility components of other vehicles. Ve-

hicle project managers were to work within and with either or both commands according to primary and component responsibilities.[3]

Being primarily a weapon with firepower objectives, the M109 howitzer accordingly remained within the WECOM orbit, managed by a project manager located at WECOM headquarters. The M109 was and remained a significant example of a combat vehicle. It was the most widely used 155mm artillery system in Vietnam. This weapon was employed as direct support artillery, and because of its versatility, mobility and armor protection, it was used in conjunction with mechanized combat operations to provide immediate response rapid fire artillery reinforcement. The M109 proved to be highly reliable, and in many instances the system continued to function effectively with components that were either out of adjustment or excessively worn. It was employed in almost all environments and combat conditions in Vietnam.

The M109 also proved to be a popular weapon of defense of the free world. Since its initial production, this weapon has been sold under international agreement to Germany, Italy, Norway, Denmark, Britain, and Belgium as well as to Switzerland, the Netherlands, and Canada.

Support for the M109 has presented some problems despite its ability to function with worn components. In May 1967, Maj. Gen. Charles W. Eifler, then Commanding General of the 1st Logistical Command in Vietnam, informed General Besson that he was concerned with the increased deadline rate of the M109 howitzer in Vietnam. He recommended a product improvement program to upgrade the vehicle's readiness posture. As a result, a full-time task force was established to implement a suitable program. Essentially, this program consisted of replacing 52 second and third year production vehicles which had been exposed to severe combat for some 16 months with new vehicles equipped with 41 product improvement kits. These product improvements were also installed on the fourth year production vehicles already in Vietnam. This program was fully coordinated with the 1st Logistical Command and the U.S. Army, Vietnam (USARV) to provide continuing technical assistance. To further this purpose, a WECOM technical liaison team was dispatched in November 1966 to Vietnam where it was expected to remain as long as required.

Outstanding examples of weapons specifically designed for use in Southeast Asia (SEA) are the various armament subsystems produced for use on helicopters. During early developmental stages, these subsystems generally utilized a single type of weapon, such as the 7.62mm M60 machinegun, the 40mm automatic grenade launcher, or a combination of these weapons was mounted according to the needs of a particular mission. Early subsystems were designed primarily to deliver overwhelming firepower on a given area, while later subsystems were designed to also provide longer range "stand-off" capabilities. "Stand-off" capability enables a helicopter to remain out of enemy fire range while delivering 20 or 30mm automatic fire upon enemy positions. Specific examples of early subsystems being phasedout in Vietnam in 1968 are the M6, incorporating four M60D 6.62mm machineguns; the M16 incorporating four M60 machineguns and two rocket pods; and the XM21, incorporating two 7.62mm "miniguns" and two rocket pods. Later subsystems being phased into Vietnam in 1968 are the XM28, which can be armed with one or two "miniguns" and 40mm automatic grenade launchers as desired; and the XM35, armed with a 20mm six-barreled rapid fire cannon.

The M60 machinegun was perhaps the most versatile and widely used machinegun in the Army's arsenal. Though it was primarily the infantryman's individual automatic weapon, the M60 has been successfully used in many helicopter armament systems. This weapon has been mounted as a door gun in the subsystem used on UH–1D helicopters, and in the M24 subsystem used on Chinook helicopters. Quad M60s were also mounted on UH–1B/C (Huey) helicopters in the M6 and M16 subsystems. Two M60s were utilized in the M2 subsystems used on the CH–13 (Sioux) and CH–23 (Raven) helicopters. These various subsystems were used to provide suppressive fire in support of helicopter landings, movements, loading, unloading, screening, and reconnaissance operations, and in support of ground combat operations.

[3] AMCR 10–21, 10 May 68, subj: Mission and Major Functions of the U.S. Army Weapons Comd.

Early in Fiscal Year 1963 verification tests were conducted on the 7.62mm machinegun XM1 armament subsystem for the UH–13 helicopter. The weapon began to malfunction after 6,000 rounds. When further tests indicated the cause of the problem, the weapon was modified, and verification tests proved satisfactory. The XM1 subsystem was superseded by the XM2 subsystem, which consisted of two 7.62mm M60C machineguns on a special helicopter mount. Tests of the modified weapon were satisfactorily completed, various improvements were made to the system, and it was type classified the M2 during the third quarter Fiscal Year 1964.

The M5 helicopter armament subsystem was a "chin-turret" mounted 40mm grenade launcher used on the UH–1B (Huey) helicopter. This weapon provided the helicopter with defensive and suppressive fire while accomplishing its mission as a utility or troop carrying aircraft within the battle zone. The M5, capable of firing 250 rounds of high explosive grenades per minute, has been very effective in increasing the survival probability of helicopters, particularly during critical take-off and landing periods.

Development and engineering of the XM5 armament subsystem was accomplished under a contract with the General Electric Company. Final development tests were completed during the second quarter Fiscal Year 1963, at which time engineering and user tests were begun. This subsystem was subsequently type classified as Standard A during the fourth quarter Fiscal Year 1964. The technical data package was completed and the first six M5 subsystems were shipped to Vietnam late in Fiscal Year 1965. They were accompanied to Southeast Asia by a WECOM materiel introductory team.

The M21 subsystem combined two types of weapons into a single helicopter armament subsystem, to provide a wide versatility in target coverage and tremendous firepower. This system mounted two high-rate-of-fire, six-barreled machineguns, capable of firing 2,400 rounds per minute; and two XM158 rocket pods which contained 14 2.75-inch folding-fin aerial rockets. This subsystem, which was introduced into Vietnam during October 1966, has been very successful in support of armored reconnaissance and ground combat operations, and in providing suppressive and protective fire for loading and unloading troops and cargo.

Production of the XM21 system continued at the Emerson Electric Company during Fiscal Year 1967. This system was deployed in Vietnam as a high density item and it was very well received. An engineering support problem arose when an ammunition feeding device failed to provide the large quantity of ammunition required from two storage boxes. Engineering changes conquered this problem. Emerson Electric was the major system contractor, while Springfield Armory was the cognizant engineering agency.

Ammunition

In the two or three years following the reorganization of the Army in 1962 and the establishment of the U.S. Army Munitions Command, the latter and its installations found themselves deeply involved in adjusting to a transition from a Technical Service orientation to a commodity command orientation. The commodity center and commodity management concepts introduced by this major reorganization helped in spelling out and fixing responsibilities throughout the command. During those early years, subordinate commands and installations concentrated on developing and implementing the commodity center and commodity management concept and in preparing to work under selected systems of operation which had their application throughout the Department of Defense and/or the Department of the Army.[4]

The tasks of munitions commodity management consisted of planning for and forecasting requirements for munitions; conceptualizing, designing, developing, manufacturing, and fielding munitions; controlling stock and issue; overseeing maintenance; producing and again supplying items expended; and disposing of obsolete, damaged, or deteriorated munitions. In short, MUCOM's commodity management role, like that of the other commodity commands, was the life-cycle management of assigned commodities.

[4] Unless otherwise noted, this section is based on submission, MUCOM to AMCHO, 4 Dec 68.

MUCOM's predecessor, the Ordnance Special Weapons Ammunition Command (OSWAC), had pioneered many of the concepts of life-cycle commodity management. The Hoelscher Report on the reorganization of the Army had recognized the value of these concepts and recommended that they be adopted throughout the proposed new logistic organization later activated in the Army Materiel Command. OSWAC headquarters was organizationally commodity-oriented rather than, like many other logistics organizations, functionally oriented. MUCOM initially continued this commodity organization, with the headquarters maintaining general oversight and integration of subordinate command and installation commodity operations and specific control in cases of problems and priority items, but the new headquarters was soon reorganized to provide functional elements for research and engineering, procurement and production, and materiel readiness (requirements, materiel programs, supply and maintenance). Meanwhile, integrated operational commodity management functioned at three commodity centers: Picatinny Arsenal for nuclear and conventional munitions; Edgewood Arsenal for chemical and biological munitions; Frankford Arsenal for fire control, cartridge and propellant-actuated devices, and small arms munitions. Each of the centers was organized to manage research and engineering and such procurement, production, and quality assurance as directly applied to commodity management up to the fielding of any managed item. The U.S. Army Ammunition Procurement and Supply Agency (APSA) remained the command production center for fielded items. It became the command supply and maintenance center under the Army Supply and Maintenance System and shared conventional ammunition commodity management with Picatinny Arsenal. Mutually supporting relationships between APSA and the commodity centers on matters of procurement, production, and quality assurance remained with adjustments as required for integrated commodity management or for APSA's functional responsibilities in procurement, production, supply, and maintenance. In handling commodity management in MUCOM, program and functional management and organizational arrangement intimately interacted. This made for flexibility in management.

In 1967 out of 6,300 items in MUCOM, roughly 200 were in the research and development stage. The balance, or approximately 6,100 were fielded. Of the 200 in the research and development stage, about 100 were in exploratory development with no commitment to be fielded. The other 100 were committed to fielding and therefore involved the full range of functional integration that was essential to introduce a new product effectively into the logistics system and customer organizations. It was these 100 items committed to fielding which were normally managed by commodity managers. Out of the 6,100 items which were being fielded, 200 were under heavy procurement and supply action, 600 were under moderate action, and the rest were under routine procurement and supply action.

While the commodity management concept was being employed, other trends were being realized throughout the Defense Establishment designed to achieve centralized control with a decentralized operation. While MUCOM's commodity center system fitted in well with this trend, the concept of centralized control with a decentralized operation raised many questions in MUCOM's subordinate commands and installations.

MUCOM, as a command with a large and varied procurement workload, found enlargement of contract execution responsibilities under Project 60 particularly difficult. The most important action and the key to the command's response to Project 60 was in determining the need for and acquiring personnel to handle these expanded functions. Under the commodity center concept, MUCOM's subordinate commands and installations took on increased contract execution responsibilities. This in turn called for specialized personnel, such as lawyers, procurement analysts, price analysts, data processing employees, etc., but there never was an adequate pool to take care of these shortages. This became a serious problem which was never really overcome. With Project 60 implemented on a nationwide basis, the impact of contract execution workload was severely felt.

TASAMS implementation likewise presented problems. In implementing TASAMS, MUCOM

consolidated its conventional and nuclear ammunition, special weapons, and chemical, biological, and radiological (CBR) functions handled in APSA and in Edgewood Arsenal into one NICP and transferred the NICP fire control functions of Frankford Arsenal to WECOM. The biggest problems facing the consolidation of the NICP at APSA, where it was ultimately assigned, were employee transfers and the acquisition of data processing capabilities. The major impact of personnel problems was felt in succeeding years when newly adopted systems depended upon the know-how of experienced employees. The consolidation of the NICP showed that APSA did have the essential flexibility to adjust to the centralized operation of MUCOM's portion of the supply and maintenance function, but succeeding years saw that agency seriously affected in its efforts to meet the demands of the system. As the system developed and as higher authority standardized it, the need for operating information and the need for adjustment to standardized procedures placed a greater burden on existing manpower and equipment than had been comtemplated when the consolidation had been implemented.

By the end of 1968, the organizational structure of MUCOM remained essentially what it had been when it was organized in Fiscal Year 1963. It consisted of a headquarters at Picatinny Arsenal, in Dover, New Jersey; Edgewood Arsenal and Fort Detrick, in Maryland; Frankford Arsenal, in Philadelphia; and APSA, in Joliet, Illinois. Edgewood, Fort Detrick, Picatinny, and Frankford were the commodity centers, and APSA was the procurement and supply support for the centers. The headquarters also had six project managers by the end of 1968. APSA, meanwhile, was responsible for managing a complex of 27 Government-owned, contractor-operated (GOCO) facilities for the production of propellants and explosives and the loading, assembling, and packaging of ammunition.

Management of Ammunition

Supplying ammunition for the United States has been difficult and in some respects unique. First of all, there is no private ammunition industry in the United States such as the Krupp industries in Germany. Secondly, each war had revealed that the United States is expected to supply a major portion of the munitions required by its allies. Finally, in time of emergency, the demands for munition support rise at a fantastic rate and require immediate and sustained response.

There is no ammunition industry in the United States in the sense that there is an automobile industry. The United States hesitates to create such an industry because of the "merchants of death" appendage applied to the Krupp industries in Germany. American industry hesitates to expose itself to warmongering connotations. Moreover, industry will not make the heavy investment in facilities that are required to meet the peak demands of war but for which there is little peacetime use. Consequently, deliberate Government and industry policy, coupled with economic considerations, preclude industry's supplying a complete round of ammunition like that for the 105mm howitzer. While in-house capability is required in all commodity areas, relatively more is required in the ammunition area because of the lesser relationship of ammunition end items to commercial end products. MUCOM must obtain most of its numerous end products by procuring components from industry and then assembling them into end items at GOCO plants.

Maj. Gen. Ferdinand J. Chesarek, then Assistant Deputy Chief of Staff for Logistics Programs, told a congressional committee in June 1965 that ammunition was "the toughest item in the inventory to manage." [5] The allocation and distribution of ammunition made MUCOM's task an extremely difficult one. Supplying the essential ammunition to troops in the field demands that requirements be effectively determined. This determination is based on a formula devised by the Department of the Army and actual estimates made by troop units in the field. These two factors are frequently in conflict. The problem is further complicated when national and international expediency requirements suddenly change, thereby affecting production and distribution. Such was the case in Vietnam, where, because of the constantly changing national and international atmosphere, ammunitions requirements fluctuated.

The management of ammunition became in-

[5] *Hearings* before the preparedness investigating subcommittee, committee on Armed Services, U.S. Senate, 89th Cong, 1st sess (GPO, 1965), 3 Jun 65, p. 151.

creasingly difficult as the war in Vietnam escalated. From 1963 to mid-1965 MUCOM's budget for ammunition was essentially a peacetime one, but from this point onward the budget rose dramatically. In Fiscal Year 1965 all programs amounted to $939 million, but in Fiscal Year 1966 these programs jumped to $3.147 billion and rose in succeeding years to $4.936 billion in Fiscal Year 1968. When it is recognized that the command achieved this success in a peacetime economy, one can appreciate the difficulty of the job. Not to be forgotten is the fact that MUCOM was responsible not only for supplying the ammunition needs of the American and allied forces in Southeast Asia but also the needs of our forces in CONUS for training purposes and of our European allies.

The biggest problem was experienced in 1965 when major U.S. forces were first deployed to Vietnam. There was an immediate need for ammuntion but also a need to maintain a balance between available stocks and receipts from production while supporting deployed forces. Whereas force deployment had reached its peak in a relatively short time, production had yet to go another six months before the production rate could match the wartime consumption. The actual time varied with each item, depending on the condition of the production base and essential resources. Until this point was achieved, the problem was critical and some shortages occurred—fortunately not shortages critically impacting on operational capability. After this point had been achieved, requirements were determined by a formula consisting basically of the number of weapons employed times the rate of expenditure times the period for which the item was to be stored or consumed. This provided the total requirement needed for munitions planning.

The above formula suited the ideal situation, which assumed enough ammunition on hand to supply the needs of everyone. Unfortunately this was not always the case. Many factors militated against the attainment of this ideal. Sudden changes in force structure and/or deployment schedules usually brought about by the uncertainties of the war and frequent changes in political and diplomatic policies interfered with the accurate determination of ammunition requirements. Climatic conditions in Southeast Asis and the special aspects of the war being fought in Vietnam made certain types of weapons obsolete and unusable and placed others in great demand as is evident from a review of WECOM's system changes. These circumstances strained MUCOM's procurement, production, and distribution plans. The inadequate production base and shortages of certain basic materials magnified the problems. The result was that ammunition of certain kinds needed to fight the war in Vietnam were not readily available in the quantities and at the time needed. Priorities had to be established and in September 1966 DA set up the allocation committee for ammunition. The purpose of the committee was to allocate critically needed conventional and chemical ammunition. By 1968 there were 41 line items being regulated by the DA. They included such bread-and-butter items as the 81mm mortar round, 105mm howitzer round, hand grenades, signals, and other items vital to the war in Southeast Asia.

One of the most significant problems was procurement and production leadtime. The major considerations in the procurement and production of ammunition were the supply urgency, type of item, production base availability, and priority designator. Leadtime varied from 4 months on small arms on a hot-base (production lines in operation or immediately ready to operate), sole source procurement to 15 months for an artillery round from a cold-base on competitive procurement. Other unforeseen factors affecting leadtimes were strikes, labor shortages, marginal contractors, and shortages of basic materials.

Since World War II, ammunition reporting from the field was accomplished manually and was submitted to the NICP for consolidation and review. The ORD 26 or 580 report, a Technical Service legacy, was prepared quarterly on all Class V (ammunition) items. In 1965, following a comprehensive assessment of the Army's ammunition posture, the need for an expanded, more frequent worldwide ammunition report was realized. As a result, a modern reporting system (known as the 1322 Report) was instituted as a vehicle to provide management data on a select number of intensively managed items. This report was revised in 1967 to cover all items and it became fully au-

tomated. The new system provided a unified, automated, worldwide ammunition requirement-and-asset report on a monthly basis for intensively managed items, and a quarterly report for all other items. It was meaningful, simple, and rapidly transmittable. It contained over 1,100 elements of data and was devised to provide tracking from one report to the next. The improvement in requirements visibility was expected to improve the AMC and Army munitions programing process.[6]

Fielding and Support—Selected Major Items

Rapid increases in small arms ammunition requirements represents one MUCOM problem. For example, in 1964 the U.S. Air Force introduced into action World War II-type Douglas "Gooneybird" aircraft armed with three side-firing Gatling-gun type 7.62mm miniguns and called them AC47's, subsequently identified as "Puff, the Magic Dragon." The Army initially employed the minigun in various configurations on helicopters during 1966. The density of helicopters and fixed-wing aircraft employing the minigun has increased greatly since that time. The armed helicopter is extremely effective and all-important in Vietnam. Concurrent with the increased use of the minigun by the military services was the U.S. Army problem of providing adequate supplies of the 7.62mm NATO (North Atlantic Treaty Organization) cartridge, linked and packaged in a ratio of 4 ball to 1 tracer. The minigun was designed to be compatible with the standard 7.62mm NATO cartridges. Ammunition requirements to support the minigun were first reflected in the Fiscal Year 1966 procurement program and since that time requirements increased approximately 1,850 percent through the Fiscal Year 1969 program.

The 7.62mm cartridge, M80 ball, and M62 tracer represent the primary combat cartridges for the M14 rifle, M60 MG, M73 MG, and minigun. The United States in its agreements among NATO member countries established criteria necessary to achieve interchangeability of NATO 7.62mm ammunition. The effort to NATO standardize the 7.62mm cartridge was formalized in July 1962, when new technical data packages for 7.62mm ball and tracer cartridges were issued by Frankford Arsenal. These technical data packages were the result of intensive effort over a two-year period to provide a more definitive technical basis for procurement of 7.62mm cartridges. By November 1962, a lot of M80 ball cartridges had been manufactured in strict compliance with the new technical data. Following a series of required national tests, a sample from this lot was submitted to NATO for formal design qualification approval proceedings. In May 1963 NATO design approval for this cargridge was received, thus constituting the first U.S. 7.62mm cartridge design so approved under the international agreements. By June 1963 production of M62 tracer cartridges to the new technical data package had also been initiated and were followed by NATO qualification at a later date. Several designs have been qualified in the ensuing years. It is this NATO qualified ammunition which not only performs satisfactorily in the NATO nominated weapons but in the 7.62mm minigun systems as well.

The 7.62mm ammunition was originally used primarily in the ground role, in support of rifles and low cyclic rate machineguns. Deployment of the minigun has changed that concept to one of a high cyclic rate (up to 6,000 rounds per minute) employed primarily from helicopters and/or fixed-wing aircraft. The minigun is capable of area target saturation fire.

Escalation of requirements for 7.62mm ammunition to support the minigun resulted in a rapid buildup of ammunition manufacturing facilities as well as attendant buildup in facilities/producers to provide the ancillary items to support the procurement program. The link is used with all automatic 7.62mm weapons: M60 MG, M73 MG, and the minigun. To expedite the requirement for links and to provide leadtime to broaden the supply base, links were procured on a sole-source basis as well as going out with a request for proposal from industry. A number of responsive bids were received and new producers have been brought into the program. A similar situation existed for ammunition boxes. During the interim period of bringing in new box producers,

[6] The material in the above two subsections is taken largely from the following works: (1) Brochure, Management of Munitions, MUCOM, Jan 1968; (2) MUCOM Orientation Brochure, Introduction to the U.S. Army Munitions Command, 1 May 67; (3) MUCOM Historical Summaries: FY 1963, FY 1964, FY 1965.

a program of rehabilitating used boxes was initiated.

Projectiles for the M79 grenade launcher were new Southeast Asia requirements. Review of the performance of the various cartridges for the M79 launcher indicated that delay arming of the fuzes reduced the effectiveness in ambush or jungle combat situations. Because of the minimum fuze arming distance, a "dead zone" existed wherein the grenadier had to rely on other weapons for his defense. Therefore, a means for providing effective lethality "from the muzzle out" was desirable.

In consideration of this recognized need and predicated on an officially published small development requirement, Frankford Arsenal submitted a proposal to the Project Manager for Selected Ammunition, outlining a multiple projectile round for the M79 grenade launcher and intended for close range effectiveness. This project was assigned to Frankford Arsenal for development, design, and follow-on engineering in direct support of production, looking to large quantity production depending on the degree of field acceptability. Design testing was conducted in March 1966. The preliminary design was so promising that a quantity of 100,000 rounds were delivered to SEA. Subsequent to this delivery, a TDP was prepared and updated during production of the 100,000 rounds and finalized during December 1966.

The 40mm, XM576E1, multiple projectile cartridge is an antipersonnel fixed round of ammunition for use in the 40mm, M79 grenade launcher, which showed tangible results in the saving of lives of our combat soldiers. The cartridge is composed of two major components: the XM576E1 projectile assembly and the XM199E1 cartridge case and a base plug assembly.

During December 1966 verbal guidance was received from the project manager's office concerning the development of a plan to procure 650,000 rounds. A plan was submitted from Frankford Arsenal early in December 1966, which projected deliveries starting in June 1967. This schedule was not acceptable to the project manager and he requested that deliveries be initiated in April 1967. In January 1967 Frankford Arsenal received a limited production requirement to supply an initial quantity of 665,000 cartridges. This quantity was increased within a year to a total of about 12,000,000 cartridges, produced by both Frankford Arsenal and the Milan Army Ammunition Plant. Frankford Arsenal accomplished initial delivery of 5,000 cartridges to the field in April 1967, after accelerated procurement placement and industrial expediting efforts. Deliveries of components to Milan Army Ammunition Plant were completed in April 1968 and were to be completed to Frankford Arsenal in February 1969. Based on known requirements, the Frankford Arsenal cartridge production was to continue through April 1970 at a monthly rate of 75,000 each. The Milan Army Ammunition Plant production was controlled by APSA.

The 40mm, XM576E1 multiple projectile cartridge was intended for use particularly in jungle environment and during hours of poor visibility, when targets appear quickly at short distances without warning. It was designed to enable the grenadier to fire quickly, using the pointing technique of fire, when precise aim is not required, with a high probability of producing a casualty. It provided for a close-in firepower capability (0 to 75 meters) that gave the M79 launcher hit capabilities against close range, short exposure, and/or fleeting targets. It was reported from Vietnam that it "scatters lethal fragments throughout the target area, cutting down foliage, bushes, brush, and the enemy—with equal efficiency." This unique munition was placed into the hands of our fighting men within 9 months of the assignments of task—less than half the time estimated for the accomplishment of this urgent mission.

Cartridge, multiple projectile, 40mm, XM576E1 weighs .27 pounds and is 2.6 inches long. It develops a muzzle velocity of 900 feet per second and a recoil momentum of 2.95± 0.15 pound seconds. The cartridge produces a pattern of no less than 13 pellets within a 5 foot diameter at 40 meters and is functionally operational at the temperature extremes from –40° F to 140° F.

Efforts to improve artillery ammunition are of course as old as artillery. One major representative AMC-MUCOM effort concentrated on the use of the canister. The concept of canister-type ammunition is not new. Before our own Revolutionary War the lethal effectiveness

of cannon loaded to the muzzle with fragments, usually varying in size and shape from culled stones to colonial barn nails, was recognized. However, it was not until the 19th Century that artillery projectiles and rifling techniques as known today were conceived. Subsequent developments in canister munitions produced two distinct types of shell: canister and shrapnel. Canister now includes all rounds that are fired pointbank at an advancing enemy with the projectile opening and freeing its fragments in close proximity to the weapon without benefit of a fuze, whereas shrapnel rounds incorporate a time delay fuze of some type and are fired in high trajectory to yield overhead burst at greater ranges.

Combat experience in Korea stimulated the effort to develop improved canister ammunition in several calibers. In 1951 requirements were established for virtually all major gun, howitzer, and recoilless weapons. Only the 90mm T22E1 (M336) canister was produced for service stocks and that was produced too late for use in Korea. The 76mm T3 series canister was obsoleted in 1957 by the cancellation of all 76mm guns but was resurrected during the Vietnam conflict.

Not until the flechette geometry and the concept of a low-drag coefficient were adopted for this munition was the potential for a canister-type projectile realized. The result was a concentrated effort on antipersonnel (APERS) munitions known as the Beehive Program. Because of its high density and lower velocity decay of the fragments, the flechette or Beehive munition results in a greater area of coverage and is much more effective than conventional canister munitions. In addition, when this round is fitted with a mechanical time fuze, a down-range capability enables Beehive ammunition to compete with conventional high explosive fire for certain targets of opportunity.

Production of Beehive munitions always was a problem. The 90mm M377 canister round was classified as Standard A in 1958 but was never produced because of inherent production problems involving the flechette. To manufacture a 105mm XM546 cartridge at the rate of 10,000 per month would have required 50 flechette heading machines and 100 flechette weaving machines on an around-the-clock basis. These numbers are based on manufacturing flechettes at a peak rate of 200 per minute and weaving flechettes at the rate of 100 per minute.

The increased effectiveness of flechette ammunition is due not only to the long range and lethal effects of each flechette but also to the increased number of flechettes that can be stacked in a given volume of space. The 105mm XM546 projectile contains approximately 8,000 of these fragments. When multiplied by the projectile production rate required, astronomical numbers of flechettes are encountered, all requiring manufacture and assembly into the projectiles. Obviously, to meet reasonable production rates, improved manufacture and assembly methods had to be developed.

The solution of flechette assembly problems resulted in production of a new item of ammunition, which could for the first time be issued for field use. This technological breakthrough occurred at a time when renewed interest was being generated for this item. As a result of additional testing in heavy foliage of the type encountered in Vietnam, it was revealed that flechette ammunition can be very effective against targets located deep in terrain consisting of heavy brush. Since the deployment of these items in Southeast Asia, results of encounters have proved that Beehive rounds are very effective in deterring mass assault tactics.

As a result of elimination of the production bottleneck associated with this ammunition, additional items for the various calibered systems were developed. Some of the items which have found wide acceptance in the Army stockpile or currently under development, are as follows:

a. 90mm M377 Canister Cartridge for Tank Gun.

b. 90mm XM580E1 APERS Cartridge for Tank Gun.

c. 90mm XM580E1 APERS Cartridge for Recoilless Rifle.

d. 105mm XM494 APERS Cartridge for Tank Gun.

e. 105mm XM546 APERS Cartridge for Howitzer.

f. 106mm XM581 APERS Cartridge for Recoilless Rifle.

g. 152mm XM625 Canister Cartridge for Tank Gun.

h. 155mm XM396 APERS Projectile for Howitzer.

Three prime projectile metal parts contractors were equipped to meet the production requirements of the above items. These contractors were capable of meeting all user and SEA requirements and have the inherent capability of meeting any future planned requests for the quantities for which equipped.

Another effort in artillery ammunition fielding and support involved providing ammunition for the 175mm weapon system. The M113 175mm gun has a one in twenty caliber twist tube and is mounted on a self-propelled full-tracked vehicle which is capable of long-range, high-speed operation on improved roads and can traverse muddy or marshy terrain, snow, ice, or sand, and ford small streams. The gun can be elevated from 0 to 65 degrees for point-blank and high-angle fire missions.

Development of the T203 projectile with the T58 propelling charge for the 175mm gun was initiated in June 1951, and type classification was obtained on 10 March 1961. During early production a safety certification test with live fuzes showed the M557 fuze to be inadequate. A strengthened version designated XM572 was assembled to a 175mm projectile and safety certification was received in July 1963. Soon after, because of proving ground failures, a program was initiated to improve the ammunition. It was concluded that the difficulties probably were caused by a separation of the explosive from the base of the projectile. The projectile was modified and type classified M437A2. A further improvement was subsequently made in the development of a projectile rotating band which does not discard even when fired in guns with extreme wear patterns.

Additional difficulties arose and persisted from July 1964 through October 1965, short rounds being observed in field firing at Zones 1 and 2. It was found that the projectile was not adequately chambered when mechanically rammed and would fall back in the chamber on top of the propelling charge. A new minimum seating depth and dissemination of information relative to chambering eliminated the problem.

The expenditure rate of 175mm ammunition in Vietnam led to programs for the expansion of the production base initiated in Fiscal Year 1966. The most serious production bottleneck was that of limited metal parts capacity. It was consequently decided to intall a second production line at the Scranton Army Ammunition Plant (AAP) and to establish an additional facility. The Gateway AAP was awarded the contract on 9 August 1967. A contract also was let to Norris Industries as a third metal parts producer on 30 June 1968. In addition to the expansion of the metal parts production base in that period, a second load, assemble and pack capability was being established by reactivation of Ravenna AAP, and a cyclic post-heating of explosive casts facility was being installed at the Iowa AAP.

Special Munitions

In 1959 the Army acquired a new standard irritant agent for riot control use to replace the familiar "tear gas" CN (chloroacetophenone). The new agent was CS—otherwise orthochlorobenzalmalononitrile, a preparation first reported by the American chemists B.B. Corson and R.W. Stoughton in 1928. British requirements for riot control munitions in the mid-1950s led to a careful comparison of known irritant compounds and focused attention on CS. The British results were made known to the American armed forces during the 13th annual Tripartite Conference on CBR in 1958, and immediate evaluations of the agent were conducted by the Chemical Corps. These resulted in the standardization of Agent CS on 30 June 1959 and an accelereated program—nicknamed "Black Magic"—for the development of use concepts and logistical support for the new agent. It was authorized as a fill for the canister and baseball-type tear gas hand grenades, and for dispersion by helicopter and airplane-mounted spray tanks. CS is a white crystalline solid at ordinary temperatures; in concentrations as low as 1 or 2 parts per million of air, it causes immediate and incapacitating irritation of eyes and respiratory system, passing off about a quarter of an hour after exposure, with no residual effects. It is rated as substantially less toxic than CN, with an estimated lethal/incapacitiating dosage ration of 2600-1.

At the time of its standardization, CS was considered a riot control agent only, suitable for use by the Army in putting down civil dis-

turbances. When American involvement in Vietnam military action became more extensive in the early 1960s, there were no plans to utilize CS as a weapon of war, although one or two instances of CS grenades being thrown to disperse hostile groups occurred. After the visit of Brig. Gen. Fred J. Delmore, commanding the CBR Agency of MUCOM, to Vietnam at the end of 1962, the possibility of CS as a tactical agent was considered more seriously, and an exploratory exercise—Operation Waterbucket—was carried out in the United States in the summer of 1963 to test its capabilities in such a role. The results indicated that CS could serve effectively in tactical situations but that existing riot control weaponry was inadequate for such a role. An array of new munitions—hand, artillery and airborne—was planned to fill the gap, and accelerated development was promptly undertaken at Edgewood Arsenal. As the Army's ENSURE (expediting nonstandard urgently required equipment) program was formulated, to provide for battlefied evaluation of selected development weapons, many of the new CS munitions became ENSURE items.

By 1968 new CS weaponry supplied to forces in Vietnam included E158 and E159 airborne canister clusters and CS canisters for 105mm and 155mm artillery shells and 4.2-inch mortar shells among the more massive forms of tactical dispersion of agent. A CS bomb, the 55-pound XM920E2, was also in existence. Other munitions calculated to produce an agent cloud more quickly and effectively than hand grenades were the E8 launcher, an expendable bank of 16 tubes firing 35mm CS cartridges, and a 40mm CS cartridge (E24) in a launcher adaptable for hand firing or use with a grenade launcher. Meanwhile, a new form of CS had been developed by milling the agent to an average particle size of less than 10 microns, then treating it with anti-aggloberants to produce an unusually fluffy, smooth-flowing product. This CS–2, as the milled product was designated, demonstrated a remarkable capacity to form effective secondary aerosols when disturbed on the ground, making it virtually a persistent terrain contaminant. This characteristic led to provision to the field, in the course of 1968, of development types of an aerial terrain denial system, a helicopter-borne linear dispenser carrying over 750 pounds of CS–2. It also resulted in the recommended use of CS–2 as a tunnel denial agent, capable of rendering a tunnel system unusable for months when dispersed by a blower. Earlier forms of CS had already been used with blowers in Vietnam for tunnel flushing.

The M7 and M25 type CS hand grenades (canister and baseball, respectively) continued in use and were supplied in constantly increasing numbers to the Vietnam theater. Total procurement of CS by the Army increased tenfold between 1960 and 1968.

Another example of special munitions was white phosphorus (WP), which is special in that requirements usually exceeded anticipations. WP has long been used as a smoke producing material, in consequence of its tendency toward spontaneous ignition in air, with the production of dense clouds of phosphorus pentoxide. It was a familiar screening smoke weapon in World War I, and by World War II was in wide use, not only as a smoke agent but also as an incendiary and antipersonnel weapon. Flaming particles of phosphorus are difficult to extinguish, can cause serious burns, and pose a severe psychological challenge to exposed troops.

WP served as a filling in World War II for grenades, smoke bombs, igniters, rockets, mortar shells, and artillery projectiles. All of these uses of WP were repeated in the conflict in SEA. M34 hand/rifle smoke grenades with WP fill were produced as rapidly as priorities for components would permit. Mortar cartridges of all sizes—60mm, 81mm, and 4,2-inch—were also supplied with WP fill, along with 105mm and 155mm artillery shells and Navy cartridges. The 105mm ammunition included one type of cartridge, the XM416, for the M68 tank gun, the main armament of the M60 medium tank. Rocket warheads filled with WP for use as Army and Navy aircraft smoke weapons were obtained by emptying and reconditioning stocks of 2.75-inch rocket warheads and refilling with WP. Both 6- and 10-pound warheads were used for this purpose, but the latter, standardized as the M156, came to predominate by 1968. The AN–M23A1 igniter, loaded with WP, was used with the AN–M173A1 fire bomb for incendiary missions.

The Air Force began using WP in SEA in massive bombs of the World War II type, loaded with 100 pounds of WP in its plasticized

form—a suspension of WP in rubber developed at Edgewood during World War II to provide a form of the agent which would produce larger burning particles with resultant smoke cloud less liable to "pillar" directly upwards instead of spreading out as desired. Subsequently, the Air Force ordered its BLU-17/B bomblet filled with WP. These bomblets were then loaded into bomb-shaped dispensers—the CBU 12/A and the CBU 22/A—for use as massive aerial munitions.

Nearly all WP munitions were filled at Pine Bluff Arsenal, Arkansas, which had become a production center for these weapons. Some additional grenade filling was accomplished in the 1967–1968 period by Rocky Mountain Arsenal, Colorado, which also began a program to empty and modify 105mm mustard-filled shells for WP fill. Occasional requirements for plasticized white phosphorus (PWP) were met by Edgewood Arsenal, which renovated its World War II PWP plant for the purpose.

While the weaponry varied in detail, the use of WP in Vietnam essentially repeated its functions in World War II—to provide dense screening smokes, to ignite massive incendiary weapons, to attack enemy troops and materiel with blazing particles of phosphorus, and to unnerve men exposed to such attacks.

Key Missile Systems

When the Missile Command became operational in August 1962, six of the 30 project-managed systems in AMC reported to the Commanding General, MICOM. These were Pershing, Sergeant, Missile B (latter renamed Lance), Hawk, Hercules, and Mauler. In addition, two others—Zeus and FABMDS (Field Army Ballistic Missile Defense System)—that reported directly to Headquarters, AMC, were attached to MICOM for administrative support.[7]

By the end of 1968, MICOM had the responsibility for 10 project-managed systems plus Chaparral, which was part of the Chaparral/Vulcan system. Only Mauler had disappeared from the list, having been terminated in 1965, while Dragon, TOW, Shillelagh, Redeye, and SAM-D (Surface-to-Air Missile Development) had been added. (FABMDS had been terminated in November 1962, and the Zeus Project Manager became a Class II activity in February 1963.) In keeping with its growing programs, MICOM's new program authority increased from $901.7 million in Fiscal Year 1963 to $1.024 billion in Fiscal Year 1969.

[7] This section is based on: (1) MICOM Historical Summaries, 1962–1968; (2) Briefings on MICOM systems by Brig Gen George H. McBride, DCG, Air Defense Systems, MICOM, and Col C. D. Sterner, DC, Land Combat Systems, MICOM, to Lt Gen John Throckmorton, CG, 3d Army, 7 Nov 68; (3) Proj Mgmt Master Plans for MICOM Systems, 1962–1968; (4) *Challenge: Compendium of Army Accomplishment,* A Rpt by the CofS, Jul 1964—Apr 1968.

Fielding and Support—Selected Major Systems

The role and status of current project-managed systems is summarized below.

The Pershing weapon system replaced the nuclear delivery capability of the Redstone weapon system, providing shorter reaction time and greater mobility, range, and flexibility. Activated in June 1962, the system has become a mainstay of our military might in Europe.

In 1964 Pershing units began to deploy to Europe in general support of the field army. In 1965 Pershing assumed a quick reaction alert (QRA) in support of theater nuclear fire programs and. in 1966, this became its primary mission. Pershing had advantages over aircraft for performing this mission because of its all-weather, better survivability, and greater penetration capabilities. The firepower of each battalion has been increased from four to eight launchers.

The Pershing 1A development program began in 1966 to improve the capability of the system to perform its QRA mission. The first production contract for Pershing 1A ground support equipment was signed in November 1967.

The demanding operational requirement placed on the Pershing in U.S. Army, Europe (USAREUR), as a result of the QRA assignment, made it imperative that supply support be programed to provide maxium reponse to requisitioning, shipment, and followup. Conse-

quently, MICOM was designated as a single point of contact, or initial source, for all Pershing peculiar repair parts, and those common repair parts contained in the Military Assistance Sales Orders for the Federal Republic of Germany. USAREUR airmailed all requisitions daily, directly to MICOM, bypassing all intermediate channels. Air transportation became the primary method of shipment for repair parts replenishment. Also, having fund control enabled MICOM to make pinpoint followup and receive 100 percent status information on all requisitions. During the first year of operation, 43,837 requisitions were processed with an average fill of 83 percent. The rapid response in processing and actual shipping time improved the supply support posture of the Pershing system to depot and battalion level by 75 percent.

The surface-to-surface Sergeant missile, deployed for over six years, provides field artillery fire support to the Army (corps). With a 25–75 nautical mile range, all-weather delivery features, and nuclear, biological, and chemical warhead capability, the Sergeant was first issued to an Army unit in June 1962. Although the system was slated to stay in the field through the mid-1970s, production and delivery of all major items of equipment have been completed. Counting Fiscal Year 1969 allocations, about $686.5 million was allotted to the system.

An improvement program began in 1964 to increase Sergeant's in-flight reliability. Installation of modification kits to tactical missiles in this program was completed in September 1968. Two other product improvement programs—the Sergeant Contractor Assisted Modification Program and the Sergeant Modification Assistance Program—have installed significant refinements to the fielded missile. The programs cover improvements to the missile, GSE (ground support equipment), storage container, and trainer, plus improvements to improve preflight reliability, shorten the countdown, and improve operability and maintainability. These modifications, begun in November 1963, are to continue through March 1971. The Sergeant system was type classified Standard A in June 1968.

Known as Missile B until January 1963, Lance is a simple, rugged, highly mobile surface-to-surface missile system to provide nuclear and nonnuclear fires in general support of Army corps. Lance will replace the Honest John rocket and the Sergeant missile. Lance is the first Army missile to use prepackaged, storable liquid propellant. It also uses a new simplified guidance and control concept called direction control-automet designed to assure a high degree of accuracy at a low unit cost.

Lance development go-ahead was given in January 1963 for only the RDTE portion of the work. The PEMA portion was deferred. Subsequently, preproduction effort and initial GSE production were approved and placed under contract in the Basic Lance Program. The ET/ST will use the production model hardware and will also be the basis on which the contractor's performance incentive fee will be paid.

In May 1967, development of an extended range capability was initiated with concurrent development and production cut-in of extended range missiles. In January 1968, in response to Secretary of Defense guidance, the Basic Lance and Extended Range Lance Programs were reoriented into development of a single Lance system with an extended range capability. The reoriented program retained the original logic of concurrency between development and production that permits ET/ST to be conducted with hardware to validate the production inventory.

The Dragon is being developed to meet the Army's requirement for a man-portable, highly accurate medium antitank/assault weapon capable of defeating enemy armored vehicles and field fortifications within a range of 1,000 meters. Dragon needs but one man to handle and fire. The gunner has only to establish a line-of-sight on the target and maintain it after pulling the trigger. The system will also have a night firing capability.

Dragon will provide dismounted infantry at the platoon level with a significantly increased capability of defeating tanks and hard point targets. Plans call for Dragon to replace the 90mm recoilless rifle; Dragon will have greater effective range than the 90mm, and will weigh approximately 40 percent less. It will defeat the main enemy battle tank expected on the battlefield when Dragon is deployed.

Established as a project in April 1965 and known as MAW until it was officially named in 1967, Dragon has been in engineering develop-

ment since September 1966. Effort on the pilot production line began in 1967, with production scheduled for 1970. A unique concept for full integration of the development and production design into a single engineering effort will eliminate the time delay and redesign normally experienced in the transition from development to mass production. The goal is to take proven development hardware and translate it into a reliable tactical weapon system, economically produced and essentially maintenance free at the unit level. The integrated approach involves the simultaneous development of soft and semihard tooling for engineering development and hard tooling in a production pilot line for production hardware. Also, the Government accepts production missile lots only after flight tests of sample missiles have proven their performance reliability.

TOW (tube-launched, optically tracked, wire-guided) is a heavy infantry antitank missile system which will replace the 106mm recoilless rifle. It will be mounted on the M274 Mule, the M151 Jeep, and the M113 Armored Personnel Carrier. The engineering development contract was awarded in January 1963, and firings of experimental missiles lasted from November 1963 to December 1964. The system became a project on 1 October 1964. Testing in the Arctic, desert, and tropic environments will be completed with production missiles. Night sight development is being performed by the Night Vision Laboratories at Fort Belvoir. The procurement of equipment and missiles, Army (PEMA), program began with the initiation of advanced production engineering during Fiscal Year 1966. A contract has been placed for first procurement of missiles and launchers.

Formerly combined with the Sheridan system in a project office at WECOM, Shillelagh became independently project-managed at MICOM in September 1964. The Shillelagh is mounted on the Sheridan and is compatible with the M60 tank and the main battle tank. The Shillelagh system consists of seven guidance and control boxes, cabling, and, of course, the missile.

Basic Hawk, fielded in August 1960, is deployed in SEA. The special supply support plan implemented for Hawk in Vietnam continued to provide excellent support. During Fiscal Year 1968, the percentage of fill for requisitions received exceeded 97 percent, and the average readiness capability of the Hawk units remained at a high level. The support plan included transportation management of an unprecedented intensity. Computer programs provided a day-to-day picture of the status of requisitions transmitted to MICOM by the 97th General Support Unit, Hawk Missile System, Vietnam. Another computer program produced a daily printout containing the complete transportation history of each requisition received and then processed through a depot or procurement channel. Innovations other than using computer programs as management tools included strategic placing of a liasion representative in the transshipping area and obtaining signed receipts other than the bill of lading or other transportation documentation from the requisitioner.

MICOM is developing the Self-Propelled (SP) Hawk System to provide all-weather low- and medium-altitude air defense for the division areas of the field army. The system is a more mobile version of the Basic Hawk system and will be achieved by installing the current towed Hawk launchers on XM727 tracked vehicles. Each SP Hawk battery will contain a towed firing platoon and two SP platoons.

Since March 1966, the SP Hawk has been undergoing production and engineering fabrication and R&D prototype hardware fabrication. Beginning in August 1967, the first production prototypes were delivered to White Sands Missile Range for ET/ST. From Fiscal Year 1965–1968, MICOM spent $47.8 million to improve the mobility of the Hawk system.

The Improved Hawk system program, in progress, updates the Basic Hawk system to increase its reliability and lethality and extend its tactical usefulness into the mid-1970s. This will produce an entirely new Hawk missile with a solid state guidance package, a larger warhead, and an improved rocket motor.

Extensively deployed worldwide since 1958, the Nike-Hercules system provides the major portion of the medium- and high-altitude defense against an air-supported threat. Since the initial deployment of Hercules, constant attention has been directed to maintenance problems and to keeping the system abreast of enemy capabilities.

In May 1966 a five-year overhaul program was instituted. The program insures that

weapons are maintained at maximum operating efficiency despite their increasing age. In addition to the overhaul program, significant improvements were developed and proposed for incorporation in the system. Of prime importance has been the provision of two additional radars to the basic system—the target-ranging radar and high-power acquisition radar. These radars contribute increased effectiveness in an electronic countermeasures environment and, in the case of the high-power acquisition radar, an increase in acquisition range.

Hercules, along with Hawk, was one of the systems slated for co-production by Japan. The United States and Japan signed a memo of understanding concerning this on 13 October 1967.

The Redeye missile system was developed to meet the requirement for an air defense weapon to protect forward elements of the field army from low-flying attack aircraft and to destroy enemy observation aircraft operating in the airspace above U.S. forces. The primary objective was to develop a lightweight, passive-homing, shoulder-fired weapon that could be employed by basic infantry, armor, and artillery soldiers with minimum training.

Research and development is essentially completed for the basic Redeye weapon. Current work includes development of an electronic trainer, a new lightweight carrying container, and a moving target simulator. In addition, final corrections and tests are being conducted on the guided missile test set.

Redeye's change of status—from a Commodity Office to a Project Manager—coincided with a decision to begin procurement of the system. The first production contract was awarded in April 1964. The Army, in Fiscal Years 1965–1968, placed orders for Redeye missiles at a cost of $125.2 million. General Dynamics, Pomona, is the prime contractor. In 1967 Redeye service tests were completed and followed by a troop test conducted by the 101st Airborne Division. Training was begun at Redstone Arsenal, Alabama, and Fort Bliss, Texas. Redeye gunners and equipment were deployed to Korea in 1967 and to U.S. Army, Europe, in February 1968.

SAM-D is a highly mobile surface-to-air guided missile system capable of conducting simultaneous multiple engagements against high performance air supported targets (AST) and short-range tactical ballistic missiles (TBM), and providing a high single shot engagement kill probability. SAM-D will provide air defense of the U.S. Field Army against ASTs and TBMs with a high level of effectiveness, complemented by forward area air defense systems, and may be used to complement the Sentinel system in defense of CONUS.

The system was an outgrowth of the AADS–70s (Army Air Defense System for the 1970s) studies conducted in 1963–1964. In October 1964 the Secretary of Defense reoriented the objectives of the AADS–70s to emphasize the air-supported program and renamed it SAM-D. He directed expansion of the technological investigation and conduct of trade off-system definition studies and a conduct of a commonalty study with the Navy on their Advanced Surface Missile System.

In mid-1965 MICOM evaluated the SAM-D concepts proposed by the contractors who had conducted trade off-system definition studies and recommended one for contract definition. SAM-D became project-managed in August 1965. In March 1966, the Secretary of Defense authorized DA to proceed with contract definition leading to advanced development. During 1966 and 1967, the Army undertook contract definition with Hughes, RCA, and Raytheon and performed a parallel "Surface-to-Air Missile Development Weapons Family Cost Effectiveness Study." A letter contract to Raytheon in May 1967 initiated the Advanced Development (AD) Program. It was definitized in November 1967 as a cost-plus-award-fee contract.

Chaparral/Vulcan was initiated in 1964 as an interim program to provide a low-altitude air defense capability to the forward areas of the field army through the mid-1970s. A mix of short-range missiles and guns, using off-the-shelf hardware, was to provide relatively inexpensive coverage of the battle area with composite battalions. MICOM's responsibility, Chaparral, is a modified Navy Sidewinder 1C infrared, heat-seeking missile, adapted for a surface-to-air role.

The Chaparral Management Office was established at MICOM on 1 December 1965.[8] On 6 December 1965, the Secretary of Defense ap-

[8] The Proj Mgr for Chaparral/Vulcan is located at Hqs, AMC.

proved the Tactical Mid-Range Air Defense Study, which called for the worldwide deployment of composite Chaparral/Vulcan battalions. It changed the interim concept into a longer range program that required many alterations and corresponding fund increases. Complete redesign of the Chaparral turret, missile, and carrier was necessary in order to meet worldwide deployment objectives.

Through Fiscal Year 1968, the Army has contracted for procurement of Chaparral missiles for $27.1 million and fire units and other supporting ground equipment for $63.7 million (excluding the cost of the M113-type carrier). The first unit was delivered in October 1967. Missile deliveries began in March 1968.

MATERIEL: COMMUNICATE AND SEE

All the money, all the management actions, all the research efforts and all the people have only one purpose: to enable the American soldier to do a better job. We want to help him shoot better, move easier, communicate with others and see his enemy.

GEN F. S. Besson, Jr.
Green Book, 1968

CHAPTER VIII
MATERIEL: COMMUNICATE AND SEE
Management of Electronics

Impact of Vietnam

With the rapid buildup in Southeast Asia (SEA), communications facilities quickly became overtaxed. Returning from the area in December 1965, the Special Assistant to the Army Chief of Staff for Supply and Maintenance in Southeast Asia named communications deficiencies as one of the most acute problems in Vietnam. He pointed out that the lack of adequate communications facilities created problems in both operations and logistics. Describing this as a matter that "can never be emphasized too strongly," the Special Assistant urged concerted efforts to cope with the difficult problems posed by the communications deficiency, and strong measures to accelerate the provision of urgently needed communications equipment.

Given the fluid situation existing in Vietnam, the design and installation of adequate communications networks in the area was a complex and difficult task. It was composed of many parts, some features of which are detailed below.[1] Under the impact of the SEA buildup, funding for communications and electronics increased 96 percent from Fiscal Year 1962 to Fiscal Year 1968.[2]

Avionics Retrofit

In the area of avionics, in January 1966 the Commander of the U.S. Army Forces in Vietnam described a serious problem involving aircraft communications and navigation equipment.[3] It concerned frequency assignment restrictions caused by the presence in Vietnam of a large number of aircraft supplied before June 1963 which were equipped with outdated electronics equipment. The solution required that substantial quantities of new radio and direction finder sets be shipped to Vietnam and installed in these aircraft, and the U.S. Army, Vietnam (USARV), asked that teams to accomplish this retrofit program be supplied by CONUS. After the requirements were defined in April 1966, the Department of the Army approved an avionics retrofit program. It included such additional items as tactial air navigation receivers (TACAN), IFF transponders, FM homing equipment, voice security equipment, airborne command posts, consoles, and ground stations.

At a conference, held at Headquarters, U.S. Army, Pacific (USARPAC), in April 1966, the retrofit program was discussed in detail, and specific courses of action were agreed upon. The actual program was to be accomplished by four self-supporting, contractor-furnished teams. It would commence in Vietnam early in October 1966, and in the meantime kits containing everything required to bring each particular model of aircraft up to the required configuration were to be prepared and assembled at Sharpe Army Depot, for air delivery to Vietnam. The 34th General Service Battalion was designated as the receiving point in Vietnam for both personnel and equipment.[4]

A great number of observation aircraft with avionics equipment were needed to meet South-

[1] Trip Rpt, Special Asst to CofS, 17 Dec 65, "SEA Supply and Maintenance," pp. 3, 13, 28–29.

[2] Submission, AMCMR to AMCHO, 17 Dec 68, p. 1.

[3] USARV msg 50247, AVSI-PO to CG, USARPAC and DA, 19 Jan 66, subj: Avionics Retrofit.

[4] Memo, Avionics Retrofit Proj Ofcr to AMCMR, 11 May 66, subj: Trip Rpt. (2) AMCMR Historical Summary, FY 1966, p. 2.

east Asia requirements. For example, in 1965 this entailed the modification and rebuild of over 400 0–1 type aircraft for use by the Army and the Air Force in Vietnam. Army supported the Air Force with repair parts, engines, and avionics by an interservice supply support agreement. The 0–1A aircraft had to be reengineered to meet configuration requirements and were then given an 0–1G designation. To replace the aircraft being withdrawn from this program, in May 1966 the OSD authorized the procurement of 255 commercial type aircraft, with an option for an additional quantity.

In the spring of 1966, the Joint Chiefs of Staff levied a requirement for a great many small aircraft with avionics equipment to be shipped to SEA on a tight schedule. The Secretary of Defense desired that this schedule be met. To meet this requirement, the AMC withdrew aircraft from active Army and National Guard activities. A concentrated effort by the Aviation Materiel Command and the Electronics Command, closely supervised by AMC Headquarters personnel, resulted in completion of this project within the prescribed time frame. Three Army aviation companies and three Air Force squadrons were completely equipped by this team effort.

Efforts to maintain adequate support of avionics items to aircraft manufacturers were hampered by increased unprogramed support of the Republic of Vietnam. In addition to the increased requirements for avionics equipment, including radio sets, and the limited support for these sets, the maintenance float factor authorized for radio sets installed in aircraft based in Vietnam was increased from 15 to 20 percent.[5]

Surveillance and Target Acquisition

General Harold K. Johnson, in his first public speech delivered after his appointment as Army Chief of Staff on 6 July 1964, emphasized the need for improved combat surveillance and target acquisition with the statement that "The Army is blind on the battlefield." This statement triggered action on the part of the AMC to improve the situation. As a result of a comprehensive study of the problem, a decision was made to establish a Combat Surveillance Office within AMC Headquarters, reporting directly to General Besson, to coordinate activities in combat surveillance, target acquisition, night vision, and battlefield identification. The Combat Surveillance Office was established on 1 March 1965, with Col. Thomas M. Rienzi as the first chief.[6] The office directed and coordinated AMC activities and interests in the above mission, including requirements, capabilities, development, procurement, support, employment, the Combat Surveillance/Target Acquisition Laboratory and related agencies and activities. On 1 July 1968, the office was redesignated the Combat Surveillance and Target Acquisition Systems Office.[7]

This reorganization involved the transfer of the Night Vision Laboratory activities from MOCOM to ECOM, along with current combat surveillance work. Also, research, development, test, and evaluation activities on night vision at AMC Headquarters were transferred, with personnel from the Development Directorate, to the Combat Surveillance Office in order to consolidate combat surveillance activities within a single AMC office. The new office placed particular emphasis on the needs of the combat forces in SEA and took numerous actions to locate sources of equipment, to expedite procurement for overhaul and shipment, to assure supply of supporting items and spare parts, and to plan against contingency requirements.

The overall logistics support requirements for combat surveillance and target acquisition equipment presented a challenge. The initial requirement was to isolate those items or systems with which the field was experiencing a high degree of failure, with particular priority given to those in SEA. Among the critical equipment requiring special attention were the countermortar, counterbattery, and ground surveillance radars, and anti-intrusion and sound-ranging devices. Extensive coordination with the laboratories, national inventory control points, depot maintenance activities, and manufacturers followed in the production, test,

[5] AMC Historical Summaries: FY 1965, pp. 429–434; and FY 1966, pp. 244–245.

[6] Submission, Combat Surveillance and Target Acquisition Ofc to AMCHO, 10 Dec. 68.

[7] Information furnished by Maj George J. Flanders of that office, 11 Feb 69. See also, AMCR 10–2, ch 13, 24 June 68.

modifications, and overhaul programs. Among the major achievements were the following: the down time of mortar radars was reduced from 70 percent to less than 5 percent; intensive management techniques used for combat surveillance were applied throughout the Army logistical structure; production and shipment of new ground surveillance radars were accelerated; newly configured electric generator sets were used to replace unreparable sets; and accelerated modification and product improvement were initiated for seismic trip wire and ground surveillance devices.

The office pursued numerous development and test activities on new or modified materiel up to 1 July 1968. In several cases, it made arrangements for tests of developmental items in SEA, particularly the AN/TNS-9 Sound Ranging System. Another achievement was the shipment of the first operational IFF airborne transponders (AN/APX-72) to SEA. A number of new items were approved for limited procurement, and the following were standardized through the AMC technical committee: AN/TSQ-43 Tactical Image Interpretation Facility, AN/PPS-5 Portable Ground Surveillance Radar; and AN/APM-123 Transponder Test Set.[8]

Mohawk

To fulfill the requirement for airborne surveillance, the Army developed the Mohawk Surveillance System—an integrated system comprised of an aircraft, photographic and electronic sensors, data links, and appropriate ground support equipment. This aircraft was designed to provide field commanders with day and night battlefield intelligence. The Mohawk was an all metal, mid-wing monoplane, powered by two Lycoming T53 engines, with Hamilton-Standard reversible propellers. It was capable of operating from small fields and unimproved runways in the forward combat area. The OV-1A version of the Mohawk was equipped with a visual photographic system; the OV-1B had a side looking airborne radar (SLAR) photographic system; and the OV-1C was equipped with an infrared photographic system.

[8] Submission, Combat Surveillance and Target Acquisitions Systems Ofc to AMCHO, 10 Dec 68.

The Mohawk Surveillance System had been in service with Army units since September 1961. Though the potential of the system had been shown in various field exercises, it took combat operations in Vietnam to provide the real proof of its capability. This was highlighted by Department of Defense recognition of the value of the system by resuming procurement of the aircraft and its systems in the Fiscal Year 1966 supplemental and subsequent budgets. The goal, which was the development of an improved Mohawk as an interim aircraft between the OV-1 and the ultimate Surveillance and Target Acquisition Aircraft System (STAAS), had also been approved and initiated. The new OV-1D would make available the capabilities of the OV-1B and OV-1C within a single airframe. This was to be accomplished by palletizing improved SLAR and infrared sensors so that either system could be installed within 60 minutes.[9]

The Mohawk Product Improvement Program, approved by the Department of the Army, was initiated during Fiscal Year 1967. Four OV-1C aircraft from the Fiscal Year 1967 contract served as prototypes for the newly designated OV-1D Mohawk. Production of the OV-1D was scheduled for Fiscal Year 1969. The OV-1D's distinguishing features were its longer wings, highly horsepowered engines, reconfigured cockpit panel, cockpit air-conditioning, improved ejection seat, and improved sensors. Grumman Aircraft Engineering Corporation proceeded with the engineering effort in Fiscal Year 1967. Four OV-1C Mohawks were scheduled to be modified beginning in 1968.[10] The improved communications package was to be procured through the Light Observation Helicopter (Cayuse) project office. Motorola Corporation received a contract for the improved side looking airborne radar and a contract for the improved infrared system was awarded to HRB Singer, Inc. A pure inertial navigation system was to be procured to replace the AN/ASN-65 Doppler Navigator.[11]

On 20 December 1966, the Mohawk Project Manager received direction to procure a limited quantity of radar warning receivers for

[9] Mohawk Historical Summary, FY 1967, pp. 1-4.

[10] *Ibid.*, pp. 6-7. (2) AMC Review of Programs, FY 1967, R&A Div, C/DP.

[11] Mohawk Historical Summary, FY 1967, pp. 7-8.

installation in seven OV–1B aircraft in Southeast Asia, to fulfill ENSURE (expediting nonstandard urgently required equipment) requirements. Grumman Aircraft Engineering Corporation participated in this work. Further system compatability testing was done at Air Force Test Range, Eglin, AFB, Florida. By 2 June 1967, the first installation had been completed and the aircraft flew a surveillance mission on that day. This provided information not previously known about the number and type of electronic weapons equipment previously used against Mohawk (SLAR) missions.[12]

During Secretary of Defense Robert S. McNamara's visit to Vietnam in November 1965, he was requested to provide 9 OV–1A, 19 OV–1B, and 29 OV–1C Mohawk aircraft for a new project titled "Tiger Hound." Eight aircraft were provided from the aviation school and one from the overhaul program and delivered to New Cumberland Army Depot on 20 December 1965 for processing for oversea shipment. Nine OV–1A aircraft departed for Southeast Asia on 26 February 1966. The remaining Mohawk requirements were provided from the modernization program that began in May 1966. A high degree of success was attained in this project which was expanded under project "Tally Ho."

On 8 March 1965, the Assistant Chief of Staff for Intelligence (ACSI) directed the AMC to prepare nine OV–1B and ten OV–1C Mohawk aircraft systems configured similar to previous aircraft and to be delivered to the 1st Cavalry Division, 20th Aerial Surveillance and Target Acquisition Platoon and Aviation School. The delivery of these aircraft was completed on 27 August 1965. The 225th Aerial Surveillance Company deployed to Vietnam with three OV–1Bs and nine OV–1C aircraft in May 1967. The unit received the balance of its aircraft, three OV–1B and ten OV–1C, in Fiscal Year 1968.[13]

STAAS (MAVS)

In 1964 the Army staff approved a qualitative materiel development objective for the Surveillance and Target Acquisition Aircraft System (STAAS). [After February 1968 the AMC continued the STAAS concept in the Manned Aerial Vehicle for Surveillance (MAVS) project]. STAAS was conceived as a requirement to replace the OV–1 Mohawk aircraft in the post 1970 period. Late in 1964, OSD disapproved a STAAS program change request for lack of a clear requirement. An extensive concept formulation study was then begun by Research Analysis Corporation (RAC), on behalf of OCRD, to define a concept for and to make an analysis of the STAAS. This study culminated in a proposed QMR which was completed in October 1965.

A series of conferences between AMC and CDC personnel indicated that a system meeting the proposed QMR's requirements would be prohibitively expensive. In January 1966, the Commanding General, CDC, forwarded the STAAS QMR to the Department of the Army with a recommendation that it be disapproved. DA deferred action and shortly thereafter the Army Chief of Staff requested CDC to study the total Army ground and airborne reconnaissance and surveillance needs.

In early 1966, CDC began this study, known as Tactical Reconnaissance and Surveillance Study—1975 (TARS–75). At its conclusion CDC recommended that a manned aerial vehicle for surveillance be developed to replace the OV–1 Mohawk. The system recommended bore substantial resemblance to the mission requirements previously outlined for STAAS.

In May 1967, General Harold K. Johnson, the Army Chief of Staff, deferred action on CDC's proposal for immediate QMR action on MAVS. General Johnson suggested that CDC further analyze the cost to support such operations in heavily defended airspace.

High priority SEA requirements precluded immediate CDC reaction to the Chief of Staff's suggestion. In December 1967, the Commanding General, CDC, and the Deputy Commanding General, AMC, met General Johnson's requirement and in January 1968 dispatched a joint AMC/CDC letter to DA suggesting that the question of operating such a system over heavily defended airspace could best be studied in conjunction with system concept formulation. The AMC/CDC letter recommended that DA give approval for work to start immediately on MAVS concept formulation. DA's reply in

[12] *Ibid.*, pp. 10–12.

[13] (1) Submission, Proj Mgr Mohawk to AMCHO, 26 Dec. 68. (2) Submission, Proj Mgr SEA NITEOPS to AMCHO, 15 Nov 68.

March 1969 asked that a more detailed AMC/CDC concept formulation plan be submitted. In June, AMC and CDC jointly forwarded to DCSRDA a detailed MAVS development plan. DA approval was held up several months while AMC and CDC resolved the question of whether or not both could simultaneously support MAVS, Utility Tactical Transport Aircraft System (UTTAS), and Heavy Lift Helicopters concept formulations. In January 1969, the Department of the Army approved the MAVS concept formulation program to start 1 July 1969. The MAVS Project Manager began advance planning actions for this program immediately upon receipt of the DA January letter of approval.[14]

Night Vision

In the history of warfare, night operations were usually extremely limited because of the soldier's inability to operate effectively in the nighttime environment. The objective of the AMC night vision program was to provide the soldier with equipment which would enable him to fight at night with the effectiveness approaching his daylight capabilities. Among the major items of this equipment were weapons sights, ground and airborne night observation devices for battlefield surveillance and target acquisition, searchlights for ground and airborne battlefield illumination, and fire control equipment for combat vehicles. Such equipment included image intensification, infrared and thermal systems, and required components.

In recognition of the success of first generation image intensifiers in Vietnam, a multimillion dollar program was started in early 1967 to develop new night vision devices for possible use in Vietnam. The program included the following items: visual surveillance system; observation devices, airborne searchlights; television for airborne application; infrared indicators; infrared searchlights; stabilized night sights; hand-held thermal images; night vision goggles; and drivers periscopes.

A new program, Southeast Asia Night Operations (SEA NITEOPS), was established in June 1967 with an increase of approximately 40 percent in the combat surveillance Fiscal Year 1967 RDTE budget. This development presented an exceptional management problem, particularly in view of the high priority assigned to the program. The Combat Surveillance Office took prompt action to get the program underway, pending establishment of special management provisions. In October 1967, a project manager, reporting directly to the Commanding General, AMC, and working closely with the Combat Surveillance Office, was appointed.

The collection, processing, and interpretation of combat information continued to be among the most important subjects in the activities of that office. As means for the collection of information increased in numbers, types, and usage, more attention was needed on aids for processing and interpretation of information. To insure proper coordination with surveillance systems, the Combat Surveillance Office monitored the work of the Automatic Data Field Systems Command on the Tactical Operational System and the Joint Services Systems Project Office for Tactical Information Processing and Interpretation. The office pursued numerous development and test activities on new or modified materiel under projects assigned in the RDTE program up to 1 July 1968. In several cases, the office made arrangements for test of developmental items in SEA, particularly the AN/TNS–9, Sound Ranging System. The first operational IFF airborne transponders, AN/APX–72, were shipped to SEA in 1968. In addition to a number of new electronic items approved for limited procurement, the following were classified as Standard A through the AMC Technical Committee: AN/TSQ–43, Tactical Image Interpretation Facility; AN/PPS–5, a portable Ground Surveillance Radar; and AN/APM–123, Transponder Test Set.[15]

Automatic Data Systems Within the Army in the Field

The purpose of the Automatic Data Systems within the Army in the Field (ADSAF) program was to apply the technology of automatic data processing to the Army in the field. In May 1965, the Army Chief of Staff approved a

[14] (1) STAAS Historical Summary, FY 1967. (2) MAVS Historical Summary, FY 1968. Further information was furnished by personnel of the MAVS Project Manager's Office.

[15] Submission, AMCSO to AMCHO, 10 Dec 1968.

plan for consolidating AMC and CDC organizational elements for development of automatic data systems for the Army in the field. Although, by that time the Command Control Information System (CCIS–70) Project Manager of AMC and the CCIS Group of CDC were operating under a combined headquarters, ADSAF and the Automatic Data Field Systems Command (ADFSC) were not officially established until 1 August 1965. The AMC had established the CCIS–70 project manager's office at the Army Electronics Proving Ground at Fort Huachuca, Arizona, in 1962.[16]

The Army had long been aware of the potential of automatic data processing equipment and as early as 1946 had prepared military characteristics for an automatic fire detection center that included an automatic computer. In 1951, the Army began work on an electro-mechanical (analog) gun data computer. Before completion of the project, however, the development of transistors and new techniques had made it feasible to design electronic digital computers. In the late 1950s the mobile digital computer (MOBIDIC) was developed. Other systems followed.[17]

During 1965, the AMC reported for disposition some of the older systems that had been utilized in the CCIS effort. Among these were MOBIDIC, the Basic Processor and Computer, the INFORMER, and the Army Tactical Operations Central, AN/MSQ–19. Meanwhile, the RCA Random Access Computer system was accepted for intelligence systems design tests. Among the other hardware items was the Field Artillery Digital Automatic Computer (FADAC), which became the responsibility of ADFSCs TACFIRE (Tactical Fire Direction System) Directorate. Initial delivery of FADACs to the 7th Army in Europe began in June 1965.[18] In January 1966, the Department of the Army approved the Qualitative Materiel Requirement for the TACFIRE system and in April the AMC approved the technical development plan. The tactical Imagery Interpretation Facility consisted of a van-mounted group of equipment used for extracting intelligence from photographs, radar, infrared, and moving target indicator imagery.[19] TACFIRE continued under prototype development and delivery of the first set was scheduled for October 1969. By June 1967, the Tactical Operations System (TOS) hardware contract had been awarded to Control Data Corporation and a TOS test bed was functioning in U.S. Army, Europe (USAREUR). Also, the Combat Service Support System hardware contract had been awarded to IBM.[20]

TACFIRE was expected to be fielded throughout the Army's artillery units during the time frame of 1972–1974. By the end of 1968, FADACs in Europe had increased to 101 units. The first issue of FADAC to combat artillery in Vietnam started in June 1967 and the first round fired at the enemy, using data supplied by FADAC, on 26 July 1967, scored a direct hit on the target. Issue of FADAC system equipment to troop units in Vietnam was completed during Fiscal Year 1968. A TOS demonstration in November 1968 was eminently successful. The Combat Service Support System test and evaluation moved forward satisfactorily during 1968, with the work actually beginning on the prototype in July.[21]

The Electronics Command

In August 1962, U.S. Army Electronics Command (ECOM) was organized at Fort Monmouth, New Jersey, consisting essentially of the operating field activities for materiel management that had existed under the Chief Signal Officer. These activities were the Army Signal Research and Development Laboratories, the Army Signal Materiel Support Agency, and the Army Signal Supply Agency.[22]

AMC Headquarters replaced the Office, Chief Signal Officer, in the chain of command. AMC's concept of operation established a re-

[16] ADSFC Historical Summary, FY 1965.

[17] TIR 6.1.1.1, Nov 1967, subj: Automatic Data Systems Within the Army in the Field.

[18] AMC Historical Summary, FY 1965, pp. 276–284.

[19] *Ibid.*, FY 1966, pp. 384–393.

[20] ADFSC Historical Summary, FY 1968.

[21] Submission, ADSAF to AMCHO, 28 Dec 68.

[22] Submission, CG, USAECOM to AMCHO, 16 Dec 68.

quirement for a commodity management staff within ECOM with full responsibility for total life cycle management of assigned materiel, a concept which differed from the functional structure of the discontinued Technical Services. A study was initiated almost immediately to design a more responsive ECOM organization.

In July 1964 a restructuring of ECOM was implemented. This was a logical continuation of the Army reorganization of 1962 and made ECOM a cohesive operating command of AMC. The restructuring consolidated missions, and eliminated command and staff layering; collocated principal mission and operating functions of research and development, procurement, production and materiel readiness; and established ECOM as the primary authoritative point with DOD for integrated life cycle management of communications-electronics commodities. The restructuring realigned agencies and functions, strengthened commodity management, consolidated common support activities, and achieved a balance between command emphasis on operations and on programing and planning.

The essence of the ECOM reorganization was the establishment of a directorate-type organization in which the former headquarters staff elements were combined with the operating elements of corresponding functional areas. For example, the Director of Materiel Readiness had two responsibilities: (1) to serve in staff capacity to the Commanding General, ECOM, on materiel readiness matters; and (2) to direct the ECOM National Maintenance Point and National Inventory Control Point (NICP).

Major organizational changes in research and development (R&D) operations within ECOM were made during 1964 and 1965. Initially, the supervisory R&D staff in ECOM headquarters was eliminated and a streamlining of staff supervision within the U.S. Army Electronics Laboratories (USAEL) was effected. A laboratory for combat surveillance and target acquisition was organized within USAEL. This innovation enabled these laboratories to be more responsive to urgent requirements, and as a result, it was recommended that other major areas of R&D operations, such as communications, electronic warfare, and atmospheric science, be placed under laboratory type organizations.

On 1 June 1965, USAEL was discontinued and six separate laboratories (Electronic Components, Communications/ADP, Atmospheric Sciences, Electronic Warfare, Avionics, and Combat Surveillance and Target Acquisition), an Institute for Exploratory Research, and a Directorate of Research and Development were organized. Although each of these organizations reported directly to the Commanding General, ECOM, the mission of the Directorate of Research and Development was to perform staff R&D functions and certain common support services. The Director of R&D was further given responsibility for recommending to the commander the allocation of resources and assignment of priorities among laboratory programs. AMC approved the transfer of the Night Vision Activity from the Mobility Command to ECOM on 2 November 1965 and the Night Vision Laboratory was organized as part of the ECOM Combat Surveillance, Night Vision, and Target Acquisition Laboratories complex.

On 11 July 1967, AMC approved a partial reorganization of ECOM, designed, in accordance with Brown Board recommendations, to provide more responsive commodity management. The Directorate of Materiel Readiness was discontinued and the Directorates of Materiel Management, Maintenance Engineering, International Logistics, and Technical Data, Cataloging, and Standardization were organized.

The Directorate of Materiel Management was the national inventory control point, and its operational plan was changed from a functional to a commodity management basis. This provided the framework to install and operate an intensive, integrated weapons systems management program. In February 1968, further emphasis was placed on the directorate's commodity management orientation by the removal of the distribution function, which was assigned to the new Directorate of Distribution.

In July 1967, ECOM organized the Operational Readiness Office and assigned it responsibility for staff cognizance and surveillance of logistics readiness, with emphasis on coordinating and evaluating situations concerning the support of ECOM's customers throughout

the world with special attention devoted to SEA matters. The command organized the Office of Deputy for Laboratories (Provisional) in July 1968 for the overall management of ECOM laboratories and related activities. The deputy had authority for operational planning and execution of the programs of the laboratories and related activities of the command and for preparation, issuance, and direction of policy and guidance in laboratory operations.

Electronics Systems Management

Management Development

Demands for new and old electronic communications, vision, detection, target acquisition, and control equipment placed a heavy Southeast Asia support burden on ECOM. Civilian strengths were increased in the face of increased requirements for personnel to man research and development, logistics, and management functions. Reorganizations, creation of new management areas and techniques, the development of special controls and new skills, formation of ad hoc groups, and other activities all contributed to the successful completion of ECOM's task of getting the right materiel to the troops expeditiously.[23]

Early in the period 1962–1968, AMC discovered that normal, peace-oriented management techniques were not geared to extremes of rapid response. In late 1965, the ECOM Commanding General recognized that a new concept of management was needed. As a result, he established a special office which eventually became the Operational Readiness Office. Hand-picked individuals from many disciplines, such as engineering, logistics, and procurement, were placed in supermanagerial roles, and pursued the solution of specific problems. These problems inevitably were those arising from the rapid buildup of men and equipment in Southeast Asia. For example, visits to units preparing to deploy resulted in tables of organization and equipment being completed months ahead of normal supply schedules.

Under intensive management procedures and by constant review and analysis ECOM assured that the full range of available resources was promptly applied to avoid or overcome production delinquencies. These expediting actions included resolution of problems at the contractor or subcontractor plants and solution of Government problems that could impede on-time delivery.

To improve materiel management, the command structure was reorganized under the equipment/systems structure. This concept provided fully integrated commodity divisions, combining the equipment/systems with the supporting critical stock fund repair parts and components. Under this concept, 68 ECOM equipment/systems were initially selected for intensive management.

The equipment/systems structure was incorporated into a computer under the supply management analysis review technique (SMART) program. This made it feasible to obtain at any given time the supply posture of repair parts required for maintenance of any selected equipment system. With the SMART program as a management tool, a supply posture of all critical repair parts was readily available. Items requiring replenishment through procurement or rebuild were identified, and as a result, quick reaction could be effected.

Field Service

The ECOM R&D Technical Liaison Team in Vietnam, which was established in January 1967, consisted of six members, including the team leader. The team reflected the organizational structure of ECOM by providing members from Avionics, Electronic Components, Combat Surveillance, Target Acquisition and Systems Integration, and Communications ADP Laboratories.

The Engineering Support Services Department also provided members to assist in matters pertaining to such areas as mechanical engineering, human engineering, and reliability. The mission of the team was to observe the operation of communications-electronics equipment at all levels of combat and support activities, identifying deficiencies in design or performance; to provide quick-fix solutions to

[23] This section based on Submission, ECOM to AMCHO, 5 Dec 68, unless otherwise noted.

problems encountered in the field and to improve performance data with which to improve ECOM response to Army requirements; and to provide R&D engineers and technical personnel with first-hand knowledge of field conditions. Specific design reliability and maintainability problems that were encountered and resolved included transient voltage suppressors in VRC–12 radios, development of power supply for use with AN/GRA–39 mobile test equipment facility, development of a quick cable splicing technique (Scotchcast), power supply for groups of telephone repeaters, as well as correction of many malfunctions and deficiencies.

In June 1965, ECOM had one Department of the Army civilian and 33 manufacturer's representatives connected with the technical assistance program in Vietnam. With the onset of the Vietnam escalation, a requirement for technical assistance on ECOM equipment led to the establishment of the ECOM Area Office in Vietnam. The object of the technical assistance program was to assist commanders in resolving maintenance problems incident to the materiel readiness status of their equipment that they were not capable of resolving with organic resources. The ECOM office was fully responsive to USARV and all ECOM activities were coordinated with USARV. The ECOM program had grown to the existing strength of 134 representatives. ECOM provided technical assistance to all Army units in Vietnam and to all free world forces when requested.

In 1962, ECOM established a customer assistance representative in Europe and had no other formal supply-oriented organization anywhere in the world. With the advent of hostilities in Southeast Asia, supply representatives were detailed to Vietnam to provide necessary assistance. Starting in July 1965, there was only one individual but this was augmented as required by personnel who were requested by the theater to assist in such areas as the inventory control center, the 34th group, and as otherwise required to support quick reaction assistance teams. Effective January 1968, ECOM established a formal customer representatives division with a total strength of 38 employees.

Fielding and Support—Selected Major Items

The needs of the frontline soldier, greatly increased by the Vietnam War, strained the talents and capabilities of the entire electronics industry in the period 1962–1968. A concentrated ECOM-industry team effort resulted in the development, fielding, and life-cycle management of entirely new generations of tactical and strategic communications and surveillance equipment as well as novel adaptations of electronics to support the intelligence and aviation missions of the Army.

Items fielded by ECOM contributed greatly to the successful operation of the fighting man by increasing his ability to "see and fight at night." This advantage enabled the combat serviceman to defend himself and to be the aggressor at night as well as during the day. Successful enemy advances and offensive actions diminished after the introduction of surveillance equipment into Vietnam. These devices, especially the rifle-mounted Starlight Scope, enabled our infantrymen to "take the night away from Charlie."

Development of the Starlight Scope, the Crew Served Weapons Night Vision Sight (AN/TVS–2), and the larger Night Observation Device (AM/TVS–4) began in 1962 at the Army Engineering Research and Development Laboratories at Fort Belvoir, Virginia. These development functions, personnel, and facilities were reassigned to ECOM in 1965.

Other surveillance equipment under ECOM's management met with great success on the battlefield. The most significant was a lightweight, man-transportable, ground-to-ground surveillance radar set (AN/PPS–5) designed to detect moving personnel and vehicles up to a range of 10,000 meters. Development time for this set was five years and eleven months. The set was initially tested in Vietnam in September 1966, and was fielded 12 months later.

Another important system was the tactical imagery interpretation facility (TIIF), AN/TSQ–43, developed to provide more advanced facilities for interpreting photographic, infrared, and SLAR imagery. The TIIF employed an M–18 computer for automatic computation and interpretation of data. System models were delivered in January 1966, and initial deployment was completed eight months later.

Electronic Warfare

Escalation of warfare in Vietnam along both counterinsurgency and conventional lines re-

sulted in identification of electronic warfare targets in detail and variety and increased requirements for tactical electronic warfare equipment to support field commanders. These requirements included self-protection devices for Army aircraft, active jamming equipment, and passive target identification and direction finding equipment.

The AN/A1Q–80 Airborne Radar Jammer provided electronic countermeasures protection to low flying Army aircraft. The jammer increased the probability of aircraft survival in a radar controlled antiaircraft environment. ECOM completed development, field testing, and limited procurement type classification of this jammer in 1967. In addition to the jammer, a further development provided for Mohawk surveillance aircraft by the antiaircraft associated fire control system alerted the pilots that they were under radar surveillance. For this purpose, ECOM procured, installed, and evaluated the Air Force-developed Airborne Warning Receiver, AN/APR–25/26. This ECOM warning device effort was accomplished and the equipment was deployed in less than nine months.

ECOM also designed an airborne fuze jammer, a self-contained wing-pod set, which would search the frequency range of interest, identify VT fuze associated signals, and generate a jamming signal which predetonated VT fuze projectiles at safe distances from the aircraft. The VT fuze jammer equipment development and testing, completed in 1967, provided that these devices significantly improved probability of aircraft survival.

A vehicle-mounted communication jammer, countermeasures set, AN/MLO–29, produced in 1965–1966, was reallocated for use as Government-furnished equipment in project Ceflien Lion. A concurrent development, the self-contained, transportable, tactical receiving and transmitting countermeasures set, AM/GLQ–3, was designed to harass enemy radio communications. Production of this set began in March 1966, and was fielded in SEA in April 1968 as the first high-power communications jammer.

As a further effort in the electronics warfare area, ECOM contributed materially to the engineering design, development, prototype, fabrication, procurement, and field support of new and improved airborne direction finders. Field commanders report that these passive systems provided them with over 90 percent of their target location information.

Communications Systems and Avionics

In the 1960s the standardized series of field radios developed and produced in the 1950s were replaced by a new family of FM radio sets which included a squad set, AN/PRT–4 and AN/PRR–9; a vehicular set AN/VRC–12; a pack set, AN/PRC–25, and a later version, AN/PRC–77. The new family was almost completely transistorized, was much lighter in weight, more reliable and easier to operate in the field than previous models. One vehicular set replaced three versions of the standardized series, covered the entire 30–76 MHZ band and provided more than twice the number of radio frequency channels. The pack sets became the primary means of communications within company and battalion patrols in Vietnam. For the first time communications were available at squad level by means of the helmet-mounted receiver and handheld transmitter of the squad radio. This entire new FM family became a very important element in the combat effectiveness of Army, Navy, and Marine Corps units in Vietnam.

The squad radio set with handheld transmitter and helmet-mounted receiver was designed as an inter- and intra-squad radio set to provide short-range tactical communications in the most forward area. ECOM received this requirement in August 1962. Before the design was finalized, CDC determined that the set should be a separate receiver and transmitter rather than a combined unit. The set was type-classified Standard A in January 1966, deliveries of production models began in December, and the set was fielded early in 1967. The power source for the transmitter was battery BA–399/U; the helmet-mounted receiver used the magnesium battery, BA–4505. The magnesium battery had a performance life of 30 hours, and could be stored without refrigeration.

The rest of this family of transistorized, short-range, two-way radios of modular construction was designed to provide reliable radio-telephone communications between military vehicles and crew-served weapons. They were radio sets AN/VRC–12, AN/PRC–25, and AN/PRC–77. The AN/PRC–25 was transistor-

ized except for one power amplifier tube in the receiver-transmitter.

The AN/VRC–12 and AN/PRC–25 radios were initially fielded in USAREUR in the first quarter of Fiscal Year 1964, and in SEA two years later. The AN/PRC–77, a product-improved version of and the eventual replacement for the AN/PRC–25, consisted of three basic configurations—the manpack set, a manpack or vehicular-mounted set; and a vehicular-mounted set. The AN/PRC–77 provided reduced interference and desensitized effects when operating with collocated radio equipment. Its completely solid state design improved reliability and reduced power drain on the battery. The set also had an "X-mode" interface facility for secure voice communications. Development of the AN/PRC–77 began in 1965; initial fielding in SEA began in March 1968.

A new family of high frequency single sideband radio sets had been developed and produced to replace the older AM radios and were currently in service in Vietnam. These included the AN/GRC–106 radio, a vehicular set which was the basic unit for long-range voice and radio teletype communications and the AN/PRC–74 which could be used by long-range patrols.

This new family provided reliable voice and radio teletype communications over all types of terrain at ranges beyond the capability of older sets. The sets had modular construction incorporating highly compact design, maximized the use of solid state parts and the interchangeability of common plug-in components, and used a common transceiver as the basic building block. Each member of the family was lighter and smaller than its predecessor and had greater communication ranges with less input power. The family also included Radio Teletypewriter Sets AN/GRC–142, –122, and –108, and AN/VSC–2 and –3.

The Army Area Communication System (AACOMS) had been developed to provide tactical long haul multichannel communications for the Army. New developments of equipment components for AACOMS had been primarily multiplexing and radio relay equipment. A completely new multiplexing technique, called "pulse code modulation" had been developed and had replaced the older frequency division multiplexing formerly used. This new technique resulted in reduced size, increased reliability, ease of operation, and lower cost. Radio relay sets also had been greatly reduced in size, and reliability had been greatly improved as a result of a solid state circuitry. Also for the first time, it became possible to develop a tropospheric scatter radio relay mounted in a shelter for transporting on a 2½-ton vehicle. Whereas multichannel communications in the past were limited to 12 channel systems, the new AACOMS include 6, 12, 48, and 96 channels of pulse code modulation.

The interim low capacity AACOMS subsystem, AN/MRC–115, was a multichannel 6/12 communications system used between major field unit headquarters in divisions and in Army air defense units of the tactical field army. It was designed to meet an urgent special purpose tactical requirement for a compact air-transportable, dual terminal, capable of short haul movement using a ¼-ton vehicle as the prime mover. It could be placed in operation quickly in division forward areas to support combat units which were displaced quickly and frequently. After being type-classified limited procurement in May 1966, this subsystem was subsequently fielded.

The AACOMS medium capacity subsystem was designed to provide multichannel, 12/24, communications between major unit headquarters within the tactical field army. The system also met selected multichannel communications requirements in the communications zone and could be used in other applications requiring 12 or 24 channel radio relay systems and similar mobility. The system was fielded in October 1967 and was in operation in SEA by the end of December 1967. Subsequent reports indicated that a high degree of reliability was being obtained. This was the first distribution of AACOMS assemblages utilizing pulse code modulation.

Past generations of Army aircraft had been limited in performance capabilities because of the large, heavy, hybrid circuitry and standard avionics items in the tri-service system. In order to extend these capabilities, the Army initiated the development of a complete solid state, lightweight avionics system specifically designed for Army light helicopters, and ultimately intended for application to all Army

aircraft. In January 1966 a development-production contract was awarded to develop lightweight replacements for the standard avionics equipment. As a result of this development a new family of avionics equipment was introduced for Army aircraft with a total weight savings of 67 pounds. These items had a basic design for performance of 1,000 hours between failures which was from two to ten times better than the items they replaced.

The FM tactical airborne radio set, AN/ARC–54, was designed to provide FM voice communication in the frequency range of 30 to 69.95 MHZ with 800 channels, a homing capability, selective calling, data transmission, and with appropriate ancillary equipment, voice security (mode X) operation for air-to-air and air-to-ground communications within a range of 25 miles. The set was initially fielded in production aircraft in 1964. An improved version, the AN/ARC–131, replaced the AN/ARC–54 radio set in the field in 1967. Except for the frequency range and the number of channels, all features of these radio sets were identical; components were directly interchangeable. The unit cost of the AN/ARC–131 was also less than that of the AN/ARC–54. A unique feature of the newer version was the commonalty of 60 percent of the maintenance parts with AN/VRC–12 vehicular equipment.

Configuration, fabrication, and deployment of air traffic control facilities began in 1965. These facilities provided an en route flight-following service for Army aircraft throughout SEA as well as tactical transportable terminal air traffic control facilities. The terminal control facilities included VFR control to tower functions and a ground control approach capability. To meet these requirements, the Flight Operations Central, AN/MSC–53, Flight Coordination Central, AN/TSC–61, and Flight Coordination Control Central, AT/TSC–63, were developed. The first of these units was fielded to SEA in September 1965. Because of the short leadtime for system delivery, no attempt was made to develop a system to meet Army-wide requirements. User experience with the facilities revealed a need for improvement and additional capabilities. The Aircraft Control Central, AN/TSQ–70, and the Landing Control Central, AN/TSQ–71 and AN/TSQ–72, were configured to achieve these ends.

As ECOM pursued its tactical communications-electronics missions, the command was called on to provide additional support for long-line strategic communications links, specifically in equipment development and procurement of end items which were to be component parts of the Defense Communications System. To facilitate management and coordination of these component items, the project management office for UNICOM/STARCOM was established at Fort Monmouth, New Jersey, in 1962.

The UNICOM/STARCOM project was composed of several separate and highly diversified categories of equipment and systems that were being developed or produced independently of one another. This materiel which formed a part of the Army's dynamic and fluid electronic/communications complex was grouped under the UNICOM/STARCOM project manager for special management emphasis. The number and scope of programs and related activities assigned to the project continued to increase each year from 1962 to 1967.

To cope with the many problems associated with the project's vast worldwide program commitments, as well as with the diversity of responsibility, the project manager established a European theater office in 1963 and a Pacific theater office in 1965. In March 1965, as a result of the project manager's recommendation, AMC established one of the project program elements, Tropospheric Scatter, as a separate project management office at Fort Monmouth.

On 1 March 1967, the U.S. Army Communications Systems Agency (USACSA) was organized as a joint AMC-U.S. Army Strategic Communications Command (USASTRATCOM) agency at Fort Monmouth, and USACSA was designated a major subordinate command of USASTRATCOM. The Army Communications Systems Agency provided centralized management for Defense Communications Systems and STARCOM projects and tasks.[24]

Before the organization of AMC, the U.S. Army Advent Management Agency had been established at Fort Monmouth as the Army manager in the new field of satellite communi-

[24] (1) *Ibid.* (2) Submission UNICOM/STARCOM Proj Mgr to AMCHO, 26 Nov 68.

cations. Shortly after the organization of AMC, the Department of the Army redesignated the element as the U.S. Army Satellite Communications Agency (SATCOM) and made it a project managership reporting to the Commanding General, AMC. ECOM provided research, development, and procurement support as directed by SATCOM.[25]

SATCOM became a leading participant in the Nation's space communications program, and the agency had a record of continuing accomplishments in satellite communications research and development. SATCOM evolved ten different classes of satellite communications terminals, achieving constantly increasing reliability and a gradual reduction in size, weight, and complexity. Ranging from massive fixed stations with 60-foot diameter antennas, through 40- 30- and 15-foot antenna transportable configurations and a novel "cloverleaf" antenna, to experimental jeep-mounted installations and new manpack designs, terminals of most types were deployed around the world and tested to evaluate the military application of satellite communications. SATCOM Agency-developed terminals circled the earth as the ground segment of two successful operational satellite communications systems, SYNCOM and the initial defense satellite communications system (IDSCS), which instantaneously and dependably carried Department of Defense messages twenty-four hours a day.

The agency had been actively involved in the SYNCOM program since January 1962. SATCOM developed and deployed fixed, transportable, highly transportable, and shipboard terminals, had responsibility for their continual redeployment to meet constantly changing requirements, and directed and evaluated research and development communications testing. The research and development portion of the program was completed in June 1966, and the two-satellite SYNCOM system became operational, with terminals located in Guam, the Phillippines, and Hawaii, as a primary route for passing military traffic in the Pacific-Southeast Asia area. A total of 25 IDSCS satellites were orbited by the Air Force in four successful TITAN IIIC missile launches—on 16 June 1966, 18 January 1967, 1 July 1967, and 13 June 1968. These satellites were launched in clusters but through a speedup on ejection were dispersed and orbited separately.

By the end of 1968, SATCOM had completed deployment of all terminals for the initial phase of the Defense Satellite Communications System (DSCS). The operational ground environment consisted of a mix of AN/FSC–9, AN/MSC–46, and AN/TSC–54 terminals located at eleven oversea and five continental United States sites. Although these terminals were Army deployments, operational responsibility within the DSCS rested with each of the armed services—the Army (STRATCOM), the Air Force, and the Navy—according to terminal location. The following chart shows the location and the armed service having responsibility for each defense satellite communications system terminal worldwide.

In addition to the deployment in the DSCS, AN/MSC–46, and AN/TSC–54 terminals were also located at the Signal School, Fort Monmouth, for personnel training and at the Agency's Engineering Test Facility for additional testing.

The SATCOM agency also had the Army's responsibility of providing reliable, flexible tactical satellite communications terminals for combat forces. Current SATCOM activity on this project was twofold. One involved experimental Army satellite tactical terminals (EASTT) utilizing experimental communications satellites developed by MIT-Lincoln Laboratory for the Air Force; the second and concurrent phase encompassed participation with the Air Force, Navy, and Marines in demonstrating the feasibility of using satellite communications for tactical communication purposes. Five EASTT terminals, two ¼-ton jeep terminals, two ¾-ton truck terminals, and one 26-foot van terminal—designed by the agency—participated in the Lincoln Experimental Satellite LES–5 launching on 1 July 1967 and in the LES–6 launching on 25 September 1968.

Experimental Army satellite tactical terminals were extensively tested by SATCOM military operating teams and test engineers. The initial technical test series with the LES–5 satellite was completed in the early fall of 1967 and was then tested in the jungles of the Army Tropic Test Center Panama Canal Zone. A

[25] Following paragraphs based on submission, SATCOM Agency to AMCHO, 4 Dec 68.

Table 7. Global Defense Satellite Communications System Network

Location	Terminal	Service operator
Fort Dix, New Jersey	AN/FSC-9	Army
Camp Roberts, California	AN/FSC-9	Army
Futenna, Okinawa	AN/MSC-46	Army
Saigon, Vietnam	AN/MSC-46	Army
Nha Trang, Vietnam	AN/MSC-46	Army
Yong San, Korea	AN/TSC-54	Army
U-Tapao, Thailand	AN/TSC-54	Army
Asmara, Ethiopia	AN/MSC-46	Army
Landstuhl, West Germany	AN/MSC-46 (2)	Army
Helemano, Hawaii	AN/MSC-46 (2) AN/TSC-54	Navy
Finegayen, Guam	AN/MSC-46 - AN/TSC-54 (2)	Navy
Northwest Cape, Australia	AN/TSC-54	Air Force
Brandywine, Maryland	AN/MSC-46 - AN/TSC-54	Air Force
Tinker AFB, Oklahoma	AN/TSC-54	Air Force
Peterson Field, Colorado	AN/TSC-54	Air Force
Shemya, Alaska	AN/TSC-54	Air Force
Wildwood, Alaska	AN/MSC-46	Air Force
Clark AB, Philippines	AN/MSC-46	Air Force

SATCOM EASTT team then toured military bases to acquaint tactical forces with the latest information in military communications and operations with the Navy and Marines in Exercise Rugby Match maneuvers. Additional tests continued with the LES-6 satellite to fully exploit the capabilities and functional flexibility of the ground elements and to obtain the information required to establish design criteria and constraints for future tactical satellite communications systems.

A number of the NATO countries participated in the experimental Army satellite tactical terminal tests, using terminals built in-country by each of the participants—Belgium, Canada, Germany, Italy, the Netherlands, and the United Kingdom. The SATCOM agency also supervised the fabrication of ¾-ton terminals for Canada, Italy, and Belgium.

In the second tactical satellite communications phase, contracts were placed for a series of experimental terminal designs including team pack and man pack equipment in addition to installations in small military vehicles and aircraft. These terminals were scheduled for delivery in early 1969.

Conclusion

ECOM's role in supplying communications-electronics life cycle support to the Army during the first six years of its existence was complicated by many factors. The type of war in Vietnam, enviromental conditions in Southeast Asia, long supply lines into primitive areas, and continuing requirements for support of Army elements not engaged in SEA, all added to the complexity of the task. Rapidly moving forces, coupled with equipment exposure to extreme environmental conditions, required mobile, highly reliable, yet lightweight families of equipment.

The rapid buildup and resulting urgent requirement for resupply and procurement of new equipment taxed the ability of the system at a time when military requirements were in competition with growing demands for contractor production of domestic goods. Additionally, urgent military requirements often dictated deployment of equipment not fully tested for use in the hostile climate and terrain of Southeast Asia. At times, therefore, some equipment had to be deployed with only limited support (spare parts, technical literature, and test equipment), and fielding frequently preceded adequate user training.

Risks in fielding new electronic equipment were minimized by intensive laboratory testing during preproduction stages. Initial support was enhanced by the provision of float equipment and replacement modules, and by aggressive procurement of high mortality and long leadtime parts. ECOM dispatched new equipment training teams to receiving units prior to equipment receipt in order that operational and maintenance training could be provided

before equipment deployment. ECOM also coordinated crash training programs with CONARC so that soldiers arriving in SEA would be able to handle newly fielded equipment.

The rapid buildup and consequent logistics problems of filling the pipeline, and in such areas as storage facilities, distribution, and communications, placed a tremendous strain on ECOM's ability in both manpower and funds to support worldwide Army forces. But despite these problems, ECOM was able, through continuous improvement in life cycle commodity management, to supply communications-electronics equipment to meet the needs of the modern Army.

It must be the foreign policy of the United States to support free people who are resisting attempted subjugation by armed minorities or by outside pressures.

Truman Doctrine
12 March 1947

CHAPTER IX

INTERNATIONAL ARSENAL

Nature of Mutual Security

Basically, the Mutual Security Program of the United States involved the broad categories of military, economic, and technical assistance. However, it was sometimes difficult to distinguish military assistance from economic and technical aid. In general, however, the type of aid directed specifically at building up the armed forces of the recipient nation fell under the term military assistance.

One of the major features of the military assistance program was the provision of weapons to friendly foreign nations. Such assistance was done by a grant to the recipient country, by cash sales, or on credit terms. Other important features included the provision of production facilities, training, mutual development of weapons, civic action programs, and military preparation under the North Atlantic Treaty Organization (NATO) known as infrastructure. Under the civic action program, the United States encouraged and supported the local forces in activities which contributed to social and economic improvement and helped to meet insurgency problems. In NATO parlance, infrastructure meant the fixed installations which were necessary for military deployment and operations, such as pipelines, airfields, navigational aids, and port installations.[1]

At the end of World War II, only the United States had the strength and resources to aid what was known as the free world. First came the special programs to aid Greece and Turkey under the Truman Doctrine; next the Marshall Plan or the European Recovery Program; and then the contributions through the new international organizations. This was followed by technical assistance to help the less developed countries to build a basis for further devlopment, and a military-economic program designed to strengthen nations on the fringe of Russia and China. Later, the United States added loan assistance on generous terms, provided surplus agricultural commodities, and embarked on a sustained program to aid the Latin American countries by participation in the Alliance for Progress.[2]

In 1959, the Draper Committee, appointed by the President to study the military assistance program, concluded that no continuing formula could be found that would satisfactorily determine the relative emphasis that should be placed upon economic or military assistance, whether overall or in respect to one particular country.[3] The Draper Committee did not believe that purely economic aid, divorced from military aid, would be of much value to weak nations such as South Vietnam and Laos, if they were about to be overrun by a stronger nation. In Latin America, however, where the problem of military security against external aggression was less acute, the Draper Committee believed that a long-range program for economic development constituted good strategic policy.[4]

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[1] (1) Information and Guidance on Mil Assistance, 8th ed., Jun 1964, prepared by DCS, S&L, HQ, USAF, pp. 18–25. (2) Benjamin H. Williams and Harold J. Clem, *The Economics of National Security: Mutual Security* (ICEF, 1964). See also the various mutual security or foreign aid acts passed by Congress from 1949 to 1968.

[2] Report to the President of the U.S. from the Committee to Strengthen the Security of the Free World, *The Scope and Distribution of U.S. Mil and Economic Assistance Programs*, 20 Mar 63, p. 1. This was called the Clay Report from Gen Lucius D. Clay, Chairman of the Committee.

[3] Communication from the President of the U.S. Transmitting the Final Rpt of the President's Committee to Study the U.S. Mil Assistance Prog: *Conclusions Concerning the Mutual Security Prog* (Draper Rpt), H. *Doc* 215, pt. I, 86th Cong, 1st sess, August 20, 1959, pp. 25–33. William H. Draper, Jr., headed the President's Committee.

[4] Draper Rpt, pt. II, p. 67.

In clarifying the foreign aid responsibilities after passage of the Act for International Development of 1961, the President delegated all military assistance functions, not otherwise delegated or reserved to the President, to the Secretary of Defense. Thus, the Department of Defense exercised primary responsibility for the direction of the miliatry assistance program.[5]

In his speech at John Hopkins University on April 7, 1965, President Johnson declared: "But we will always oppose the efforts of one nation to conquer another nation. We will do this because our own security is at stake."[6] In essence, the security of the United States and its allies was ultimately the basis for mutual security. Numerous statements and actions substantiated this objective of the program from its beginning. As stated, the Act of International Development of 1961 had the following purpose: "To promote the foreign policy, security, and general welfare of the United States by assisting peoples of the world in their efforts toward economic development and internal and external security, and for other purposes."[7] Pointing out that twice in one generation the Nation had to fight against aggression in the Far East, President Johnson declared that the United States was in South Vietnam because "our own security is tied to the peace of Asia."[8]

Challenge of the 1960s

Beginning in 1961, one of the most significant changes in foreign assistance was the steady shift in emphasis from short-term survival assistance, to long-term development in Asia, Latin America, and Africa. As more countries solved immediate problems of security and stability, the United States was able to focus its assistance on fostering self-sustaining growth and toward an eventual end to the need for external aid. As late as Fiscal Year 1961, development assistance accounted for less than 25 percent of the combined foreign assistance program, but by Fiscal Year 1964, such assistance constituted more than 45 percent of the total economic and military assistance.

In the decade from 1950 to 1960, the greatest need was in the great arc of Asia from Turkey to Korea. In response, two-thirds of the aid by the United States was military assistance, and a great part of the economic aid was short-term defense support to help threatened countries survive. In 1965, survival was still directly an issue in Southeast Asia. By that time, investments in recovery of Western Europe and Japan were completed and returns were plainly visible. By then these nations were prosperous and were sharing in helping others. In the less developed countries of Asia, Africa, and Latin America, the success of long-range investment was not certain or imminent, but foreign assistance was the chief hope of these countries to survive external and internal pressure. There was much evidence that progress in these countries was difficult. But, there was also clear evidence that progress was possible.[9]

From the beginning of the foreign assistance programs after World War II, the pertinent laws and their implementation reflected the flexibility of requirements for aid in response to changes in the world situation. In 1950, approximately 76 percent of the military assistance went to Europe, 19 percent to the Middle East, and 5 percent to the Far East. By 1963, the assistance level for the Far East had risen to 48 percent of the total program.[10]

The Foreign Assistance Act of 1961 was designed to give new vigor and direction to the entire program. Under this act, military assistance became more flexible. Among other things, it required the President to reduce with "deliberate speed" and eventually to terminate

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[5] (1) Exec Order 10973, Administration of Foreign Assistance and Related Functions, 30 Sep 61. (2) PL 87–195, 75 *Stat* 424 [1961].

[6] Text of President Lyndon B. Johnson's speech at Baltimore, Md., The *Washington Post*, April 8, 1965.

[7] PL 87–195, 75 *Stat* 424 [1961].

[8] State of the Union Message, 89th Cong, 1st sess, H. *Doc.* 1, January 4, 1965.

[9] David E. Bell, Foreword of Summary Presentation to the Congress on Proposed Mutual Defense and Development Programs for FY 1966, Mar 1965.

[10] "Backbone of our Global Alliance," *This Changing World*, vol. 1, No. 18, 2 Apr 62, pp. 2–3. See also, Benjamin H. Williams and Harold J. Clem, *op. cit.* and Richard M. Leighton and Ralph Sanders, eds., *New Dimensions in the Cold War: Transition and Tension in the Underdeveloped World.* (ICAF, 1963).

grants of military supplies and equipment to any country having sufficient wealth to enable it to maintain and equip an adequate military force without undue burden on its economy. It also prohibited assistance to communist countries except in certain instances, such as a determination by the President that such assistance was vital to the security of the United States.[11]

To be faced in the 1960s and beyond was the widespread poverty in Latin America, Asia, and Africa. In the Near East and Southeast Asia, ancient hostilities and new political disputes still caused trouble. However, Turkey, Pakistan, and India had made progress under their self-development programs. Korea had survived a ruinous war. But in 1965, South Vietnam was still locked in a bitter conflict with communist insurgents. With the buildup of U.S. forces in SEA, the AMC faced the problem of filling the logistic needs of Vietnam as well as U.S. troops.

In January 1967, Maj. Gen. W. B. Latta, Commanding General, Army Electronics Command, expressed a concern over the heavy workload being generated by the International Logistics Program at the possible expense of the AMC's efforts in support of combat troops. General Besson believed that there was little doubt that there had been increased interest in all levels of the International Logistics Program. He reasoned that this interest and resultant pressure stemmed from a desire to meet all commitments for international logistics and support of the troops in Vietnam. He believed, however, that the demands of SEA had given "too many of us an excuse to disregard or delay attention to international logistics requirements," and that, consequently, complaints from our foreign customers had risen in volume and intensity.[12]

General Besson emphasized his desire that the AMC address itself to all requirements placed upon it. He believed that when international logistics and troop support requirements conflicted, the priority decision must be made at the level possessing not only the overall responsibility, but the control of total assets as well. General Besson asked that no Southeast Asia requirement be left unfilled because of a MAP commitment. He did not believe, however, that the Vietnam effort at that time was being seriously endangered by the emphasis on the International Logistics Program.[13]

In October 1966, the Secretary of Defense assigned to the military services the responsibility for planning, budgeting, and funding Grant Aid repair parts and minor secondary items on the same basis as equipment for U.S. armed forces. Under this system, these parts and items for Grant Aid support were to be prestocked as common items within the Army peacetime operating stocks.[14] Based on Department of Defense guidance, the Department of the Army provided implementing authority and instructions for the AMC.

AMC Responsibility

The Army Materiel Command executed for the Department of the Army the logistical programs embracing both materiel and services. According to Army regulations, the purpose of the overall mutual security program was to provide materiel and related services, including worldwide technical advice and assistance, to the DA elements of unified and specified commands and other foreign customers.[15] The AMC Directorate of International Logistics monitored all aspects of the program to insure that international logistics requirements were appropriately considered and that management controls were established to fully implement DA directives in order to satisfy the customer.[16] This directorate gave special attention to matters pertaining to this program which might otherwise have been subordinated.

Fundamentally, the AMC participated in the

[11] (1) PL 87–195, 75 *Stat* 424 [1961]. (2) MFR, Asst General Council, Intl Affairs, DOD, 15 Aug 61, subj: Foreign Assistance Act of 1961.

[12] Ltr, Gen F. S. Besson, Jr., CG, AMC, to Maj Gen W. B. Latta, CG, ECOM, 17 Feb 67, n. s.

[13] *Ibid.*

[14] SECDEF Memo, 14 Oct 66, subj: Logistical Support of Equip Furnished under MAP.

[15] (1) AR 10–11, 22 Mar 65, subj: Organization and Functions of the USAMC. (2) AR 750–22, Jun 1963, subj: Tech Assistance Prog.

[16] Submission, AMCIL to AMCHO, 26 Dec 68.

international development program by supplying the needs of the Agency for International Development (AID). As was the case in other elements of the mutual security programs, the major subordinate commands of the AMC had a principal role in the supply of equipment and services for AID. The national inventory control points participated in programs planning and development and furnished price and availability data.[17]

Transitions and Alignments

Before the activation of AMC in 1962, the Army's portion of the Mutual Security Program was administered primarily through DCSLOG and the Technical Services. The primary function of the Technical Services in the Military Assistance Program was the furnishing of materiel and services as required. During the planning phases of tentative programs, the Technical Services provided information concerning the availability of materiel from existing stocks, those items that would come from procurement, and the price of these items and their spare parts. Upon receipt of the program, the Technical Services made a complete review for nomenclature corrections, availability by type and quantity, and application of the latest prices.[18]

All of the Technical Services involved in the program were governed by similar policies. All had similar organizational arrangements in the offices of the chiefs of the Technical Services, except the Office of the Quartermaster General (OQMG) in which the Mutual Security Office was a complete operating entity. This office managed, executed, acted as the national inventory control point, and otherwise accounted for the mutual security program in the OQMG. The Quartermaster Corps had no mutual security field office as did the Ordnance Corps.[19]

The Ordnance Mutual Security Field Agency located at Rossford Ordnance Depot, Toledo, Ohio, was the largest and most important field agency in this program to be transferred to the AMC. Under the Army reorganization in 1962, its functions were absorbed by the AMC Mutual Security Office. The other Technical Services primarily controlled their MAP supply operations through the following field organizations: the Corps of Engineers had the Engineering Supply Control Office in St. Louis; the Transportation Corps (TC) performed its complete stock control, including that for the MAP at the Transportation Materiel Command, St. Louis, and at the TC National Inventory Control Point, Ft. Meade, Maryland, which was established for certain commercial vehicles. In addition TC was responsible for the shipment of MAP cargo. The Chemical Corps performed these operations through Edgewood Arsenal and the Signal Corps had its supply control agency in Philadelphia.[20]

With the approval of the Secretary of the Army, DCSLOG had established the U.S. Army Military Assistance Program Logistics Agency (MAPLA) in November 1960.[21] The centralized control of MAP billing and reporting activities required that MAPLA be located as near as possible to the U.S. Army Finance and Accounts Office in Washington. This fact resulted in the selection of the Navy Yard Annex in Washington, D.C., as the site for the new agency. The agency began operations in December 1960. By March 1961, it had an authorized personnel staff of 88—14 military and 74 civilian. This authorization soon increased to 99 and remained at that level until the con-

[17] Melvin O. Amoth: Presentation at ALMC, 18 Mar 65.

[18] Interv, Raymond J. Snodgrass with Col Michael A. Matzko, Evaluation Br, Intl Log and Plans Div, Mutual Security Ofc, HQ, AMC, 25 Oct 63.

[19] (1) AMC Dir 795–2, 20 Aug 63, Subj: Supply for Mutual Security Programs, Concept of Operations for MAP. (2) Interv, Raymond J .Snodgrass with Norman Ashworth, Intl Logistics Sec, Opns Br, Stock Control Div, Dir/Supply, SMC, 5 Jan 66.

[20] (1) Staff Directory, HQ, OCCm10, 1 Sep 59. (2) Interv, Raymond J. Snodgrass with Mason Cartmell, Intl Log Sec, Opns Br, Stock Control Div, Dir/Supply, SMC, 10 Jan 66. (3) Interv, Raymond J. Snodgrass with Edmund Comitz, Electronics Div, Dir/Materiel Readiness (DMR), HQ, AMC, 7 Jan 66.

[21] (1) DA GO 45, 30 Nov 60. (2) Mutual Security Ofc and Mutual Security Agency Historical Summary, FY 1963, sec 1, p. iv.

trol of the agency passed to AMC on 1 August 1962.[22]

By June 1961, MAPLA was partially operational in all phases of its mission except the centralized control of data processing. Between June 1961 and June 1962, this agency expanded its operations, completed a data systems application study, defined the MAPLA's data processing mission, selected a data processing system along with the equipment, obtained DOD approval of the data processing facility, and prepared for changes that were to come under the reorganization of the Department of the Army. Around the MAPLA, which was to become the heart of the MAP structure in AMC, the early thinking on the command's concept of MAP operations revolved.[23]

On 1 August 1962, the Ordnance Mutual Security Field Agency (OMSFA) came under the jurisdiction of the Commanding General, AMC, who placed it under control of MAPLA. During the interim phase of the reorganization of the Department of the Army in 1962, the OMSFA, which had been renamed the AMC Mutual Security Field Office, like all mutual security offices of the Technical Services, remained in place until absorbed by MAPLA or by the AMC Mutual Security Office. On 18 March 1963, the Commanding General, AMC, transferred this field agency at Rossford Army Depot to the AMC Mutual Security Agency at the Navy Yard Annex in Washington, D.C.[24]

AMC Organization and Management

As a result of the 1962 Army reorganization, the AMC assumed operational control of MAP which had been controlled from the Department of the Army staff level. Effective 1 August 1962, the MAPLA, as an operating agency, passed from the operational control of DCSLOG to AMC. With the abolishment of the Technical Services, AMC decided to centralize the control of all MAP operations and to transfer all MAP operational functions and personnel to MAPLA.[25] This transfer from the Technical Services and from elements of the Mutual Security Division, DCSLOG, was not completed until 1963.

In the MAP area, as in the supply area generally, DCSLOG had made some progress in the reduction of the differences in practices among the Technical Services. However, at the time of the reorganization of the Department of the Army in 1962, DCSLOG did not have effective control over the wide range of practices within the Technical Services. Many of these practices were solidly based on differing requirements of the commodities managed or services performed, such as the differences between Quartermaster and Ordnance supply and service responsibilities. Other such practices could be attributed to the size of the programs. For example, the Chemical Corps was a small, compact organization with relatively minor supply requirements. On the other hand, the Ordnance Corps had jurisdiction over a large, diversified organization with a number of subordinate commands, as large, or larger, than the Chemical Corps, and had the major responsibility for all phases of materiel management. DCSLOG's experience with this diversity of doctrine and practice revealed certain key factors which had to be taken into account in any approach toward a solution of the problems.[26]

MAPLA, which had been staffed with personnel from DCSLOG, was primarily a data

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[22] (1) AMC GO 5, 26 Jul 62. (2) Mutual Security Ofc and Mutual Security Agency Historical Summary, FY 1963, sec. 1, p. v.

[23] (1) Mutual Security Ofc, Mutual Security Agency Historical Summary, FY 1963, sec. 1, p. v. (2) MFR, Lt Col Kyle Davis, AMC Planning Group, 24 May 62, subj: Briefing for Dir/Supply Opns, DCSLOG.

[24] (1) AMC Cir 3, 18 Jul 62. (2) AMC GO 7, 26 Jul 62. (3) MFR, Lt Col Kyle Davis, Mutual Security Div, HQ, AMC, 25 May 62, subj: Briefing for Dir/Supply Opns, DCSLOG. (4) AMC GO 12, 28 Feb 63.

[25] (1) Summary of Major Events and Problems of DCSLOG, 30 Jun 62, sec. II, pp. 1–3. (2) AMC Dir 795–2, 20 Aug, Supplies For Mutual Security Programs, Concept of Opns for MAP.

[26] MDLC Planning Dir No. 2, 21 Feb 62, subj: Transition Plan.

processing agency responsible for executing the Grant Aid Program, supervising all Army MAP activities in CONUS and overseas, and inspecting materiel delivered to MAP countries. This included operational control of the Military Assistance Observer Teams (MAOTs) who monitored the flow of MAP materiel to foreign countries. MAOTs were located in New York, Heidelberg, and Camp Zama, Japan.[27]

The task of maintaining stability of MAP operation during the transition period posed major problems.[28] There was not a prompt, smooth transfer of MAP personnel and functions by the DCSLOG to the AMC. On the day AMC became operational, Col. C. R. Teaboldt, Chief, Mutual Security Office, AMC Headquarters, reviewed the personnel authorization for his office and concluded that it would be adequate. The next day AMC learned that certain key personnel of DCSLOG, who had been identified for functional transfer to AMC, had been or were soon to be reassigned elsewhere.[29] This action, which was accomplished without consulting the AMC, deprived the command of personnel with skills and knowledge that were essential for the performance of the MAP functions. It weakened the command's ability to perform its mission and prolonged the time required for it to assume effectively its MAP obligations.[30]

Another MAP problem concerned the transfer of reporting responsibility from DCSLOG to AMC. An agreement between the two on 16 August 1962 set forth the policies and procedures under which an orderly transfer of the DCSLOG's reporting responsibilities was to be made to AMC. The purpose was to assure that an uninterrupted flow of reports from the field was maintained. As a final reporting transfer action, DCSLOG at the request of AMC was to make the physical transfer of the master file of each report and AMC was to indicate the acceptance and assumption of responsibility. The agreement was to remain in effect until all appropriate DCSLOG reports were transferred to AMC.[31] However, DCSLOG did not comply completely with the 16 August 1962 reports agreement, nor did it relinquish all the operational aspects of the MAP program to AMC. Not until the fall of 1964 did AMC take over many of the operational aspects of the MAP program.[32]

Realignment Under AMC

The key points in the AMC concept of operations as it pertained to MAP were the centralization of the important decisionmaking process, and the decentralization of the implementation of the operations. According to the plan, DCSLOG was to pass MAP orders received from the Department of Defense to MAPLA, which in turn would issue MAP extract orders to the NICPs in the name of the Commanding General, AMC. These orders were to go directly to the NICPs for implementation.[33]

This practice woud not permit strict adherence to the sanctity of command channels. That this could be done, however, had been proved by the special channel that had existed between the Assistant Secretary of National Security Affairs (ISA) and the DCSLOG. Also, this practice had been proved by the management system used for control of Nike missile batteries. However, for efficient operation, the plan demanded explicit instructions concerning responsibilities and procedures.[34]

As foreseen in the AMC Activation Plan, the structure of the MAP organization underwent many changes during the period of 1 August to

[27] Submission, AMCIL to AMCHO, 26 Dec 68.

[28] MFR, Lt Col Kyle Davis, AMC Planning Group, 24 May 62, subj: Briefing for Dir/Supply Operations, DCSLOG.

[29] (1) DF, Col C. R. Teaboldt, Ch, Mutual Security Ofc, HQ, AMC to Mgmt Science Ofc, 1 Aug 62, subj: Personnel Space Authorization for the Mutual Security Ofc. (2) Ltr, DCSPER to CG, AMC, 2 Aug 62, subj: Names to be Removed from List of Those Eligible for Functional Transfer to AMC.

[30] Ltr, Ch, Mutual Security Ofc, HQ, AMC to DCSLOG, 8 Aug 62, subj: Problem Areas Pertaining to DCSLOG Functional Transfers.

[31] Agreement Between DCSLOG and AMC on Transfer of Reports Resulting from DA Reorganization, 16 Aug 62. This agreement was signed by Col Paul D. Hickman, Ch, Data Systems Ofc, AMC, and Col Robert E. Vanderberg, CO, DCSLOG Data Processing Center.

[32] (1) Ltr, LOG/D15742, 10 Jul 62, subj: A Concept of Operations for Mil Assistance in the DA. (2) Interv, Raymond J. Snodgrass with George W. Jacobs, Ofc, Naval Material, 7 Apr 65. Mr. Jacobs was formerly in the Mutual Security Ofc, AMC.

[33] MFR, Lt Col Kyle Davis, AMC Planning Group, 24 May 62, subj: Briefing for Dir/Supply Operations, DCSLOG, with incl.

[34] AMC Dir 795–2, 20 Aug 62, subj: Supplies for Mutual Security Programs, Concept of Operations for MAP.

31 December 1962. The men who had worked in the mutual security planning groups played an important part in molding the MAP organization that followed.[35] Early in July 1962, Col. Charles R. Teaboldt became the nominal Chief of the Mutual Security Office and Melvin O. Amoth became the deputy.[36] Colonel Teaboldt and his staff proceeded with plans to integrate certain mutual security functions of the DCSLOG, the MAP offices of the Technical Services, and the Ordnance Mutual Security Field Agency, into AMC.[37] However, the major MAP functions of the Quartermaster went to SMC because of the number of Defense Supply Agency items involved. To perform the MAP functions, AMC and SMC fell heir to over 300 personnel who had been performing such functions.[38]

The realignment of mutual security functions was hardly underway when Col. Clarence C. Haug replaced Col. Teaboldt as Chief of the Mutual Security Office on 1 October 1962. During that month, he was nominated for promotion to brigadier general, and General Besson decided that the position of Chief of the Mutual Security Office warranted that rank. Almost immediately, the new chief requested his key personnel to review carefully the existing organization and submit proposed additions or clarifications.[39]

In November 1962, the Mutual Security Office proceeded to change its organizational structure by adding an Operations Division, which had charge of the Military Assistance Program Logistics Agency located at the Navy Yard Annex. The Mutual Security Office then had three major divisions, including the previously established Policy and Evaluation Division and the International Agreements Division.[40] To a considerable extent the restrictions on the size of the Headquarters, AMC staff prevented the Mutual Security Office from absorbing the personnel of MAPLA. Hence, the Mutual Security Office absorbed certain MAPLA functions without absorbing the personnel involved into the Mutual Security Office table of distribution.[41]

On 1 February 1963, AMC expanded the Military Assistance Program Logistics Agency, renamed it the Mutual Security Agency, and established this agency as a class II activity under the Mutual Security Office.[42] The AMC Mutual Security Field Office at Rossford Ordnance Depot was discontinued and its equipment and personnel were transferred to the Mutual Security Agency in Washington, D.C.[43]

Another major reorganization, in March 1963, necessitated by the need for a uniform fiscal policy common to all segments of the MAP, resulted in the creation of a budget and fiscal office by merging the financial functions of the Grant Aid and Military Sales divisions. Other organizational and personnel realignments for better management which followed reflected the revised and expanded mission and followed the AMC concept that the Mutual Security Agency, although a Class II activity, was an integral part of the Mutual Security Office. In June 1964, the Chief of the Mutual Security Agency, located in the Washington Navy Yard, was redesignated the Deputy for Operations, Mutual Security Office, AMC.[44]

Although the AMC Preliminary Implementation Plan (PIP) of April 1962 placed the international aspects of the research and development program under the Director of Research and Development, the Activation Plan

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[35] AMC Cir 3, 18 Jul 62, subj: AMC Plan for Assumption of Comd on 1 Aug 62.

[36] AMC SO 9, 17 Jul 62, effective 2 Jul 62.

[37] (1) Interv Raymond J. Snodgrass with Col C. R. Teaboldt (Ret), 8 Jan 65. (2) Interv, Raymond J. Snodgrass with Melvin O. Amoth, 23 Feb 66.

[38] AMC Dir 795-2, 20 Aug 62, Subj: Concept of Operations for MAP. See also Presentation of MAP by Col C. R. Teaboldt at AMC Commander's Conf, Aberdeen Proving Ground, Md., 13-14 Sep 62.

[39] Memo, Col C. C. Haug for Admin Asst and Chiefs, Intl Agreements Div and Mil Assistance Div, 8 Oct 62, subj: AMC Organization and Functional Manual.

[40] (1) AMC Cir 10-3, 16 Nov 62, subj: Organization & Functions, Mutual Security Ofc, HQ, AMC. (2) AMCR 10-39, 25 Jun 63, subj: AMC Organization Manual.

[41] Memo, Ch, Mutual Security Ofc, to Chiefs, Operations Div and Policy and Evaluation Div, 4 Dec 62, subj: Realignment of Responsibilities and Functions with incl.

[42] (1) AMC GO 9, sec. II, 7 Sep 63, subj: Reorganization—USAMC Mutual Security Agency. (2) DA GO 5, 4 Feb 63.

[43] (1) AMC GO 13, 28 Feb 63, sec. III. (2) Mission Transfer—Memo of Understanding between Mutual Security Field Ofc and Mutual Security Ofc, 4 Dec 62.

[44] Submission, AMCIL to AMCHO, 26 Dec 68.

of July placed these functions under the Mutal Security Office.[45] Included in these programs were the Mutual Weapons Development Program, the Defense Development Exchange Program, the Mutual Weapons Development Data Exchange Program, the U.S.-Canadian Defense Development Sharing Program, the Cooperative Research and Development Program, and other bilateral and mutilateral activities, such as those under NATO.

The organizational changes did not end with the early realignment in structure of the Mutual Security Office, but continued through the following years. At the AMC Management Conference in August 1963, General Haug concluded that there was a great need for a more concise delineation of responsibilities for the execution of the MAP within AMC and SMC. He called for a better understanding of the nature of the total mutual security effort and for a clearer definition of responsibilities by other AMC elements, and recommended that each of the two commands expand its organizational and functional statements to include full coverage of those MAP responsibilities for which it had staff responsibility.[46]

Before the establishment of the Mutual Security Field Offices, the AMC relied on the Military Assistance Observer Teams to police the flow of MAP materiel to foreign recipients. In August 1964, AMC discontinued the MAOTs in CONUS after the General Accounting Office report of May 1963 maintained that these teams duplicated the inspections performed by AMC major subordinate commands. The combination of this GAO report and the centralized management of the Army supply system under the AMC concept resulted in the elimination of the MAOTs' prime function in CONUS to monitor the flow of MAP materiel from U.S. Army supply sources.[47]

Following the elimination of the MAOTs, AMC established three oversea Mutual Security Field Offices (MSFOs) to foster good customer relations, improve customer service, and to investigate promptly complaints concerning the execution of the mutual security program. The three MSFOs were as follows: MSFO-Europe; MSFO-Far East, located in Hawaii; and the MSFO-Southern Command, located in the Canal Zone.[48]

MAP Supply Channels

In December 1962, General William J. Ely, Deputy Commanding General of the AMC, had concluded that the Military Assistance Program Logistics Agency should serve as a focal point for receipt and routing of MAP requisitions.[49] In referring to General Ely's conclusion on this MAP subject, General Haug commented:

> What should be our position? Basically, I subscribe to the principle that MAP is another customer and should be recognized as such instead of tending to build up a separate organization and supply system just for MAP. Making MAPLA a point for receipt and routing of MAAG requisitions aids and abets the latter philosophy. I know there are good arguments on the other side.[50]

General Haug concluded that this would require substantial changes to MAPLA automatic data processing operations, it would be an advantage from the standpoint of status reporting and execution of the MAP program generally.[51]

The consideration of making MAPLA a focal point for routing Military Assistant Advisory Group requisitions was based on the understanding that the Overseas Supply Agencies (OSAs) were to be phased out. The OSAs had been field agencies of DCSLOG. On 30 No-

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[45] (1) PIP, 27 Apr 62, pp. A-59, A-72, A-73. (2) AMC Activation Plan, 16 Jul 62, p. A-83.

[46] Brig Gen C. C. Haug, AMC Mgmt Conf Rpt, Panel No. 16 (Mutual Security), 5 Aug 63.

[47] (1) Ltr, Ch, Mutual Security Ofc to DCSLOG, 28 Jun 63, subj: GAO Final Rpt to Congress. (2) AMC Historical Summary, FY 1963, p. 460. (3) AMC GO 58, 17 Aug 64. The MAOTs discontinued in 1964 were located as follows: Navy Yard Annex, Wash, D. C.; Defense Construction Supply Center, Columbus, Ohio; Memphis Defense Depot, Memphis, Tenn; and Sharpe Army Depot, Lathrop, Calif.

[48] (1) AR 795-12, 22 Sep 64, subj: USAMC Mutual Security Field Ofs. (2) AMC GO 76, 11 Dec 64. (3) Ltr, Dep for Operations, Mutual Security Ofc to CG, SMC *et al.*, 3 Dec 64, subj: MSFOs.

[49] MFR, Maj Gen Wm. J. Ely, DCG, AMC 21 Dec 62, subj: Army Supply Sys.

[50] Memo, Ch, Mutual Security Ofc, for Chiefs, Policy and Eval Div and Opns Div, 26 Dec 62, subj: Par. 2 of Gen Ely's MFR, 21 Dec 62.

[51] (1) Memo, Ch, Policy & Evaluation Div, Mutual Security Ofc, for Mr. Amoth and Ch, Opns Div, 26 Dec 62, subj: MAP Supply Sys. (2) Interv, Raymond J. Snodgrass with Melvin O. Amoth, Dep Ch, Mutual Security Ofc, 17 Mar 66.

vember 1961, the Secretary of Defense approved the abolition of the three OSAs (New York, New Orleans, and San Francisco), but DA efforts resulted in the withdrawal of this directive. Under the reorganization plan, effective 1 August 1962, AMC took over the OSAs and operated them through its newly established SMC. However, the OSAs were abolished on 1 July 1964. Meanwhile, mutual security personnel devoted much attention to the question of transferring the mission and functions of the mutual security divisions in the three OSAs to some other organization.[52]

Whether the Mutual Security Agency (formerly Military Assistance Program Logistics Agency) at the Navy Yard Annex could absorb the OSA functions related to MAP was a subject that required considerable study by MAP personnel. However, this question was resolved by the establishment of the Mutual Security Directorate in Brooklyn, New York, concurrently with the close-out of the Oversea Supply Agencies on 1 July 1964.[53] Meanwhile, the Army Supply and Maintenance System (TASAMS) study had been approved by the Department of Defense on 12 December 1963.[54]

With the OSAs gone, the new stock control and distribution system under TASAMS provided that the channel for overseas command requisitions be directed to seven NICPs of AMC commodity commands, eight defense supply centers of the Defense Supply Agency (DSA), and one General Services Administration (GSA) region. Thus, the need for better liaison was obvious. Instead of following the TASAMS study recommendation, SMC established the Mutual Security Directorate, a new organization, as an element of the U.S. Army Terminal Command, Atlantic (USATCA). This directorate combined all of the responsibilities for MAP requisitions that had been performed by the three OSAs.[55] It served as a single point of contact for receipt and processing of all requisitions for MAP customers, maintained status files, and monitored timely supply support for requisitions under the worldwide Grant Aid and Military Assistance Sales Programs.[56]

In September 1964, the Army Logistics Management Center completed a comprehensive study on supply support of the international logistics programs.[57] This resulted in the establishment of a new International Logistics Center to serve as a link between MAP customers and the U.S. Army supply system, and to provide supply and financial accounting services. For this center to become operational involved the development and testing of a new computerized system as well as the transfer of personnel from Washington, D.C. to New Cumberland.[58] The Director of International Logistics, AMC, assumed operational control of the U.S. Army International Logistics Center (ILC) on 1 July 1966. The ILC functioned as the U.S. Army single point of contact within CONUS for receipt and processing of all requisitions relating to Grant Aid, Foreign Military Sales, and Supply Support Arrangements.[59]

During 1966 the Co-production Office at AMC Headquarters was expanded in order to cope with the growing interest and workload in that area. Futhermore, the Cooperative Logistics Program was separated from the Military Sales Division to provide for greater efficiency in handling common support arrangements which were increasing in number. In mid-1966, the great interest in international logistics led the Army Chief of Staff to develop a management system for detailed control over this program.[60]

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[52] (1) Fact Sheet, Asst DCSLOG for Prog & Bud, 9 Oct 62, subj: OSAs. (2) Ltr, AG to CG, AMC, 17 Jul 63, subj: Phase-Out of Army OSAs. (3) ALMC Study, Feb 1962, subj: Essentiality of OSAs in the Army Supply Sys. (4) DA GO 6, 28 Feb 64.

[53] (1) Memo, Lt Col M. A. Matzko for Col C. J. Merrill, 27 Dec 62, subj: Army Supply Sys. (2) SMC Historical Summary, FY 1964, pp. 34–35.

[54] (1) *Ibid*, pp. 34–35, 121–122. (2) DA TASAMS Implementation Plan Summary, 1 Nov 63, sec. IV–Mutual Security Program, pp. 52–62.

[55] (1) SMC Historical Summary, FY 1964, p. 34. (2) SMC GO 30, 28 Feb 64.

[56] SMC Historical Summary, FY 1964, p. 35.

[57] ALMC Study, 1 Sep 64, subj: U.S. Army Support of Intl Logistics Programs.

[58] Minutes of SMC Staff Meeting, 22 Jul 65.

[59] Submission, AMCIL to AMCHO, 26 Dec 68, pp. 10–12.

[60] *Ibid.*, p. 14.

After AMC became operational in 1962, the command made considerable progress in channeling the execution of the Military Assistance Program into the normal functional organizational elements. However, continuing problems arose because of a lack of understanding of the functional responsibilities for mutual security within the AMC and the SMC. To some extent this lack of understanding stemmed from the fact that during the first year of operation, while under heavy pressure to meet Grant Aid expenditure objectives set by the Department of Defense, the Mutual Security Office performed functional activities, thereby giving rise to the assumption that this was its responsibility. The Mutual Security Office, however, was organized on a program rather than a functional basis its proper roles being that of staff supervision and coordination.[61]

An effort by the Chief of the Mutual Security Office to promote a better understanding by all AMC organizational elements of their functional responsibilities for mutual security programs was not uniformly successful. In March 1964, he signed a Memorandum of Understanding with the Director of Supply, SMC, and the Director of Materiel Readiness, AMC, to clarify the broad responsibilities for the mutual security program. This memorandum was prompted by the AMC Inspector General's Report of Inquiry of January 1964 concerning Supply Support of Ammunition to Vietnam, and the Ammunition Procurement Supply Agency's recommendation that the AMC "pin down once and for all a system of implementation that is clearly defined and economically supportable." According to the memorandum, there was a need to focalize responsibility for developing and coordinating detailed procedures for mutual security supply operations between the national inventory control points and the customers.[62]

In June 1964, General Haug signed another memorandum of understanding with the Director of Supply. Since AMC staff responsibility for supply had been delegated to the SMC, General Haug negotiated directly with the Director of Supply concerning their respective responsibilities for the international logistics program. These negotiations culminated in the Memorandum of Understanding of June 1964 in which the two commands recognized that mutual security actions had been handled without uniform guidance and "without adequate regard to existing assignment of functional responsibilities." In this memorandum, the delineation of responsibilities was based on the premises that the Chief of the Mutual Security Office had primary responsibility for program management and that the Director of Supply had primary responsibility for program execution.[63]

This agreement broke down promptly over the question of whether a transfer of functions and therefore of personnel spaces was involved. The Director of Supply held that under the reorganization in 1962 the SMC received only the four MAP people associated with DSA-type items and that all other such personnel were transferred to AMC. To assume any more MAP functions, he insisted, SMC would have to have those people then performing these functions. General Haug said that the Mutual Security Office had, from the beginning, been organized on a program basis and that no transfer of functions was involved. To him, it was a matter of getting the functional directorate to perform functions which had

[61] (1) Memo, Ch, Mutual Security Ofc, AMC for Dir/Supply, SMC, 13 Feb 64, subj: AMC Supervision and Execution of Mutual Security Programs. (2) Memo, Brig Gen C. C. Haug, 5 Aug 63, subj: AMC Mgmt Conf Rpt No. 16 (Mutual Security).

[62] (1) Memo of Understanding, 5 Mar 64, n.s., signed by Lt Gen August Schomburg, CG, SMC, Brig Gen C. C. Haug, Ch, Mutual Security Ofc, and Col Ira C. Redfern, Jr., Materiel Readiness Ofc, AMC. (2) Memo, IG, AMC to Director, Materiel Readiness, AMC 13 Mar 64, n.s., with incl.

[63] Memo of Understanding, 11 Jun 64, subj: Staff Responsibilities with Respect to Mutual Security Programs, signed by Maj Gen B. E. Kendall, Dir/Supply, SMC, and Brig Gen C. C. Haug, Mutual Security Ofc, AMC, and attached tabulation, 24 Apr 64, subj: Responsibility for Mutual Security Programs.

been theirs from the beginning, with transfer of personnel or functions to be determined as events unfolded. Since both offered cogent arguments, it can only be concluded that there had been no precise definition of MAP personnel and functions transferred from the Technical Services to elements of Headquarters, AMC, and SMC. Efforts to resolve the problem continued during 1964 and 1965.[64]

To the Mutual Security Office the main problem was the failure of the functional elements to accept sufficient responsibility for the execution of mutual security program functions. Mutual security personnel pointed out that the program accounted for approximately 20 percent of AMC's procurement and supply mission in Fiscal Year 1964 and that such a program had a substantial impact throughout the command. Futhermore, they observed that this program was an important tool of foreign policy, had numerous sensitive aspects, and that certain country programs had very high priority.[65]

The AMC Headquarters Organizational Study of 1964 devoted considerable attention to international logistics. At the request of the Commanding General, SMC, late in June 1964, the factfinding phase of this study was expanded to include all elements of Headquarters, SMC. In August 1964, at the request of General Besson, Lt. Gen. Jean E. Engler, Commanding General, SMC, presented his long-range organizational concepts for the AMC. Discussions on these concepts led to the conclusion that Headquarters, AMC and SMC should be merged and that a detailed review should be made of the separate activities reporting directly to Headquarters, AMC. The report of the AMC organization study group in September 1964 recommended that the two headquarters be consolidated to correct overlapping and duplication of functions, but General Besson deferred any decision. To be considered, among other factors, was the impact of the findings of studies on international logistics that were underway at the time.[66]

Late in January 1964, the Commanding General of the AMC directed the Army Logistics Management Center to determine how the command could best discharge its responsibilities for supply support of the international logistics programs. This action came as a result of the AMC Inspector General report of January 1964 on ammunition supply failures in Vietnam in the fall of 1963. Later in 1964, the AMC developed new procedures for an uninterrupted flow of ammunition. These procedures were meant to improve on normal MAP procedures. Known as the Vietnam Ammunition Procedures (VAMP), they provided for ammunition to be charged to MAP only after being unloaded in Vietnam. They sharply reduced the normal MAP program cycle. The ALMC study, "U.S. Supply Support of International Logistics Programs," commonly known as the Lockhart Study because Col. L. H. Lockhart headed the ALMC study group, was published on 1 September 1964.[67]

The Lockhart Study was a comprehensive review of the responsibilities of the Department of the Army, and specifically the AMC, in giving supply support to the international logistics programs. Essentially, the study provided an overall view of the international logistics programs, the Army supply system, and their interrelationship. In general, the major problems identified and the proposed solutions were broad in nature. Therefore, the study avoided operational details except as they helped in identifying major problem areas.[68]

The study concluded that the existing support for MAP items was below the standard of

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[64] (1) Memo, Brig Gen C. C. Haug to Maj Gen B. E. Kendall, 11 Jun 64, subj: Responsibilities with Respect to Mutual Security Programs. (2) Memo, Gen Haug to Dep Dir/Supply, SMC, 8 Jul 64, subj: same. (3) Memo, Dep Dir/Supply, SMC to Ch, Mutual Security Ofc, AMC, 30 Jul 64, subj: same. (4) Memo, Maj Gen R. C. Kyser, DCG, SMC for Ch, Mutual Security Ofc, AMC, 29 Jul 64, subj: Responsibilities with Respect to Mutual Security Functions. (5) Interv, Raymond J. Snodgrass with Melvin O. Amoth, Mutual Security Ofc, AMC, 29 Apr 66.

[65] (1) AMC Cir 10–4, 1 May 64, subj: Hq, AMC Organizational Study. See especially para 9b. (2) Memo, Col Claude J. Merrill, Lt Col Walter P. Cumbie, and Melvin O. Amoth for Ch, HQ, AMC, Study Group, 26 May 64, subj: Organization and Functions.

[66] (1) AMC Headquarters Organizational Study, 5 volumes, n.d. (2) Ltr, Lt Gen Jean E. Engler to Gen F. S. Besson, Jr., 4 Aug 64, n.s. with incl, Reorganization Study, AMC, Jul 1964.

[67] (1) ALMC Study, 1 Sep 64, subj: U.S. Army Support of Intl Logistics Programs, tab B. (2) AMC Historical Summary, FY 1964, pp. 582–583.

[68] ALMC Study, 1 Sep 64, known as the Lockhart Study.

support given to the U.S. Army. It recommended 85 detailed actions needed to correct the existing practices in the supply support system. In the organizational area, the study concluded that the arrangement and assignment of responsibilities in the Department of the Army had not kept pace with developments in international logistics.[69] The study cited many examples of the lack of clarity in organizational structure and responsibility for program execution. According to the study, DCSLOG's continuation of an operational directorate for Grant Aid and MAP sales, plus a division for cooperative logistics, could not be justified. Similarly, the continuance by DCSLOG's Director of Materiel Readiness of furnishing all supply intelligence for the grant aid program was questioned. Thus, the need for some element under DCSLOG to develop policy dealing purely with international logistics matters seemed apparent.[70]

In forwarding the Lockhart Study to DCSLOG in November 1964, General Besson explained that he was initiating action to implement its recommendations that were in the scope of his authority. He urged DCSLOG to give all possible support to obtain necessary DA and DOD approval. Meanwhile, a special study group proceeded to develop the plan for a realignment of mutual security functions and personnel so as to integrate, to the maximum extent possible, the international logistics programs with the Army logistics system for the support of U.S. troops.[71]

In the fall of 1964, the SMC recommended that the Lockhart Study be implemented immediately. Maj. Gen. R. C. Kyser, Deputy Commanding General, SMC, did not favor deferring this action to await the merger of AMC and SMC.[72] Nevertheless, the AMC deferred action but in late November 1964 established a task group under the Management Science Office to prepare a plan for implementing the Lockhart Study recommendations. This task group of AMC-SMC personnel completed the plan in January 1965,[73] but in the meantime events had overtaken some of the conclusions and recommendations of the Lockhart Study. Since MAP functions of the two commands had not been clearly defined, General Besson's announcement on 17 March 1965 of the collocation and ultimate merger of AMC and SMC had a direct bearing on this question. Furthermore, by mid-March 1965, Lt. Gen. L. J. Lincoln, DCSLOG, expressed the opinion that the study had served its purpose and did not need to be pursued further. Instead, he believed that the International Logistics Improvement Program (ILIP) would alleviate the problems raised by the Lockhart Study. General Lincoln and his Director of International Logistics, Brig. Gen. Howard K. Eggleston, believed that the concepts of the Lockhart Study conflicted with the ILIP. This emphasis on the ILIP by DCSLOG led to a decrease in the emphasis on the Lockhart Study. The ILIP continued to be emphasized throughout the remainder of 1965 and following years.[74]

Major AMC Programs

Grant Aid

Grant Aid legislation authorized military assistance to certain friendly foreign countries and international organizations. Military assistance planning under Grant Aid was long range in nature. Plans were prepared for specific countries on a five-year basis. Congress appropriated funds on an annual basis. This

[69] *Ibid.*, Tab D.

[70] Lockhart Study, pp. 95–101.

[71] (1) Ltr, CG, AMC to DCSLOG, 12 Nov 64, n.s., with incl. (2) AMC Cir 10–18, 23 Nov 64, subj: Organization and Functions, Mutual Security.

[72] Memo, DCG, SMC to CofS, AMC, 23 Oct 64, subj: Mutual Security Functions.

[73] (1) AMC Cir 10–18, 23 Nov 64, subj: Organization and Functions, Mutual Security. (2) Minutes of Task Group, 23 Nov 64. The steering committee was composed of Maj Gen R. C. Kyser, DCG, SMC, Brig Gen C. C. Haug, Ch, Mutual Security Ofc, AMC, and Col M. G. Hatch, Ch, Mgmt Science Ofc, AMC. Edward H. Spearman of the Mgmt Science Ofc headed the task group.

[74] (1) Ltr, DCSLOG to CG, AMC, 20 Mar 65, n.s. (2) Ltr, CG, AMC to DCSLOG, 19 Apr 65, n.s., and MFR. (3) Interv, Raymond J. Snodgrass with Melvin O. Amoth, Mutual Security Ofc, 29 Apr 66. (4) Interv, Raymond J. Snodgrass with Francis Ginther, Dir/Intl Logistics, DCSLOG, 17 Mar 65.

was the part of the military assistance program for which the United States received no reimbursement, as distinguished from military sales. MAP supported civic action, which involved the use of indigenous foreign and paramilitary forces, was designed to support social and economic development or to eliminate insurgencies. In nations with serious insurgency problems, such as Thailand, emphasis was placed on solving those problems, while in other countries economic and social problems received primary attention.[75]

To assist friendly nations in manufacturing military equipment, the United States entered into arrangements with its NATO allies for the production of such equipment, including missiles, in Europe. This was meant to stimulate cooperative efforts among the allied countries in developing and producing modern weapons. The United States sometimes encouraged a country to purchase defense articles and services, or to produce its own materiel, by negotiating a cost-sharing agreement with that country. A good example of a multilateral cost-sharing arrangement was the consortium production of F–104 aircraft in Europe, while F–104 production in Japan and several shipbuilding arrangements were prime examples of bilateral cost-sharing. Costs-sharing assistance was planned and programed in the same manner as Grant Aid.[76]

Implementation of the Grant Aid Program differed according to the source of supply. Items furnished from U.S. Army stocks, or CONUS procurement were the supply responsibility of the AMC, which integrated the requirements into normal supply programs of the U.S. forces. Items furnished from offshore procurement were contracted for and monitored by the responsible oversea command. Program deviations affecting the deletion of quantities of approved programs were initiated by the Military Assistance Advisory Group, based on approval of the Unified Command, and sent to the AMC. Items in the approved programs were normally delivered according to a forecast prepared by the AMC and approved by the Department of the Army.[77] In general, the AMC administered the execution of the MAP for all materiel and logistical services.[78] The AMC handled a large portion of the entire Army Grant Aid Program. For example, the command's portion of the Fiscal Year 1963 program, including prior year orders, totaled $1.239 billion, while the remainder of the Army Grant Aid Program totaled only $404 million.[79]

In June 1964, the Army Chief of Staff strongly emphasized the sanctity of the Government's mutual security commitments. According to the Chief of Staff, the Secretary of Defense considered that both sales and Grant Aid commitments had to be met on time from whatever sources were available. Furthermore, the Army was required to guarantee support for equipment furnished under these programs throughout its life span. The Army could be called upon to an increasing degree to meet any shortfalls from its own materiel resources.[80]

By 1965, some European countries that once had received Grant Aid had become our economic competitors. Over the past several years, the total amount of support provided under Grant Aid had remained fairly constant, while military sales increased rapidly.[81] Aid to western European countries was limited largely to the fulfillment of previous commitments and to a modest amount of training essential to the achievement of U.S. objectives. During Fiscal Year 1965, approximately 70 percent of the Grant Aid Program went to nine key countries on the periphery of Communist China and the

[75] Information and Guidance on Military Assistance 10th ed., 1966, pp. 11–13.

[76] (1) AR 795–17, C12, 8 Apr 68, subj: Intl Logistics —General Policies and Principles for Furnishing Army Materiel on a Grant Aid Basis. For further discussion of the U.S. Mil Assistance Policy see, Richard M. Leighton and Ralph Sanders, *op. cit.*, pp. 139ff.

[77] (1) Information and Guidance on Mil Assistance, 10th ed., 1966, pp. 27–28. (2) AR 795–16, Jul 1968, Operating Instructions and Procedures for Grant Aid Mil Assistance Programs.

[78] AR 795–17, Supplies for Mutual Security Programs —Supply of Army Materiel to Foreign Governments on a Grant Aid Basis, 5 Nov 63, and C3, 23 Mar 65.

[79] Report, AMC: The First Year, by C/DP, AMC, Oct 1963, p. 63.

[80] Ltr, Gen Earle G. Wheeler, Army CofS, to Gen F. S. Besson, Jr., CG, AMC, 5 Jun 64, n.s.

[81] (1) Interv, Raymond J. Snodgrass with Brig Gen C. C. Haug, Ch, Mutual Security Ofc, 7 Jul 65. (2) DF, Cmt 2 and incl, Ch, Mutual Security Ofc to SGS, AMC, 21 Jul 64, subj: Visit to HQ, AMC by Army CofS.

Soviet Union—Greece, Turkey, Iran, Thailand, India, Pakistan, Vietnam, Korea, and the Republic of China.[82]

The DOD supplemental appropriation bill, which was signed by the President on 24 March 1966, provided for the realignment of funding for the Republic of Vietnam Armed Forces from the Military Assistance Program to the military departments. This realignment included the transfer of logistical support from MAP to the military departments. The procedure retained the MAP programing system, but budgeting and management followed normal Army channels. This system led to some confusion and delays but proved generally satisfactory. The acceleration of action in Vietnam required this change in the Grant Aid Program with large amounts of materiel, especially ammunition, being shipped to that country. Also in 1966, the MAP-Peculiar Spare Parts Program amounted to $31 million. Thus, the significant shift in funding was made from military assistance appropriations to regular Army appropriations.[83]

The greatest problem after the transfer of this responsibility on 25 March 1966, was the absence of published Army regulations for use in the AMC subordinate commands. While no degradation of supply support to Vietnam was reported, there was much evidence of the need of a central point in the AMC to permit the orderly transition from the existing duplicate logistical systems until the full integration of supply support was accomplished at the U.S. Army-Vietnam level.

During the 1962–1968 period, the number of countries receiving Grant Aid declined from 62 to 46. Similarly, there was a reduction in the dollar value of the Grant Aid deliveries from a high of $840 million in Fiscal Year 1963 to $449 million in 1968. Worldwide political events had a great impact on Grant Aid programs, halting shipments to countries involved in internal revolution, such as Indonesia and Cambodia, or local wars, such as Greece and Turkey, or the countries involved in the Arab-Israeli conflict.

Military Sales

In the ten-year period from 1952 to 1962, the military sales program totaled only $3 billion. In contrast, during the 1962–1964 period, this program was almost as much as that for the previous ten years. From $630 million in Fiscal Year 1961, military sales grew to over $1.5 billion in Fiscal Year 1966. Henry J. Kuss, Jr., Deputy Assistant Secretary of Defense for International Logistics Negotiations in the Office of International Security Affairs, DOD, headed the military export sales program. This program increased the defensive strength of our allies, promoted the concept of cooperative logistics, and helped to offset the unfavorable balance of payments caused by oversea deployment of U.S. military forces. The program included joint development and coproduction agreements as well as straight military sales.[84]

In each fiscal year after 1962, military sales were greater than Grant Aid and the gap continually widened over the following years. The United States gave Grant Aid mainly to those underdeveloped countries whose security was in the interest of our country, while military sales were promoted with the more industrialized friendly nations. The Foreign Assistance Act of 1961, which specifically authorized military sales was amended several times in the succeeding years.

The Department of Defense tried to persuade the more prosperous friendly nations to allocate more resources to their own military establishment, as well as to share in supporting the defense establishment of less developed allies. This involved an intensive foreign military sales program. Collateral benefits included such factors as offsetting the foreign exchange costs of maintaining the U.S. military position abroad, standardization of equipment, joint acceptance of strategic and tactical concepts and

[82] Summary, Materiel Support Under the Mutual Security Program, by Melvin O. Amoth, 18 Mar 65, pp. 34–35.

[83] (1) Mutual Security Ofc Historical Summary, FY 1966, pp. 31–32. (2) AR 795–10, 23 Aug 66, subj: U.S. Army Materiel and Service Support for Republic of Vietnam Armed Forces/Free World Military Assistance Forces (RVNAF/FWMAF).

[84] (1) Defense Industry Bulletin, May 1965, pp. 2,5. (2) AMC Review of Programs, by C/DP, FY 1963 through FY 1967. (3) DOD Dir 5100.27, 27 Apr 62. (4) James L. Trainor, "Can U.S. Maintain the Momentum of Its Military Sales," *Armed Forces Mgmt*, Jan 1967, pp. 36–40.

doctrine through use of common hardware, and interchangeability in material, services, and logistics facilities.[85]

The United States philosophy in the military sales program was to sell only those weapons which the purchasing country wanted and needed. Actually, Henry Kuss maintained that the success of the sales program was not a result of his staff's "super salesmen" efforts, but of the world defense ministers being "super buyers." For example, he pointed out that Great Britain saved $1.5 billion by buying United States F–4, F–111, and C–130 aircraft rather than developing and procuring similar British aircraft. He said that Germany realized appreciable saving from the logistic support that the United States provided for the weapons that it sold to that country. German Defense Minister, Franz-Joseph Strauss, agreed to the purchase of equipment on condition that the United States would provide the support.[86] Among the major items sold were helicopters, missile systems, combat and transport vehicles, weapons and ammunition.

According to Paul C. Warnke, Assistant Secretary of Defense (International Security Affairs), military sales was an effective and relatively inexpensive implement of U.S. national security policy. He pointed out that a soundly conceived and controlled arms sales policy could enable U.S. allies to provide for their own defense and the security of their region of the world. Among the basic principles of the military sales programs were the following: to increase defense capability tempered with concern for economic development and political realities; to sell U.S. equipment to financially capable buyers, tempered with a willingness to consider co-production abroad; to share technology with our allies; to prove our willingness to procure selected defense equipment abroad for use by our forces in return for large scale foreign purchases; and to encourage the growth of an economically, politically, and technologically strong NATO.[87]

Secretary of Defense Robert McNamara believed the United States should sell arms for cash to friendly nations able to pay. Where a nation had the economic capacity to pay for arms over a period of time, he believed that it was only common sense to sell on credit. In all cases, Secretary McNamara maintained that "the transaction must contribute to the collective defense of the free world, or otherwise support our overall foreign policy."[88]

The Assistant Secretary of Defense (ISA) was charged with the responsibility of directing, administering, and supervising the Grant Aid and Foreign Military Sales programs and planning, organizing, and monitoring activities of the MAAGs.[89] Also with his approval, the Department of the Army sold military equipment and services to eligible nations. Each military department in the area assigned to it provided administrative support for the unified commands, and MAAGs, subject to policy guidance of the Director of Military Assistance. The handbook, *Information and Guidance on Military Assistance* and the *Journal of Military Assistance* were specifically designed to cover the activities of DOD, as well as those of the military departments, in implementing their military assistance roles.[90] The AMC utilized the handbook and journal.

The AMC executed the logistical portion of the sales program, including materiel and services. Among the major functions of the AMC were the following: supervising the execution of the Army's logistical programs under the

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[85] (1) Warren C. Heintzelman, The Administration and Operation of the U.S. Military Assistance Program, Thesis No. 71, ICAF, Wash, D.C., 15 Mar 65, pp. 15ff. (2) PL 87–195, 75 *Stat* 424 [1961]—Foreign Assistance Act of 1961.

[86] James L. Trainor, *op. cit.*

[87] Craig Powell, "Arms Sales Is More Than Just A Military Question," *Armed Forces Management*, Jan 1968, pp. 72, 77, 81. See also C. W. Borklund, "What Military Exports Can Mean," *Armed Forces Mgmt*, Jan 1965, pp. 27–31.

[88] "Collective Defense Hinges on Military Assistance," *Armed Forces Mgmt*, Apr 1968, pp. 100–101.

[89] (1) DOD Dir 5132.2, 20 May 61, subj: Asst Secy of Defense (ISA). (2) DOD Dir 5132.3, 1 Jul 63, subj: Dept of Defense Policy and Responsibilities Relating to Mil Assistance. (3) AR 795–24, Mar 1964, subj: Supplies for Mutual Security Programs—Operating Instructions and Procedures for Mil Assistance Sales.

[90] These publications were prepared under the direction of the Director of Military Assistance. The handbook was published yearly, while the journal, which was classified Secret-NOFORN, was published quarterly.

Foreign Assistance Act; preparing supply and financial plans, Foreign Military Sales cases, Civilian Aid Programs and other implementing documents; conducting operational analyses of supply performance and taking corrective actions on deficiencies; making recommended changes in Army policy pertinent to the execution of the international logistics program and participating in the formulation of such policy; and staff supervising the AMC Customer Relations Program for selected shipments of U.S. Army materiel. Under supervision of AMC, the International Logistics Center, New Cumberland Army Depot, controlled the supply flow from commodity commands. The center prepared and maintained requisitions for military sales and monitored the execution of supply actions.[91] For the sale of training services, AMC negotiated letters of offer with foreign representatives in Washington, D.C.[92]

The AMC Customer Relations Program was established by the command in 1965 to assure that shipments of Army materiel were delivered to the recipient in a satisfactory condition. Customer relation teams were created to assure special delivery of selected shipments of materiel. These included impact shipments designed to attain a desired political or military objective; sensitive area shipments which required special handling for political, military, economic, sociological, or psychological reasons; shipments of materiel being introduced into a country without prior arrangements for the services provided by customer relations teams; complex materiel shipments requiring highly skilled technical support; high-dollar value shipments of $1 million or more; and shipments that were selected for special delivery by AMC Headquarters for other pertinent reasons. Customer relations teams augmented the normal channels of communication between foreign recipient and the appropriate AMC elements for prompt corrective action and adjustment of discrepancies in mutual security shipments.

The Fiscal Year 1963 AMC military sales program, including prior year orders, totaled $1.164 billion. By Fiscal Year 1966, AMC's portion of the Army's sales programs had risen to $2.7 billion. It further rose to $2.9 billion in Fiscal Year 1967 and to $3 billion in Fiscal Year 1968. Germany was by far the largest customer. The Italian sales program ranked next and Belgium's program came third.[93] In general, a sales transaction began with a letter of inquiry from a foreign nation. AMC replied with an offer which include all terms of the transaction. This letter was a commitment to sell at a specified time.[94]

The number of countries participating in the military sales program increased from 64 in 1962 to 90 in 1968. DOD recognized that the United States was losing money because overhead costs related to administration and operation had not been charged to the foreign governments. Consequently, in 1965, the United States began charging a fee of five percent of the value of the materiel up to $1 million and one-half percent for the amount in excess of $1 million. Germany and Canada were exempt from this tax. In 1967 the charge was fixed at two percent for all new sales to foreign governments with the exception of Germany and Canada. In addition, after 1967 there was a charge for their pro rata share of research and developments costs for major defense equipment, where research and development costs exceeded $25 million and estimated production costs exceeded $100 million.[95]

Among the highlights of the military sales program was DOD's emphasis, beginning in 1966, on closing out old sales cases. During the Fiscal Year 1967–1968 period, over 3200 cases with a value of almost $650 million were closed out. For the 1962–1968 period, 7300 cases with a value of $1.1 billion closed.[96]

Among the lessons learned over years of military sales operations were the following: management of sales cases was more effective under a country-oriented organization than under a functional alignment; management under the case manager concept was more ef-

[91] (1) Ltr, Maj Gen John M. Finn to CO, Intl Logistics Center, 23 Aug 66, subj: Transfer of Selected Intl Logistics Functions to the Intl Logistics Center. (2) Ltr, Gen Finn to AMC major subordinate commands *et al.*, 25 Jul 66, subj: Improved Utilization of ILC.

[92] AR 551–50, Feb 1963, subj: Foreign Nationals-Training of Foreign Personnel by the U.S. Army.

[93] AMC Review of Programs, FYs 1963–1968 by C/DP.

[94] Interv, Raymond J. Snodgrass with Col H. R. Dichtenmueller, Ch, Military Sales Div, 21 Oct 63.

[95] Submission, AMCIL to AMCHO, 26 Dec 68.

[96] *Ibid.*

fective than when each field command was responsible for only a portion of a case; blanket open-end cases were the most economical in selling minor items; technical data packages should not be sold indiscriminately since they were often used for production and sale of equipment to third parties; the Foreign Military Sales Data Book was of great assistance and considerably reduced the number of price and availability inquiries for planning purposes.[97]

General Besson emphasized that military sales commitments had precedence over all other supply requirements of the Army except Vietnam. He directed that action be taken to assure compliance with this policy. Furthermore, he directed that major commanders personally sign all letters of offer involving military sales of $1 million or more.[98] Military sales helped to reduce the adverse balance of payments, and the use of common equipment and services help to promote cooperation between the United States and its allies.[99]

Cooperative Logistics and Co-production

Foreign Military Sales included various types of logistics support and services ranging from one-time direct procurement of requirements to continued support when the United States performed all logistics functions for the recipient country. Supply of repair parts and related services for support of U.S. materiel in the inventory of foreign countries might be provided on a full and continuing basis under cooperative logistics support arrangements. Under such arrangements, the United States purchased, stored, managed, and issued repair parts and furnished related services to the customer through the logistics system used to support U.S. forces.[100] In effect, a supply support arrangement provided for a friendly nation to share in the U.S. logistics system for continued support of specified common items.[101]

The U.S. Army supply pipeline was the heart of cooperative logistics. This arrangement provided for an initial investment of filling the pipeline and a quarterly usage charge for materiel and services. This program was primarily concerned with support of weapons systems that were common to the United States and the other nations involved. In general, supplies were provided on a reimbursable basis, and included such equipment as common end items, secondary items, repair kits, and modification kits.[102]

Among the typical items involved in supply support arrangements were the following: M48A2 and M60 tanks, M42 self-propelled guns, M113 armored personnel carriers, Nike and Hawk missile systems, 8-inch howitzers, and combat and transport vehicles. Several nations had arrangements covering support for 25 to 95 major end items. Germany had the largest supply support arrangement. The principal countries which had such arrangements with the United States were Germany, Austria, Japan, Belgium, Italy, Norway, Spain, Australia, Canada, the Republic of China, South Korea, Israel, and Saudi Arabia.[103]

Co-production was a mutually beneficial military sales arrangement. This category of sales to foreign nations increased during the 1960s. Under this procedure the U.S. Government provided drawings, specifications, and other technical data for a U.S. weapons system to an eligible foreign government. Parts of the specified weapons system were manufactured in the United States, or in the foreign nation, and

[97] *Ibid.*

[98] (1) MFR, Ch, Mutual Security Ofc, 16 Jun 65, subj: Briefing of Gen Besson—MAS and MAP Management Improvement. (2) Ltr, Ch, Mutual Security Ofc, to SMC *et al.*, 22 Jun 65, subj: Authority to sign Mil Sales Ltr of Offer.

[99] *Hearings*, U. S. Congress, H of Reps, 88th Cong, 2d sess, Committee on Foreign Affairs, Foreign Assistance Act of 1964, p. 95.

[100] DOD Instruction 2000.8, 14 Feb 64, subj: Cooperative Logistics Support Arrangements.

[101] Manual: Organization and Functions, Mutual Security Office, AMC, 1 Jun 64.

[102] (1) Interv, Raymond J. Snodgrass with Carl Bush, Military Sales Division, Mutual Security Ofc, 4 Nov 65. (2) AMCR 795-10, 22 Dec 64, subj: Intl Logistical Policy, Procedures, and Responsibilities for Cooperative Logistical Support.

[103] Dir/Intl Logistics Historical Summary, FY 1967, pp. 6–13.

also were assembled in the foreign country. Co-production was not quite as desirable for the United States as direct military sales, since up to 50 percent of the cost of the weapons system could be expended in and for the benefit of the foreign country. However a co-production agreement could often lead to direct military sales. Co-production fell into the following two main categories: coordinated production, in which case the foreign government bore the entire production and assembly cost; and cooperative production which involved both United States and foreign funds in the manufacture and assembly of a specified U.S. weapons system.[104]

The first U.S. Army coordinated co-production agreement was established with Italy early in 1963. Late in 1962, Italy proposed the agreement as a means of equipping its armed forces with American M113 armored personnel carriers (APCs). Representatives of the two governments signed a Memorandum of Understanding relating to coordinated production of the M113 APCs on 12 February 1963.[105]

The agreement called for the selection of Food Machinery Corporation (FMC) in San Jose, California, to provide technical and production assistance to OTO Melara in La Spezia, Italy, as the primary assembly plant, while FIAT in Turin and LANCIA in Bolzano were to produce some major components. The two governments approved an agreement between the two industrial organizations.[106] The agreement provided that 50 percent or more of the cost of components, subassemblies, and materials involved in the program be purchased in the United States during Fiscal Years 1964, 1965, and 1966. The Italian government standardized the M113 APC for its armed forces with an initial requirement of 4,000 vehicles. Italy purchased 1,000 M113s and co-produced the remainder. The agreed minimum total expenditure by Italy in the United States was $30 million. The total value of the program was originally estimated at $120 million. By September 1968, approximately 2,500 M113 APCs had been manufactured in Italy against the projected total of 3,000 vehicles.[107]

AMC provided technical assistance to the Italians on a reimbursable basis. This assistance included training of a team of Italian government and industry representatives at Aberdeen Proving Ground, the Army Tank-Automotive Center (ATAC), and at the Food Machinery Corporation (the American manufacturer for M113s) plants in California and West Virginia. In addition, ATAC placed liaison officers at La Spezia and sent additional representatives to Italy to review quality assurance plans and procedures, and to provide technical assistance. Co-production opened up the possibility of selling items in addition to basic armored personnel carriers. These included such items as machineguns, radios, recoilless rifles, mortars, and mounts.[108]

The M113 Italy Co-production Project was the first of several similar projects. In 1964, an agreement was drawn up for the production of M60A1 tanks in Italy. The project was assigned to the M60 Tank Project Manager at ATAC, who was directed to cooperate closely with the Mutual Security Office.[109] Lt. Col. Francis E. Abrino, M113 Project Manager, was assigned responsibility for coordinating additional co-production programs for the Mutual Security Office. These included support of co-production for the M60 Italy Co-production Project, the co-production planning effort on the M109 self-propelled howitzer and the UH-ID helicopter, and the AMC coordination of the barter of a Hawk missile battalion to Italy, including the provision of seven other

[104] Warren Heintzelman, "The Administration and Operation of the U.S. Military Assistance Sales Program," ICAF Thesis, 15 Mar 65.

[105] Memo of Understanding Between the Ministry of Defense of the Govt of Italy and the DOD of the United States of America Relating to the Coordinated Production of the M113 Series of APCs, 12 Feb 63.

[106] (1) Memo of Understanding Between OTO Melara and FMC to the Essential Terms of Proposed Agreement for Furnishing Data, Know-how, and Tech Assistance for M113 Type Vehicle Co-production in Italy, 15 Jan 63. (2) Lt Col Francis E. Abrino, "Co-production," *American Ordnance*, May-Jun 1964, pp. 646-648.

[107] Submission, AMCIL to AMCHO, 26 Dec 68.

[108] Mutual Security Ofc Historical Summaries: FY 1963; and FY 1964.

[109] (1) Ltr, Actg ASA (I&L) to CG, AMC, 20 May 64, subj: Manufacture in Italy of the M60A1 Main Battle Tank. (2) Msg 5-4504, CofS, U.S. Army, to CG, AMC *et al*, 20 May 64, n.s. (3) Memo, Ch, Mutual Security Ofc to Proj Mgr, M113 Italy Co-production Proj, 22 May 64, subj: Co-production of M60 Tank.

military items by the Italian government.[110] Colonel Abrino also coordinated the policies and procedures concerning co-production of numerous other items, such as rifles, radios, helicopters, ammunition, general purpose vehicles, and Nike-Hercules, Hawk, and Redeye missiles. His office became informally known as the Co-production Office. A number of other countries participated in co-production programs with the United States, including Germany, the Netherlands, Japan, Taiwan, Sweden, Norway, and Canada.[111]

International Research, Development, and Standardization

Upon its activation in August 1962, the AMC assumed responsibility for centralized control of the various international development programs under Army cognizance. Under the Technical Services these programs had seen assigned to a coordinating office as an extra duty. This practice was characterized by varying degrees of emphasis and varied procedures. Within the AMC, the management and administration of all international research, development, and standardization programs were assigned to the Directorate of International Logistics. The AMC standardized procedures tended to increase efficiency and led to more effective international cooperation.

The major segments of the international development programs were the Mutual Weapons Development Program, the Mutual Weapons Development Data Exchange Program, the United States-Canadian Development and Production Sharing Programs, the Cooperative Research and Development Program, International Professional (Scientist and Engineers) Exchange Program, the International Scientific Cooperation Program, the American British-Canadian-Australian (ABCA) Standardization Program, the North Atlantic Treaty Organization (NATO) Standardization Program, the Air Standardization Coordinating Committee Program, the Technical Cooperation Program, and the Strategic Trade and Export Control Program. International standardization programs were also assigned under the Southeast Asia Treaty Organization (SEATO), the Central Treaty Organization (CENTO), and the Inter-American Defense Board Standardization Program, but activities under these remained negligible.

The ABCA Standardization Program, the Technical Cooperation Program, the United States-United Kingdom Cooperation Agreement, and the U.S. Army-Canadian Development Sharing Program were designed to further cooperation on a bilateral or multilateral basis between the United States, the United Kingdom, Canada, and Australia. These four programs were especially responsive to the expanding effort of international research and development cooperation. Taken together, they had the establishment, organization, and procedures which facilitated full and free exchange of information and promoted tangible collaboration in research and development of weapons and equipment to meet common requirements. International cooperation in research and development beyond the quadripartite area was accomplished through the Mutual Weapons Development and NATO Multilateral Research, Development and Production Programs.[112]

During the 1966–1968 period, the AMC supported numerous research and development activities by increased participation in demonstrations, working panels, and by exchange of technical information. In Fiscal Year 1967 alone, the member participants increased by 12, bringing the total to approximately 65. During that same year the command participated in 150 NATO standardization working

[110] TWX, CofS, AMC to Proj Mgr, M60 Tank *et al*, 14 Dec 64, subj: Relationships with Co-production Prog. For background information on the M113 Italy and other co-production projects, see AMC Historical Summary, FY 1964 and 1965.

[111] (1) Intl Co-production Prog Rpt, 30 Jun 66 (RC-AMIL-109). This report was submitted to DA and widely distributed to the major organizational elements of the AMC. (2) Interv, Raymond J. Snodgrass with Warren C. Heintzelman, M113 Co-production Ofc, 1 Dec 66. (3) For a clear definition of the co-production concept and delineation of responsibilities, see DOD Directive 2000.9, subj: Intl Co-production Projects and Agreements Between the United States and Other Countries or Intl Organizations, 26 Mar 68. (4) DOD Instruction 2000.8, 14 Feb 64, subj: Cooperative Logistics Support Arrangements.

[112] Submission, AMCIL to AMCHO, 26 Dec 68.

groups and committees under the Armaments Committee of the Military Agency for Standardization, and five panels and committees under the Advisory Group on Aerospace Research and Development. In late 1966, the panels of the command's NATO Armaments Group were regrouped into ten panels representing such items as transport and combat vehicles, infantry weapons, surveillance and target acquisition, communications, and engineer equipment.[113]

In an overall review of the Military Assistance Program, it was apparent by 1966 that the AMC had made great progress in managing its portion of the program. Carryover programs from preceding years were not as large generally as they had been and overall deliveries were meeting expectations. At top level, the Secretary of Defense placed great importance on the business of mutual security. He declared that delivery commitments to foreign countries had to be met, with careful attention to both the customer and the impact upon United States requirements and resources. Put simply, he decreed that when a commitment was made, it would be met.[114]

[113] AMCIL Historical Summary, FY 1967, pp. 18–19.

[114] (1) Memo, Robert S. McNamara for Secy of Military Depts, JCS, DPRE, and Directors of Defense Agencies, 21 Mar 66. (2) "New Look for Military Assistance," *Armed Forces Mgmt*, Mar 1966 pp. 13, 16, 18.

As Robert Lovett once told President Truman, a Defense Secretary's prime power of command over the military departments is his command of the budget—and that power is especially strong during periods of relative peace and especially weak during periods of war.

"Is PPBS All That Good?"
Armed Forces Management,
Vol. 14, No. 7, Apr 1968, p. 33

CHAPTER X

THE CHALLENGE OF SEA

When the United States embarked on a land war in Asia in 1965 the challenge to the AMC, as to the military establishment as a whole, was more than that of supporting a major war effort halfway around the globe and it was more than that of doing so while the military departments were still in the process of digesting the many changes initiated within the Department of Defense since 1961. These were factors, but the dimensions of the challenge to the AMC derived primarily from the fact that the commitment of U.S. forces to combat came at the eleventh hour and virtually without preparation for the logistics requirements of a major American buildup in Vietnam.

Guerrilla warfare had broken out in South Vietnam in 1959 and it had grown steadily in intensity. The political instability that followed the overthrow of Ngo Binh Diem in November 1963 weakened the government's efforts to put down the insurgency. While political unrest wracked the cities, the elusive Viet Cong expanded their dominion over rural South Vietnam. By early 1965 there had been such a weakening of the government's position that travel between cities became increasingly hazardous, except by Viet Cong sufferance, and a complete collapse of the Saigon government's authority grew ever more imminent.

It was under these circumstances that the United States was committed to war in Southeast Asia. To prevent victory over the Saigon government by the Viet Cong, the United States had to rush combat troops to Vietnam faster than the logistical base there could support them. This caused problems, created by the generation of too much cargo moved too fast for discharge through undeveloped ports, to coalesce into a logistical nightmare. By early December 1965, when U.S. forces in Vietnam still numbered less than 125,000, there were 145 deep-draft ships in the Western Pacific loaded with cargo for Vietnam. Only 29 of these were actually being discharged; the rest were riding at anchor in various holding areas, some of them for weeks, waiting for a chance to unload.[1]

Unfortunately for the staggering logistic structure in the Pacific, the buildup had barely begun. The large-scale introduction of U.S. forces into the conflict had blunted but not turned back the Viet Cong drive, and 1965 ended with the lines still drawn in substantially the same pattern as they were at the outset of the increased U.S. commitment. What had changed was the scope and intensity of the struggle and the parts being played by the United States and North Vietnam. For the United States, the prospect was a brutal, grinding, inconclusive war of attrition which pitted American economic might and technology against the manpower resources of Asia, or an ever-expanding war requiring continuous introduction of additional U.S. forces with no end in sight.[2]

The basic stimulant to the U.S. commitment in Southeast Asia was not to be found in the region itself but in Chinese hostility and fear of Chinese expansionism. But if fear of Chinese expansionism was the basic stimulant, U.S. strategy in Vietnam was based on the proposition that the principal force at work in Southeast Asia was not international commu-

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[1] (1) To COMUSMACV, it was necessary to hold ships in Vietnam waters as floating depots during the early months of the buildup; to the Military Sea Transport Service, which was having trouble finding bottoms and crews for service to Vietnam, it was essential that the turnaround time of available shipping be reduced. (2) Hurlbut Rpt, 17 Dec 65, p. 33 and *passim*.

[2] *The Vietnam Conflict: The Substance and the Shadow*, Rpt of Senators Mansfield, Aiken, Muskie, Boggs, and Inoyue to President Johnson, 19 Dec 65, pp. 10–13.

nism but nationalism. It was also based, for some time at least, on the proposition that a military solution to an essentially political problem was possible. By waging a war of attrition against the Viet Cong and North Vietnam, the United States sought to impel Hanoi to abandon its friends in the south and its hopes for unification. This assumed that North Vietnam would elect such a course rather than accept Chinese "volunteers" to its cause, and that China would not intervene to prevent an American military victory in Vietnam.[3] By the end of 1968, these assumptions were still untested, perhaps because to many on both sides of the conflict there was a flaw in the U.S. position, one comparable in consequence to that contained in Napoleon's expedition into Russia. In neither case could the side with the preponderance of military power meet with its enemy in decisive combat, and in both cases time and circumstance were weighted in favor of the weaker side.

Automatic Supply

AMC OPLAN SEA

The AMC became involved in the buildup in Southeast Asia when the Department of the Army called a supply planning conference in Hawaii for the week of 8–15 May 1965. The purpose of this conference was to develop a concept for the support of forces to be deployed to Vietnam. A contingency plan for Southeast Asia had been prepared; the AMC version had been published in October 1964 and a series of changes to this plan had been issued following the mortar attack on Pleiku early in February 1965.[4] By May 1965, however, the Secretary of the Army was developing a plan for increasing the number of U.S. Army troops in Vietnam to 125,000 by the end of the calendar year.[5] This was a far larger commitment than that envisioned in previous planning, and the supply planners concluded that a flexible approach to the problem of supporting a major American buildup in Vietnam was needed.

The result was the supply support concept contained in AMC OPLAN SEA, which was originally published on 21 May 1965. Under it, the AMC was to compute resupply packages for whatever Army units were deployed from CONUS (continental United States) and ship these packages to appropriate destinations in Southeast Asia. Because of limited port facilities in Vietnam, it was decided to break these shipments into 15-day increments. Initially, 15 of these increments were scheduled for delivery to Vietnam and 4 increments to Okinawa, but this was subsequently reduced by the Department of the Army to 12 increments for Vietnam and 2 for Okinawa.[6]

AMC OPLAN SEA became the basic docu-

[3] (1) For prophetic views of the situation in Vietnam at the end of 1962 and of 1965, and of what the United States could and could not do about it, see (a) Rpt of Senators Mansfield, Boggs, Pell, and B. A. Smith to the Committee on Foreign Relations, U.S. Senate, 25 Feb 63, and (b) Rpt of Senators Mansfield, Aiken, Muskie, Boggs, and Inoyue to President Johnson, 19 Dec 65, both reprinted in *The Vietnam Conflict: The Substance and the Shadow* (GPO, 6 Jan 66). (2) According to Anthony Eden, Chinese hostility derived largely from the belief—an article of faith with the Chinese—that the United States was implacably hostile and dedicated to the overthrow of the Chinese Communist State, a belief that sought and found confirmation in virtually every American move in the Pacific. Anthony Eden, Earl of Avon, "Toward Peace in Indo-China: Twelve Steps to a Long-Range Settlement," *Harpers*, Aug 1966.

[4] AMC OPLAN 21 Oct 64, with changes 1 through 12, 15 Feb–25 May 65.

[5] (1) As subsequently approved on a piecemeal basis by the President, this plan constituted Phase I of the buildup. It also recommended a callup of the reserves, but the President decided to expand the Army by other means, including increased draft calls. (2) Interv, Charles W. Lynch with Mr. Fritz Albrecht, Plans Div, C/DP, AMC, 6 Jan 66.

[6] (1) AMC OPLAN SEA, 21 May 65. (2) For resupply concepts for deployment to SEA, see ARPAC msg GPLO-PO 8629, 4 May 65, and ARPAC msg GPLO-SD 9511, 15 May 65. (3) DA msg, DCSLOG/C4 716843, 22 May 65, directed action to effect automatic resupply.

ment for supply to Vietnam.[7] As originally published, it consisted of a concept for supporting the buildup rather than a plan. The plan itself was developed as the shape and dimensions of the buildup became evident. As units were nominated for possible deployment to the Pacific theater, changes to AMC OPLAN SEA were issued.[8] These changes designated the units to be deployed and the schedules by which the AMC would "push" supplies to them until normal ("pull") requisitioning procedures could be established.

Detailed guidance for the execution of automatic resupply responsibilities was issued, as required, in the form of messages. Later, in December 1965, the instructions contained in these messages were incorporated into the plan. This included such guidance as the mix of combat and Type B rations, the factors to be used in computing the various ammunition requirements, the types of Class II and IV items which were not to be included in automatic resupply, and the special instructions for the supply of repair parts for aircraft. Also included in this revised version of Annex A, were the reports and actions to be taken by the inventory control points, the depots, and the SMC's Logistics Control Office-Pacific in providing automatic resupply to SEA.[9]

Since the buildup in Vietnam was accomplished on an "as required" basis, not in response to a preconceived plan, no troop lists were furnished to the AMC. AMC planners had to haunt the halls of the Pentagon in an effort to obtain the earliest possible warning of coming events. The decision to deploy the 1st Cavalry Division (Airmobile) was a case in point. This decision was first announced by the President on 28 July 1965, and the unit was scheduled for deployment during the following month. The AMC had gotten wind of this several weeks earlier, but this information was "close hold" at the time and there was nothing the AMC could do with it. The command pressed the Pentagon for authority to publish this information as a change to AMC OPLAN SEA, and on 28 June the DCSLOG obtained the necessary approval from the Vice Chief of Staff, Gen. Creighton W. Abrams, Jr. This enabled the AMC to get the first increment of supply for this division to Vietnam on 30 August, something that would have been virtually impossible if it had been necessary to wait until the President's announcement. The same thing happened a short time later with regard to the 1st Infantry Division.[10]

For each of these divisions, automatic resupply was effected on an extremely close schedule. For the former, the oversea terminal arrival date was just 63 days after approval; for the latter, 65 days. Considering about 25 days ocean shipping time, 5 days port handling time, and ten days CONUS transit time, there was little time available to compute requirements, issue shipping instructions, process supplies at the depots, and effect shipments.

Force Packages

As units were nominated for deployment, the AMC grouped them on the basis of their scheduled deployment dates into "force packages." The first such package consisted of 24,407 troops in 317 units specified, on a CONARC/ARSTRIKE troop list published on 17 May 1965, as marked for deployment. At the time, no specific destination had yet been determined for these units, and automatic resupply was tentatively scheduled for shipment to Okinawa. Force Package 1 was subsequently divided into two parts: Force Package 1A being all units with an equipment readiness date of 8 June or earlier, and Force Package 1B being all other units included on this troop list.[11]

Most of the engineer units deployed in this early stage were in Force 1B. The fact that automatic resupply shipments were not made for these units created a critical shortage of repair

[7] The Surgeon General's plan for the supply of medical materiel was included as an annex to the plan for the sole purpose of providing a single supply document for the support of SEA. See C17, 23 Sep 65, and C20, 27 Oct 65, to AMC OPLAN SEA, Annex M.

[8] Altogether, 22 troop lists were published in OPLAN SEA, but "push" packages were supplied for only 18.

[9] AMC OPLAN SEA, C25, 28 Dec 65, Annex A, subj: Computation and Documentation—Automatic Resupply.

[10] (1) Paper, Plans Division Role in Logistical Support of Forces in SEA, Mr. Fritz Albrecht, Contingency War Plans Br, Plans Div, OPRED, n.d. (Jan 66). (2) Submission, AMCOR to AMCHO, 9 Dec 68.

[11] AMC OPLAN SEA, 21 May 65, with C1 and C4, 22 May, 9 Jun 65.

parts for construction equipment in the theater. The AMC was able, belatedly, to compensate for this by assembling a semiautomatic [12] package of repair parts for this equipment and airlifting it to the theater. A similar action was taken for generators and materials handling equipment.

The introduction of Army combat troops into Vietnam began with the designation, in May 1965, of Force Packages 2 and 3. The former consisted of a brigade force (about 3,600 men) from the 1st Infantry Division; the latter a somewhat smaller brigade force from the 101st Airborne Division. These units were readied for deployment to Vietnam during June and July, respectively, and in the process a serious situation was narrowly averted. The destinations of these two brigades had been reversed without the AMC being informed of the change, and at the time one brigade was firing 5.56mm ammunition while the other was using 7.62mm.[13]

The 1st Cavalry Division (Airmobile), consisting of 15,850 men in 71 units, was designated Force Package 4A. Corps-type supporting elements for the division were designated Force Packages 4B and 4C, and plans for the automatic resupply support of these forces were published during June and July.[14] The troop list for Force Packages 5, consisting of the balance of the 1st Infantry Division, was published by the Department of the Army on 14 July, and schedules for the automatic resupply support for these units were published as further amendments to AMC OPLAN SEA.[15]

Force Package 6 was published in August 1965 solely for planning purposes. At the time, the AMC was engaged in assisting units in preparation for oversea movement, and the commodity commands had numerous customer assistance teams visiting various CONUS installations for this purpose. To help these teams identify units to be assisted, regardless of deployment dates or destinations, Force Package 6 was published. Force Package 7 consisted of units of the 2d Logistical Command deploying to the offshore logistics base on Okinawa, and no automatic resupply was scheduled for this force.[16]

Heavy artillery and Hawk missile units were included in Force Packages 8 and 9. Soon after these lists were published, the units therein were reshuffled to consolidate in Force Package 8, the units destined for Cam Ranh Bay, and in Force Package 9 those scheduled for resupply through Saigon.[17]

By the fall of 1965, a number of support type units had become ready for deployment, and these were included in three more force packages published before the end of the calendar year. The last two, Force Packages 11 and 12, were small deployments of 2,463 and 3,228 troops respectively, and for these the AMC issued revised supply schedules. The new plan called for the 14 shipments of 15-day increments to be consolidated into three shipments of 60-day increments into the objective area, plus one shipment of 30-days of supply to the offshore logistics base (Okinawa). This greatly eased the burden of computing, assembling, and scheduling of automatic resupply packages, and it sharply reduced the number of small containers that had been required under the 15-day increment plan.[18]

From time to time the supply schedules published in AMC OPLAN SEA had to be revised to keep them current with the developing situation. In August 1965, for example, the AMC issued revised schedules for Force Packages 1 through 5, 8, and 9. Later, near the end of the year, the AMC revised the supply schedules for all the Force Packages then being supported by automatic resupply shipments: 1A, 2, 3, 4A, 4B, 4C, 5, and 8 through 12.[19]

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[12] The term semiautomatic supply was used to distinguish bulk shipments of a particular type of supplies, requested by the theater, from automatic resupply packages which were intended for theater stockage.

[13] (1) Submission, AMCOR to AMCHO, 9 Dec 68. (2) AMC OPLAN SEA, C1, 22 May 65, and C2, 24 May 65.

[14] AMC OPLAN SEA, C5–7, 28 Jun–12 Jul 65.

[15] (1) See DA msg DCSOPS 723649, 14 Jul 65. (2) AMC OPLAN SEA, C8, 27 Jul 65, and C16, 15 Sep 65.

[16] (1) AMC msg 8-1524, C/Plans Div, AMCOR to CG, MOCOM *et al.*, 13 Aug 65, subj: Description of Force Packages 6 and 7, AMC OPLAN SEA. (2) AMC OPLAN SEA, C9, 29 Jul 65, and C18, 30 Sep 65.

[17] AMC OPLAN SEA, C11, 9 Aug 65, and C13, 19 Aug 65.

[18] (1) *Ibid*, C14, 25 Aug 65, C15, 30 Aug 65, C18, 30 Sep 65, and C19, 20 Oct 65. (2) Briefing, Lt Col Lawrence Edholm, C/Plans Br, Programs Ofc, Dir/Supply, SMC, for Brig Gen Frederick Austin, Asst Dir/Supply (temp), SMC, 10 Jan 66.

[19] AMC OPLAN SEA, C12, 14 Aug 65, and C25, 28 Dec 65, Appendices to Annex A.

Transition to "Pull"

The transition from push to pull supply was an evolutionary process which was complicated by two factors. One was the initial inundation of the logistical forces in Vietnam in the early months of the buildup; the other was the requirement to continue the escalation of the war while the logistical forces were still trying to bail themselves out of the initial flood.

The first tentative step came in January 1966, when the Department of the Army announced a new policy in regard to automatic resupply for forces deploying to SEA. It provided for two 60-day increments of repair parts to be provided for brigade-size and larger forces being deployed from the CONUS, with no automatic resupply for forces of less than brigade size. In accordance with this policy, no "push" supplies were furnished for Force Packages 13 and 14, which were groupings of miscellaneous units deployed in the Spring of 1966.[20]

Force Packages 15 and 16 consisted of separate brigade forces of the 25th Infantry Division, and Force Package 17 consisted of the remaining elements of the division. Up to this point, automatic resupply had been provided only for forces deployed from the CONUS. The decision to deploy the 25th Infantry Division from Hawaii added a requirement for automatic resupply to theater-based forces. In accordance with current DA policy, the first two were supplied with two 60-day packages of repair parts (including low-mortality parts), whereas the latter was supplied with but one 60-day package.[21]

During a briefing of General Besson on 8 March 1966 on support to the 4th Infantry Division, Brig. Gen. Thomas H. Scott, Jr., Director of Supply, SMC, proposed that current policy to push two 60-day increments of repair parts be changed. At the time, only one brigade of the 4th Infantry had been alerted for deployment, but General Scott proposed that the AMC furnish one 60-day increment of high-mortality[22] repair parts for the entire division. This would greatly reduce the logistic effort in the CONUS, and it would encourage SEA elements in their efforts to switch from a "push" to a "pull' system of supply.

Acting on this suggestion, the AMC laid the groundwork for an early transition from "push" to "pull" supply. In a message to the Department of the Army and the CINCUSARPAC, the command described General Scott's proposal and suggested that this should give the theater enough leeway to begin requisitioning its requirements. In support of this position, the AMC summarized past automatic resupply actions. It noted, for example, that it had already sent a 60-day package of repair parts to Cam Ranh Bay for depot stockage, a package computed on the basis of all the Army units to be supported from that logistics complex by the end of June 1966. This and other actions, coupled with the proposed 60-day increment for the entire 4th Infantry Division, the AMC suggested, should enable logistics forces in SEA to begin to provide for both current and future requirements through normal supply procedures.[23]

General Abrams agreed that the problems created by the push system could best be corrected by an early conversion to a 100 percent requisitioning (pull) basis. He endorsed the AMC proposal and noted that it should provide about 5 months leadtime for implementing a pull system. He therefore established it as the DA position on resupply that requisitioning from Vietnam was to start not later than 1 June for consumption beginning 1 October 1966.[24]

As a consequence, automatic resupply for Force Package 18 provided for one 60-day package of high-mortality repair parts for theater stockage to support the entire 4th Division.[25] Force Packages 19 through 22 consisted

[20] (1) DA msg 748876, 27 Jan 66. (2) Interv, Charles W. Lynch with Lt Col Lawrence Edholm, C/Plans Br, Programs Ofc, D/Supply, SMC, 20 Apr 66. (3) SMC msg 1-108, AMSSM-SP-L, XO, Dir/Supply to CG, USATAC *et al.*, 6 Jan 66, subj: Automatic Resupply for 25th Infantry Division (U) (4); Ltr, same to same, 8 Feb 66, subj: same.

[21] AMC OPLAN SEA, C27, 2 Mar 66, and C28, 15 Apr 66.

[22] For definition of high-mortality repair parts, see AR 700-18, par 3a.

[23] AMC msg 23660, CG AMC, to DA for DCSLOG C/4 and CINCUSARPAC, 9 Mar 66, subj: Automatic Resupply for 4th Infantry Division.

[24] DA msg 759345, CofS, signed Abrams, to CG, USARV and CINCUSARPAC, 11 Apr 66, subj: Automatic Resupply Packages for Deploying Units.

[25] AMC OPLAN SEA, C28, 15 Apr 66.

of units of the 11th Armored Cavalry, 196th Light Infantry Brigade, 9th Infantry Division, and the 199th Light Infantry Brigade, respectively. For each of these force packages, automatic resupply was limited to a 90-day package of high mortality repair parts.[26] The "push" phase of supply support to Vietnam was drawing to a close.

Though not specifically a part of AMC OPLAN SEA, semiautomatic supply shipments contributed greatly to the logistics posture in Vietnam. In addition to those mentioned, there were packages of construction and barrier materials, repair parts for unit stockage (ASL and PLL) for the 25th Infantry Division, and similar bulk shipments. Even in a brief history of the AMC, one of these would merit a special note, for it involved shipping depot stocks, not just cargo.

Early in 1966, the AMC began computing a 60-day stockage level of repair parts for all units to be supported out of the Cam Ranh Bay depot complex as of the end of June 1966. At the time, the strength of these units was estimated at about 95,000. Equipment density data for this force were computed by the Major Items Data Agency (MIDA), and the national inventory control points (NICPs) used these data, plus established replacement factors, to compute the repair parts requirements. Unlike previous shipments, the items involved were consolidated at assembly depots, where teams assembled them into an actual depot operation. The entire package was binned in 70 vans and 437 CONEX transporters, and a library of manuals, stock records, locator cards, and other documentation was assembled. This, in General Besson's words, was CONEX in its most sophisticated form: a section of the depot moved intact from The States to Vietnam.[27]

The teams that assembled these vans and transporters accompanied them to Vietnam and provided on-the-job training to military personnel in the operation of this depot system. The success of this operation was remarkable: 26 warehouse denials out of a total of 13,538 material release orders issued.[28]

For months after the buildup began the embryonic logistics system in Vietnam was swamped. What the supply system needed during this early period, if essential items were to get through the port bottleneck on the far shore, was the ability to exercise a high degree of selectivity. In Vietnam, this was virtually impossible during the early months of the buildup for a variety of reasons. One was the gap which existed between MILSTRIP and MILSTAMP procedures. Because of this, troops on the far shore could not know what was loaded in each hold, and scarce port and cargo-handling facilities had to be used to handle materiel not urgently needed ashore.

In the United States, selectivity was hampered by the AMC's inability to determine, on a timely basis, what units were deploying to Vietnam, what equipment they would take with them, and what non-organizational materials would be needed. While the AMC made some attempt to weed out items inappropriate for Vietnam,[29] the most it could usually do was to assemble support packages on the basis of whatever information was available and hope for the best. But it was precision, not quantity, that was needed in Vietnam, for by December 1965 ships were stacked up all over the western Pacific waiting for a chance to unload. To free this shipping, and to help reduce the port problem to manageable proportions, General Hurlbut recommended that much of this cargo be unloaded elsewhere in the western Pacific, and called forward later when needed.[30]

Computation of Automatic Resupply Requirements

The inability to get firm troop lists in time to determine the items of equipment to be supported led to errors in computing automatic re-

[26] Submission, AMCOR to AMCHO, 9 Dec 68.

[27] (1) *Ibid.* (2) Speeches, Gen F. S. Besson, Jr., "Logistics Support in Vietnam," Annual Meeting of the AUSA, Wash., D.C., 10 Oct 66, and to Washington Chapter, American Ordnance Association, Wash, D.C., 15 Apr 68. (3) Briefing, Lt Col Edholm for Brig Gen Austin, 10 Jan 66.

[28] Submission, AMCOR to AMCHO, 9 Dec 68.

[29] (1) AMC msg 8-3109, AMCMR-S to MICOM, 12 Aug 65, n.s. (2) AMC msg 8-3120, same to same, subj: AMC OPLAN SEA, with MFR. (3) By these messages, the AMC suspended automatic resupply for ENTAC missiles and M-22 launcher system on the assumption that these systems would be deleted from the area.

[30] (1) Hurlbut Rpt, 19 Dec 65, pp. 11, 30. (2) Interv, Charles W. Lynch with Col V. O. Smith, Ch, Opns Br, Stock Control Div, Dir/Supply, SMC, 28 Mar 66.

supply requirements, errors which either wasted resources and contributed to the congestion in Vietnamese ports or which left needs unfilled.[31] In some considerable measure, these difficulties derived from the fact that equipment status reporting procedures, as prescribed in AR 711–5, were not adequate to meet the needs of contingency plan executions which followed the pattern of OPLAN SEA. They were adequate to support the normal contingency planning processes, and to support Army-wide requirements computation and distribution planning, but OPLAN SEA raised doubts that future contingency executions would follow this pattern. As a consequence, the Directorate of Materiel Readiness, AMC, recommended, in February 1966, that a study group be established to determine whether the existing concept of supporting contingency executions was in fact a practical approach.[32]

Under AR 711–5, unit equipment status reports were made monthly and used by MIDA to up-date the data bank at Letterkenny Army Depot. On the average, it was about 45 days following the end of a month before this information was available for recall, but under normal contingency planning processes this created no particular problem. Given a firm troop list, the AMC could determine each unit's shortages, locate available items, and compile equipment densities by make and model, which could then be used as a basis for filling shortages and for computing resupply and support requirements. Under these circumstances, changes in equipment status either could be predicted or taken in stride, and when units were deployed they would arrive in the objective area with an automatic resupply of repair parts and ammunition that, in theory at least, would match the makes and models actually deployed.

As the situation developed in Vietnam, previously prepared plans had to be revised drastically to coincide with actual events. Deployments were far beyond the scale originally anticipated; units were added to the troop lists; new TOEs (tables of organizational equipment) were developed and old TOEs were modified as units were tailored to meet unique requirements; and equipment had to be pulled from lower priority units to fill out alerted units.

Under these circumstances, the equipment status information in the data bank was of little value. With many equipment changes being made before the unit was considered ready for deployment, it was out of date, and under these circumstances resupply requirements had to be computed and shipped before final density data could be obtained. In one case, a major unit's resupply packages were shipped before its TOE was even final.

Existing procedures did provide for a final report of equipment actually shipped to a theater, but by the time this report was received, many of the resupply packages had already been shipped. The data provided by this final asset report had to serve until reporting could be instituted overseas, and in the case of Vietnam this involved a time lag of several months.

Apart from problems deriving from the compression of time, the implementation of OPLAN SEA revealed some other problems which plagued the AR 711–5 system of reporting. One was that the level of reporting, such as battalion, did not necessarily coincide with the level of deployment. Another was that units were activated for immediate deployment, in which cases there were no equipment status reports to consult, and resupply packages had to be computed and assembled before the unit was issued its equipment. A third was that OPLAN SEA caught the AMC in the middle of a one-month moratorium on reporting, declared while new data processing applications were being instituted. As an interim measure, the AMC dispatched technical assistance personnel to units and installations to obtain up-to-date information on the equipment status of alerted units. The question of whether the basic concept and system for equipment status reporting was in fact practical for the support of contingency operations was something that would have to be studied in depth.[33]

Adequacy of AMC War Planning

In July 1965, as deployments under the hastily-conceived OPLAN SEA were getting underway, General Besson directed the AMC

[31] The Hurlbut Rpt, pp. 33–34.

[32] DF, Dir/Materiel Readiness to Ch, OPRED, ATTN: AMCOR-RC, 16 Feb 66, subj: Lessons Learned—SEA, incl 4.

[33] *Ibid.*

Board to evaluate the adequacy of the AMC planning effort and the command's potential for accomplishing its wartime mission.[34] The buildup in Southeast Asia offered ample reason for such a review. The whole purpose of the Department of the Army's contingency war planning effort was to have in being a basis from which to respond to any requirement for the deployment of U.S. forces in support of the Nation's foreign policy. The fact that there was no such plan for a major deployment of U.S. forces to Southeast Asia—that one had to be made up as Administration policy took shape and implemented as it was made up—greatly complicated the logistics support problem. It also indicated that in their war planning the military services needed to consider the possibility of a sudden shift in U.S. policy.

The study revealed other aspects of the problem. The AMC Board found, for example, that the execution of OPLAN SEA had invalidated a basic assumption of AMC contingency planning: that there would be a Declaration of Emergency (and a mobilization of selected Reserve Forces) upon execution of an OPLAN. This had created an overly optimistic environment for planning, for it had obviated the need to identify and seek relief from constraints to rapid and effective support. In the future, the AMC Board decided, AMC plans should portray the most restrictive situation in which the command might be required to respond. They should be based on the assumption that a declared State of Emergency would not exist, and that peacetime operations and limitations would apply until specifically changed by higher authority.

Existing procedures (AMCR 120-7) did require commanders to identify peacetime limitation that would deter proper support of OPLANs and to indicate what waivers they would require. AMC commanders had submitted such reports early in April 1965, but before these reports could be analyzed it became apparent that the existing OPLAN would be replaced by OPLAN SEA, and all available effort was focused on this new plan. In many respects, the failure to complete this analysis was probably unfortunate, for many of the comments submitted later in response to a specific AMC inquiry on capabilities versus requirements merely restated problems brought out in the Commanders' estimates submitted three months earlier.[35]

The AMC Board also noted that under existing procedures the effectiveness of automatic resupply was directly related to the timely receipt, by the command, of lists of units to be supported. It was on the basis of these lists that the number of each major item of equipment to be supported in the objective areas was computed, and these equipment density data, coupled with established replacement factors, enabled the NICPs to compute repair parts requirements. The troop lists furnished under OPLAN SEA were anything but firm. For the most part, they were received too late for accurate computation of resupply requirements; furthermore, they were subject to numerous changes. This was a problem that had plagued the Services of Supply during World War II,[36] and there was reason to doubt that accurate troop lists, furnished on a timely basis, ever could be expected.

General Besson therefore directed that a procedure be developed, on a priority basis, for providing automatic resupply independent of any specific operations plan or troop list. One approach would be to provide initial resupply requirements on the basis of a "type force," with refinement of requirements being delayed until the specific units being deployed became known. Another would be to develop support packages for specific quantities of end items, such as for fifty 2½-ton trucks or ten PRC-25 radios. Under this concept, all repair parts for an end item could be assembled into a package, and these packages could be shipped, when re-

[34] Proj Brief, Gen F. S. Besson, Jr., AMCB 3-65, 24 Jul 65, subj: The Potential of AMC to Accomplish its Wartime Mission.

[35] (1) AMC msg to CG, MICOM *et al.*, 3 Jul 65, subj: Capabilities versus Requirements. (2) AMCB 3-65, 17 Dec 65, subj: The Potential of AMC to Accomplish its Wartime Mission, pp. 30, 80.

[36] (1) For an account of the problems faced by the Services of Supply during World War II, many of which were also faced by the AMC during the buildup in Southeast Asia, see Richard M. Leighton and Robert W. Coakley, *Global Logistics and Strategy, 1940–1943*, U.S. Army in World War II series (Wash, D.C., 1955), pp. 296, 346, 429, and *passim*. (2) For a wry comment on "lessons learned" in World War II, Korea, and again in Southeast Asia, see AMCB 4-66, 30 Jun 66, subj: Lessons Learned in Logistic Support of SEA, p. 51.

quired to support a specific operation, according to the density of the end items to be supported.[37]

The study also highlighted the fact that without adequate oversea bases, staffed with trained supply personnel, the AMC's best efforts could be negated. Early in World War II it had been necessary to ship duplicate equipment for an entire corps to Great Britain because the equipment originally shipped could not be located. The same thing happened in Vietnam. Commodity commanders told of shipping the same material two and three times because the forces in Vietnam could not find it, and of urgently needed repair parts which had not been found in Vietnam until located by AMC personnel sent by the commodity commands. One of AMC's objectives was to continue to press with the Department of the Army and the CONARC to provide for an adequate training base for logistical personnel and units. Greater emphasis on logistical training was a major recommendation by the AMC in its first "lessons learned" report to the Department of the Army in March 1966.[38]

The base development requirement was another area in which the AMC had strong interests, both direct and indirect, for it involved not only the materiel requirements to be provided by the AMC, but also the logistical troops and facilities required at the oversea destination if supplies shipped by the AMC were to reach their proper destination. Base development plans were the responsibility of the theater commanders, and such a plan had been included as an annex to the existing plan for SEA. However, neither the Department of the Army nor the AMC had established procedures for detailed feasibility studies of such plans to determine either their adequacy or the AMC's ability to support the projected requirements for supplies and equipment. Under existing procedures, the AMC had no knowledge of requirements and took no action to provide materiel until the Army commander established an operational project and requisitions were received from the theater.

This left much to be desired, for many base development requirements were long leadtime items, and at its meeting in December 1965 the AMC Board approved an objective calling for AMC coordination with theater Army commanders to obtain planning requirements for base development. General Besson also directed that action be taken to develop a bill of materials for a typical base development, and to stock this equipment in the AMC depot system as mobilization reserves.[39]

The Problem of Stock Objectives

In October 1966, the Army Vice Chief of Staff dispatched a special DA team to Vietnam to get first-hand information on the repair parts situation. He had recently called for tightening discipline and for instituting a comprehensive supply management program in the USARV, and he had reviewed the programs which had resulted. He had also reviewed the USARPAC-USARV analysis of the situation which Lt. Gen. L. J. Lincoln, DCSLOG, had recently brought back from his visit to the theater.

Even so, General Abrams remained concerned with logistics support operations in SEA in general, and with the validity of the computation of Class II and IV requirements for authorized levels at troop user, direct support, general support, and depot levels. Though aware of the adverse conditions in Vietnam and the efforts being continuously made there, he wanted to know all he could about just how good, bad, or adverse the situation might be. He decided to obtain this information by the most severe but realistic measurements possible, i.e., by sending a special DA team to Vietnam to inquire into matters as his direct representative.[40]

The special DA Supply Assistance Team which went to Vietnam in mid-October 1966 was sent to investigate the status of 14 selected major items, plus several hundred related secondary items. One purpose was to identify excesses resulting from the early "push" supply support; and the other was to assist in establishing realistic stockage levels.

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[37] AMCB 3–65, 17 Dec 65, subj: The Potential of AMC to Accomplish its Wartime Mission, pp. 79–80.

[38] (1) Ltr, Actg Ch, OPRED, AMC, to ACSFOR, 2 Mar 66, subj: Special Rpt for Period 1 Jan 65–31 Oct 65 [RCS-CSGPO-28(R1)] (U), with incl. (2) AMCB 4–66, 30 Jun 66, pp. 47–49. (3) The Hurlbut Rpt, 17 Dec 65, pp. 54–55, *passim*.

[39] AMCB 3–65, 17 Dec 65, subj: The Potential of AMC to Accomplish its Wartime Mission, pp. 68–70, xv.

[40] CofS, AMC, Working Files, WDC 12039, Oct 1966.

Both the AMC and the USARV became concerned lest the net effect of this project would be to produce over-optimistic views as to projected requirements. General Besson was already under pressure from the DOD to reduce the increased safety levels he had introduced into procurements of spare parts, the feeling in DOD being that the pipeline was full. While he too was anxious to avoid any excesses, General Besson believed, rightly it developed, that the USARV was still a long way from realistic stockage lists both in range and depth. During the last half of 1966, the range of USARV stockage lists had increased dramatically, and there was still no indication of a leveling off. Even after the range stabilized, General Besson expected the levels to continue to increase. Under the conditions obtaining in December 1966, he did not consider current demand experience to be a reliable factor on which to base future requirements. Unless other factors, such as increased deployments, increased usage, and block replacement requirements, were also considered, there could be a reduction in the AMC funding level. At stake was the AMC's ability to provide adequate support to the theater several months hence.[41]

To the 1st Logistical Command in Saigon, it seemed that the mission of the assistance team was being diverted from its intended purpose, and that it seemed more inclined to write up well known problems than to direct its efforts to helping to improve the logistical operations. Since the team was operating under Army Chief of Staff authority, the 1st Logistical Command felt powerless to influence the direction of its efforts. Admittedly the command still had problems, but these were known and some of the most talented supply officers in the U.S. Army were busily engaged in planning and directing the needed improvements. What the command did not need was a requirement to divert its skilled manpower from these tasks to one of drafting replies to an untimely audit.

The view in the theater was that the assistance team was "reinventing the wheel" in discovering that push packages cause excesses with little recognition of the basic cause. In the early days, when ships were backed up and requisitions were bogged down in USARPAC and Okinawa, push packages had served to keep the operation going. They had contained items which were not necessary, including repair parts for major items which were not in Vietnam. During this same period, the USARV was unable to get clear status information on requisitions which had been submitted, and some of these were duplicated as a measure of insurance. The fact that requisitioning objectives had to be derived from nothing more substantial than the best judgment available within a context of feverish activity within a fluid situation also led to some mistakes. Furthermore, prescribed load lists (PLLs) received little attention during the initial buildup. Units arriving during that time knew of supply shortages in the theater and overstocked on parts, some of which were later turned in to the depots. At the time, the idea was to bring enough.

Later, as the requisition bottleneck broke, the CONUS was flooded with many requisitions at one time. As the theater became able to review its stocks, it was able to cut back on some of its orders, but some shipments could not be stopped in time and some excesses resulted.

For the first several months, most units lived, at least in part, out of the extra stocks they took to Vietnam; consequently, the demand data recorded at depots did not represent actual usage. As General Besson saw it, the point was not that excesses had developed, for these were to be expected under a "push" system, but rather how to identify and recoup these excesses and establish realistic stockage objectives as the basis for the more efficient "pull-type" supply support system. These stockage objectives were of particular importance to the AMC. They would provide the basis for AMC funding and procurement, and thereby largely determine how effectively the command would be able to support theater requirements in the months to come.

Early in December 1966, the 14th ICC assumed the mission of cross leveling among the three major depots in Vietnam. This gave the 1st Logistical Command better information concerning depot stocks and depot recorded demand data, and made for a more efficient operation in the theater. The task of projecting requirements as a basis for stockage levels, however, was complicated by a number of factors.

[41] CofS, AMC, Working Files, GVP 884, 6 Dec 66.

For one thing, the troop strength and the amount and varieties of materiel to be supported continued to grow, and the level of future operations was unclear. Neither the theater nor the AMC considered that the demand experience available in December 1966 offered a reliable guide to future requirements. Increased deployments, increased usage, block replacement requirements, and other factors not generally indicated by the current demand experience, they believed, had to be considered in projecting future requirements.[42]

In Vietnam, there was disagreement between the DA team and the 1st Logistical Command concerning the approach to the computation of stockage levels. In one sample review of 59 repair parts, the team had based its findings on demand experience over the previous 10 months, whereas the 1st Logistical Command was using the experience of the latest 6 months. The 1st Logistical Command considered its approach the more valid one for it eliminated most of the unrealistically low demand period when units were living off their "push" packages and when the supported strength itself was relatively low. Also, the team made no allowance for future increases in the density of the equipment to be supported, whereas the 1st Logistical Command was using a factor of 20 percent. The net result was that on 47 of the 59 items, the requisitioning objectives (R/Os) established by the 1st Logistical Command were higher than those computed by the DA team, and in some cases the differences were significant. On one engine, for example, the 1st Logistical Command set an R/O of 644 as compared to 342 by the DA team. On another engine, the objectives were set at 245 and 69 respectively.

The 1st Logistical Command conceded that there were some very sound data in the team's report, particularly those pertaining to PLLs and ASLs.[43] The command was also convinced that the team could do a great deal of good if it would confine itself to the scope identified in its plan, i.e., investigating the status of 14 selected items such as forklifts, M48A3 tanks, M113 personnel carriers, several models of generators, etc., as well as 400 related secondary items. The command was skeptical, however, that this would be done, and it was concerned lest the team's report provide a basis for decision in the Department of the Army without the theater being given an opportunity to comment on the findings.[44]

On this score, the 1st Logistical Command was unnecessarily concerned, for there was no such intention at Headquarters, DA. Prior to its departure to Vietnam, the DA Supply Assistance Team had been instructed to keep completely coordinated with all commanders and staffs at all levels during its visit, and no action was expected to be taken on the team's final report until it had been fully coordinated with the 1st Logistical Command, the USARV, and the USARPAC.[45] The Department of the Army was just trying to get the facts.

Logistics Structure for Support to SEA

The Situation

OPLAN SEA had loosed a flood of materiel toward Vietnam where there were virtually no facilities for receiving it. Saigon, the only deep-water port south of Da Nang, was 34 miles up the Mekong River and barely adequate for commercial needs. It soon became choked with supplies and shipping, and for troops in Vietnam the result was poverty in the midst of plenty—debilitating shortages of urgently needed items at a time when the roadsteads were crowded with supply ships unable to unload. Ironically, some of the most critical items were parts for cargo-handling equipment, the equipment which had to be kept running if the logjam at the ports ever was to be broken. Many of these items were close at hand —either aboard the waiting ships or buried in the wild disorder at the docks—but U.S. troops simply could not locate them. It was for this reason that the Red Ball Express was established early in December 1965—so vital repair parts could be flown directly from the CONUS

[42] (1) *Ibid.* (2) CofS, AMC, Working Files, ARV 451, 8 Dec 66.

[43] Prescribed Load Lists (PLLs), Authorized Stockage Levels (ASLs).

[44] *Ibid.*

[45] CofS, AMC, Working Files, WDC 14438, 9 Dec 66.

and logistical forces in Vietnam, already swamped, would not have to sift through a mountain of supplies in a vain, frustrating search for the items needed first.[46]

The United States had taken a calculated risk in building its force levels in Vietnam more rapidly than the logistical base could support.[47] There had been about 23,500 U.S. military personnel in South Vietnam in February 1965; a year later Army personnel alone numbered 134,324,[48] and the logistics structure in the Pacific had become swamped. But this was to be only the beginning for another factor had entered the equation.

U.S. strategy had been based on (1) isolating the battlefield (South Vietnam) with airpower, and (2) using American firepower and mobility to wear down the enemy to the point where the Government of South Vietnam could police the country. But U.S. authorities had miscalculated; airpower had failed to stem the flow of men and supplies from the north. The question then became not one of applying increased pressure against a defined military situation, but rather of pressing against a military situation which was open-ended. How open was anybody's guess.[49]

With the logistics structure already staggering under the impact of the initial buildup, escalation of the U.S. war effort continued. By July 1966, there were almost 300,000 U.S. troops in South Vietnam, with 65,000 more on ships of the 7th Fleet in Vietnamese waters and another 25,000 in nearby Thailand. But these figures do not reveal the full dimensions of the buildup or of the logistic requirements it entailed. The 25,000 South Korean troops in Vietnam—a number which was shortly to be doubled—were paid and supplied by the United States, as were the regular (316,000 men) and paramilitary (272,000 men) forces of the Republic of South Vietnam. For the United States, the cost of the war had rocketed from $2 million to $40 million a day since July 1965.[50]

This figure too soon doubled as the war effort continued to be escalated through 1967 and into 1968. By the end of January 1968, at the time of the Tet Offensive, there were about 1,285,000 fighting men in South Vietnam who were paid and supplied by the United States. This included 506,147 U.S. troops, of which 338,381 were Army.

Two months later, the enemy's Tet Offensive had come and gone, but the balance of forces in South Vietnam remained largely unchanged. U.S. strength had increased to 529,727, Free World Military Assistance Forces to 62,213, and Republic of Vietnam to about 725,560, for a total of some 1,317,590. But enemy strength had increased by a corresponding percentage. His total in-country combat strength—exclusive of any forces that might be poised to cross into South Vietnam from Laos, Cambodia, or through the Demilitarized Zone—was estimated at 72,668 North Vietnamese and 50,263 Viet Cong, or a total of 122,931.[51]

Despite this advantage in numbers and the overwhelming superiority of U.S. troops in firepower and mobility, the war was far from over. It was three years and perhaps 80 billions of dollars later, but the situation in Vietnam remained substantially unchanged. The Chinese communists had not introduced their manpower directly into the conflict, nor had they needed to. The conflict that had raged in Southeast Asia since World War II had always

[46] (1) Trip Rpt, Special Asst to CofS, SEA Supply and Maintenance, 17 Dec 65. Cited hereafter as Hurlbut Rpt. (2) Interv, Charles W. Lynch with Col V. O. Smith, Ch, Opns Br, Stock Control Div, D/S, SMC, 28 Mar 66. Col Smith was one of two AMC members of Gen Hurlbut's party.

[47] (1) Hurlbut Rpt, 17 Dec 65. (2) Osborn Elliott, "A Day with Westmoreland," *Newsweek*, 18 Apr 66, p. 32.

[48] (1) *Hearings* on Mil Posture and H.R. 4106 before the Committee on Armed Services, HR, 89th Cong, 1st sess, p. 139. (2) Army troops in Vietnam, Feb 1966, were classified as follows: combat units, 44 percent; combat support units, 50.3 percent; MACV comd and staff personnel and Army advisory elements, 5.7 percent. Congressional Fact Paper, Vietnam (SEA), ODCSOPS-7, 30 Dec 65.

[49] (1) Rpt of Senators Mansfield, Aiken, Muskie, Boggs, and Inoyue to President Johnson, 19 Dec 65, reprinted in *The Vietnam Conflict: The Substance and the Shadow* (GPO, 6 Jan 66), pp. 10–13. (2) Fred S. Hoffman, AP, "Viet Air War Seen as Failure," *Washington Post*, November 14, 1968, pp. H1, H8.

[50] "Vietnam War: How Much Bigger?" *U.S. News and World Report*, 1 Aug 66.

[51] (1) Rpts, Highlights of USARPAC Activities in SEA (U), prepared by Mil History Br, OACofS, USARPAC, Mar 1967, p. 4; May 1967, pp. 4–5; Jul 1967, pp. 4–5, 47. (2) Rpts, Highlights of USARPAC Activities (U), Jan 1968, p. 4; Mar 1968, pp. 4–6.

been more political than military, and for the United States, political power in Asia had not grown out of the barrel of a gun. When the U.S. command in Saigon asked for yet another 206,000 men following the Tet Offensive, this request was not approved. From all indications, the buildup of U.S. forces in Vietnam had finally ended, stabilized as just under 550,000 U.S. troops, and the search for a military victory in Vietnam was over.

In the meantime, the logistics structure in the Pacific had survived the chaos of 1965–1966, and it gradually had become a flexible, responsive organization of great capacity. But it had taken time, money, and the best efforts of the Army's top logisticians.

The Logistical Problem

The decision to deploy combat troops in substantial numbers to Vietnam in advance of base development virtually guaranteed that there would be logistical problems aplenty, but by July 1965 this was a chance that had to be taken if the United States was to rescue the Saigon Government. The Secretary of Defense took action to assure prompt, high-level attention to whatever logistical problems developed. On 9 August 1965, he named Army Brig. Gen. Hal D. McCown as head of the Vietnam Support Expediting Task Force, a special DOD-level task force charged with monitoring logistics support to the Military Assistance Command, Vietnam (MACV), and expediting the flow of supplies. Logistical problems identified by the task force received priority attention by appropriate agencies within the Department of Defense.[52]

Predictably, severe strains did develop in the logistical support of Southeast Asia, and the task of bringing order out of chaos got underway. It was a task that would require many months to accomplish, for neither the dimensions of the buildup in Southeast Asia nor the requirements that would be placed on U.S. forces there were yet clear. Also, leadtime already had been lost in such crucial areas as DeLong piers and airfield surfacing materials.[53]

[52] Congressional Fact Papers, Vietnam (SEA), ODCSOPS-7, 30 Dec 65, and 30 Mar 66.

[53] AMC Historical Summary, FY 1966, pp. 191ff, 221ff.

The Hurlbut Report

In November 1965, the Army Chief of Staff, Gen. Harold K. Johnson, took steps to find out what was wrong with the Army's supply and maintenance support to Vietnam, and what should be done about it. He named Maj. Gen. O. E. Hurlbut as his Special Assistant for Supply and Maintenance in Southeast Asia, and instructed him to examine the situation in Vietnam and suggest ways to bring order out of the existing chaos. Singled out for special attention was the whole area of repair parts supply.[54]

Accompanied by a small staff, General Hurlbut examined the Army's logistics structure on the West Coast, the Pacific area in general, and Vietnam in particular. The group's comprehensive report, dated 17 December 1965, contained numerous recommendations in the areas of supply, maintenance, transportation, data processing, communications, and construction. Some pertained to actions to be taken in Vietnam; others were directed toward improvement in the Army supply system as a whole.[55] For the AMC, the most important recommendation was that pertaining to a proposed new logistics structure for the support of Southeast Asia.

Logistics Structure in the Pacific Theater

General Hurlbut found that both Hawaii and Okinawa were bottlenecks in the logistics structure in the Pacific. For theater-based forces in the Pacific, all requisitions were funnelled through the USARPAC Inventory Control Point (ICP) in Hawaii, but the ICP was unable to handle the avalanche of paperwork generated by the buildup in Vietnam. Established under a concept approved in April 1963 to provide a centralized source of logistic data for the Pacific theater, it was scheduled to come into being under a timetable designed to coincide with the complete realignment of the CONUS supply system as developed by TASAMS,[56] and the phasing out of Oversea Supply

[54] CSM 65-565, for Heads of Army Staff Agencies, 15 Nov 65, subj: Special Asst to the CofSA for Supply and Maintenance, SEA.

[55] The Hurlbut Rpt, 17 Dec 65.

[56] The Army Supply and Maintenance System (TASAMS), based on an SMC study approved by DA in Jun 1963, was the plan whereby the supply systems inherited from the Technical Services were to be transformed into a single AMC supply and distribution system.

Agencies. In approving TASAMS in December 1963, the DOD had reduced the time frame for its implementation by one year, and this speed-up led to the introduction of some hastily-conceived data processing procedures. The USARPAC was still in the process of overcoming these faults, through the installation of its Standard Supply System ("3–S") concept, when the buildup got underway.[57]

The net result was that the USARPAC ICP simply did not have the capability to function as a central source of information, particularly for the expanded wartime requirements of Vietnam. The MILSTRIP system provided for supply documentation by individual line item, a process that involved card transactions in astronomical numbers. Furthermore, the system was based on proper quantities of supplies being available throughout the pipeline; and when the pipeline was not full, the number of card transactions multiplied. For the system to work, sound data processing procedures and adequate automatic data processing equipment (ADPE), which the ICP did not yet have, were essential.[58]

General Hurlbut did not believe it would be wise to rely on the existing USARPAC system for wartime requirements and he recommended some sweeping changes. Noting that the SMC's Logistics Control Office—Pacific (LCO–P) at Fort Mason, California, had already been strengthened to enable the AMC to monitor its "push" shipments to Southeast Asia, he recommended that its mission and organization be expanded further, to a point closely approximating that previously assigned to the Oversea Supply Agencies, with responsibility for monitoring all shipments to Vietnam.

He also recommended that the CONUS logistic base be extended overseas to Okinawa—that the AMC take over the 2d Logistical Command operation there and operate Okinawa as an AMC depot.[59] In this way AMC-owned stocks could be positioned in Okinawa, thereby providing a broader basis for support of Vietnam. Replenishment could be made automatically on the basis of stock status reports maintained by the NICPs rather than by requisitioning, and this would reduce the load on the Pacific communications system.[60]

DA Approval and Guidance

These recommendations were approved by the Army Chief of Staff on 19 December 1965, and the AMC was charged with developing a plan, in coordination with the USARPAC, for bringing the new logistics structure into being as soon as possible. The proposed concept would extend the AMC wholesale logistics system 8,000 miles closer to its customers in Vietnam, and it would have the effect of "free issue" to these customers from the wholesale stock fund without any intermediate management.[61] In its efforts to meet the needs in Vietnam, the Army had found it necessary to establish separate supply procedures for missile repair parts, engineer construction materiel, nonstandard items for the 1st Cavalry Division, avionics, and the Red Ball Express. While there was a place for special procedures to meet unusual high-priority requirements, there was also an urgent requirement for a supply system which would minimize dependence on specialized procedures.[62]

Under guidance furnished by the DCSLOG, the AMC plan was to be based on the transfer, to the AMC, of all the maintenance and supply responsibilities in support of Vietnam currently assigned to the Commanding General, U.S. Army, Ryukyu Islands (USARYIS), including the 2d Logistical Command and its subordinate units and activities on Okinawa. There was to be no change in hospitalization and evacuation procedures, for the Surgeon General was on record as favoring retention of medical supply as a separate system, but the

[57] The Hurlbut Rpt, 17 Dec 65.

[58] Interv, Charles W. Lynch with Col V. O. Smith, Ch, Opns Br, Prog Control Div, D/S, SMC, 28 Mar 66.

[59] As an alternative, he suggested that these depots and the 2d Logistics Command on Okinawa be transferred to the USARV.

[60] The Hurlbut Rpt, pp. 10, 43–44.

[61] (1) Ltr, SGS, DA, to CG, AMC, 8 Jan 66, subj: Trip Rpt of the Special Asst to the CofS for Supply and Maintenance, SEA. (2) DCSLOG ltr, no addressee or date, subj: Proposed Logistics Structure for Support of Vietnam (U).

[62] From all indications, it would have taken a minimum of 6–12 months, and substantial increases in personnel and automatic data processing equipment, to bring the USARPAC ICP up to a satisfactory level of operations. The DA staff concluded that the Army could not accept such a delay in developing a supply system fully responsive to the requirements of Vietnam.

plan was to provide for the integration of medical supply into the AMC supply system.[63]

The LSSA Project

Within the AMC, the Logistics Structure for the Support of Southeast Asia (LSSA) Project, as this effort was known, received top priority. The steering committee was headed by General Besson himself, and the working group was chaired by General Bunker. A number of individuals in Headquarters AMC/SMC were assigned full time to the project,[64] and during the early months of 1966 many persons throughout the AMC complex became involved in this undertaking.

The concept seemed to offer some significant advantages considering the fluid situation in Vietnam. Under it, the AMC could move supplies to Okinawa as a command transfer, thereby greatly simplifying problems in regard to stockage levels and funding. Requisitioning channels could be streamlined and the supply pipeline shortened, for the AMC would be 8,000 miles closer to its most important customers.

Some extensive changes in the existing logistics structure were involved. Within the CONUS, the NICPs would become offices of record and accountability for AMC supplies on and being shipped to Okinawa, just as they were for CONUS depots. There needed to be a single point of control in regard to items managed by the Defense Supply Agency and the General Services Administration, and the Army Class Manager at Frankford Arsenal was designated as this point. For the Logistics Control Office-Pacific, it involved an expansion of mission to something approximately that of the discontinued Oversea Supply Agencies, and considerable additions to its ADPE capabilities and programs.[65]

Significant changes in the logistic structure in the Pacific were also involved. In assuming command of the 2d Logistical Command on Okinawa, the Commanding General, AMC, would assume the responsibility for supply and maintenance support to Vietnam then being discharged by the Commanding General, USARYIS. While the CINCUSARPAC would retain command of the U.S. Army, Vietnam (USARV), and associated units, customers in Southeast Asia would bypass the over-burdened ICP at USARPAC and requisition directly on the Okinawa depot.

The Army Chief of Staff approved this concept on 14 January 1966, including an expansion of the role of the LCO–P to make it responsible for monitoring all requisitions reaching the CONUS from Vietnam and for followup on all supply shipments in support of Vietnam. He asked for target dates for implementing this concept and called for a detailed supporting plan to be ready by 21 February.[66]

In submitting its target dates, the AMC offered several proposals which elaborated on the approved concept. The AMC proposed shortening transportation and financial channels by positioning more stock close to its major customer as soon as possible, so as to eliminate the current "unmanageable retail flow of single-line requisitions to CONUS and a diffuse and inefficient retail return flow of separate supply procurement, transportation and financial actions." It also proposed that the current "too rigid criteria for stockage on Okinawa be broadened to allow stockage there of levels of so-called fringe items." Ultimately, and as soon as possible, nearly all supply from CONUS to Okinawa was to be by bulk shipment initiated by CONUS NICPs to resupply NICP-computed and -controlled requisitioning objectives of the Okinawa depot.

The AMC expected to implement this plan in two phases. First, it would assume control of the 2d Logistical Command on 1 March, but the USARPAC would remain technically in the picture. It would retain ownership of stock and continue to pay the bills until 1 April, when ownership of Okinawa stock would pass to the AMC in a capitalization action.[67] The second phase was largely contingent on the installa-

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[63] DCSLOG ltr, no addressee or date, subj: Proposed Logistics structure for Support of Vietnam (U). LSSA Working Group File.

[64] Planning Dir, Maj Gen William B. Bunker, DCG, AMC, 3 Jan 66, subj: Logistic Structure for the Support of SEA.

[65] (1) Ltr, CG, AMC, to CG, MICOM *et al.*, 29 Dec 65, subj: Logistic Structure for the Support of SEA. (2) Ltr, Maj Gen W. B. Bunker to CO, USA Support Ctr, Richmond, Va. *et al.*, 14 Jan 66, subj: same.

[66] Ltr, TAG to CINCPAC and CG, AMC, 14 Jan 66, subj: Logistic Structure for the Support of SEA.

[67] Ltr, Gen F. S. Besson, Jr. to CofSA, 20 Jan 66, subj: same, with incl, "Proposal for Inmprovement of the Logistical Structure for Support of SEA."

tion of adequate ADPE equipment and programs at the LCO–P. Until this could be accomplished, sometime between 1 March and 1 July, the LCO–P, which was to play a key role in the functioning of the new system, would be limited to the role established for it in July 1965.[68]

What the AMC had in mind for the 2d Logistical Command was a 3-customer concept: Republic of Vietnam, Thailand, and Fort Buckner, with the latter acting for all other customers supported by USARYIS from Okinawa. While preparations were going forward in the U.S., General Besson made a trip to the Pacific during the first half of January to coordinate this and other proposals with the Pacific commands involved. On this trip he encountered a noticeable lack of enthusiasm for the LSSA project, but a willingness to support it "if the decision was final." He also encountered a fear that the AMC had other ambitions, for he felt it necessary to assure Pacific commanders that the AMC had no intention of extending its system and authority beyond the 2d Logistical Command.[69]

While holding the AMC's additional proposals under advisement, the Army Chief of Staff did approve some of the key target dates, and throughout the AMC the development of a detailed implementation plan continued unabated. The dimensions of this undertaking were considerable, however, and the Chief of Staff soon changed the date for submitting the completed plan to 1 April. He also directed that the transfer of command and stock to the AMC be concurrent, and set the date at 1 July 1966.[70]

The final shape of the logistic structure for the support of Southeast Asia was not yet settled, however, for the Pacific commands were beginning to make their views known. General Engler, who had been sent to Vietnam in January 1966 to straighten out the logistics situation, noted in April that there had been three successful methods for Army supply support of Vietnam to date. One was the Hawk supply system, wherein a direct support unit (DSU) placed requisitions directly on the Missile Command for all parts peculiar to the Hawk system. The second was the Red Ball system. Here, all requisitions were placed by the 1st Logistical Command in Vietnam directly on the Logistics Control Office—Pacific (LCO–P), and that agency assumed complete responsibility for obtaining the required parts, placing them on transport for Vietnam, and keeping the 1st Logistical Command posted as to status and shipping. The third was the system established for ammunition. In this case, requisitions followed the normal MILSTRIP channels through Okinawa and Hawaii, but were backstopped by a monthly print-out of all requisitions submitted. This print-out was forwarded directly to the AMC's Ammunition Procurement and Supply Agency (APSA), and that agency initiated supply action based on the print-out and assumed responsibility for pulling individual requisitions out of the system.

All three systems had two things in common. First, requirements were placed directly on one agency in the CONUS, which put these requirements on the proper element of the wholesale supply system. Second, the agency in the U.S. which received the requirements was responsible for keeping Vietnam informed as to the status of these requisitions. With these two elements present, General Engler declared, the problem of lost requisitions disappeared and supply followup was positive.

Though he recognized that other versions might well be workable, General Engler believed that an agency such as the LCO–P would still be necessary to control the final link-up between depot, port, and Vietnam. The LCO–P had already demonstrated such a capability with Red Ball, and he strongly recommended that it be machine-equipped and staffed to fulfill this function on all pull-type requisitions from Vietnam.[71]

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[68] (1) Papers, LCO–P Mission Statement, 1 Feb 66, Guidelines for LSSA. (2) SMCR 10–37, 26 Jul 65, subj: SMC Logistic Control Ofc, Oakland, and C1, 22 Sep 65, subj: SMC Logistic Control Ofc, Pacific.

[69] (1) Trip Rpt to SEA, 3–18 Jan 66, by Col R. A. Hansen and Mr. Richard Moran, on Trip of General Besson and Party to SEA in connection with extension of AMC responsibilities. (2) Msg 20697, CG, AMC, to CINCUSARPAC, 4 Feb 66, subj: USAMC Working Group (U) DA for DCSLOG.

[70] (1) Msg 748194, CofSA to CG, AMC, info USARPAC, USARYIS, and 2d Logistical Comd, 24 Jan 66, subj: Logistic Structure for the Support of SEA. (2) Msg 749338, CofSA to CINCUSARPAC, 3 Feb 66, subj: same.

[71] CofS, AMC, Working Files, 27 Apr 66.

The USARPAC agreed that it was desirable that a single agency receive requisitions, place them on the wholesale supply system, and monitor the shipments, but held that the appropriate agency for this role was the 2d Logistical Command, utilizing the theater's 3S system, rather than the LCO–P. This system was still new and in need of considerable debugging, but the theater believed that it could meet the requirements of Vietnam earlier and better than an expanded LCO–P operation, and that it would integrate better into the overall theater supply system, including the extension of direct requisitioning from Vietnam when the 14th Inventory Control Center (ICC) had developed this capability.

The theater then fired a decisive salvo. It noted that an expanded LCO–P operation would become, in essence, an Oversea Supply Agency (OSA), and that these agencies had been abolished by the DOD. Even if the LCO–P concept were accepted to meet a special situation, the theater said, it might prove to be only an interim expedient. If subsequently abolished in accordance with the proscription on OSAs, the theater would once again be left to fill the void with inadequate time or resources to do the job.[72]

The AMC completed its implementation plan on the appointed day,[73] but the Army Chief of Staff decided that the transfer of the 2d Logistical Command to the AMC would not be necessary. He cited as reasons the progress made by the USARPAC in solving its logistical problems, and the AMC's efforts in developing stockage lists and levels. As a consequence, all actions in support of the AMC LSSA Plan were terminated, effective 1 May 1966. AMC elements were instructed to retain their LSSA records, however, for the USARPAC was expected to incorporate certain features of the LSSA Plan into its logistics support structure.[74]

Evolution of the Supply Support System

In cancelling the AMC's LSSA Project, the Army Chief of Staff approved a plan developed by the USARPAC. A subsequent review of the logistics situation in the Pacific and of stock fund matters by the Army Staff pointed up problems, however, and early in September 1966 General Johnson directed the Army Staff to review the complete spectrum of logistical structure and the related financial system in the USARPAC.[75]

At about the same time, the Secretary of Defense also directed an Army review of the logistics system in the Pacific, and a high-level group was appointed by the Secretary of the Army to direct this effort.[76] The findings of this group were contained in the USARPAC Logistics Plan VN 67–68, which was forwarded to Secretary McNamara on 7 October 1966. This plan addressed aspects of the Okinawa stock fund, the role of the 14th Inventory Control Center (ICC) in Vietnam, stockage levels in Okinawa and Vietnam, and communications requirements in the Pacific Command (PACOM).

Some time later, in December 1966, the Secretary of Defense provided the Secretary of the Army with guidance for modifying the USARPAC logistic system. Among other things, he noted that the role of Okinawa now needed to be reexamined in the light of the logistics capability which had been achieved in Vietnam. Insofar as Vietnam was concerned, Okinawa's role was to be limited to supporting the major overhaul and repair mission, supporting U.S. forces located on or staging through Okinawa, and supporting Vietnam depots in any items for which direct support from the CONUS was not yet feasible. Okinawa stocks were to be purged to reflect this more limited mission.

The new plan meant that maximum support for Vietnam would be provided directly from the CONUS, and that a control mechanism for operating the depots in Vietnam would have to be established. The Secretary of Defense called for detailed plans for implementing this concept to be submitted within 30 days. This included plans for the Okinawa phase-down and

[72] CofS, AMC, Working Files, 2 May 66.

[73] (1) Ltr, DCG, AMC to CGs, AMC Maj Subordinate Comds, 6 Apr 66, subj: LSSA Implementation Prog. (2) LSSA Proj, Implementation Prog and Schedule for USARPAC and AMC, 1 Apr 66.

[74] (1) AMC msg 28925, DCG, AMC to CG, WECOM *et al.*, 10 May 66, n.s. (2) Interv. Charles W. Lynch with John Shada, Exec Asst to the CG, SMC, 19 May 66.

[75] (1) CSM 66–39, 2 Sep 66. (2) Army Buildup Progress Rpt, 14 Dec 66, pp. 55–57.

[76] (1) This group consisted of the ASA (I&L), VCofSA, COA, DCSLOG, and ADCSLOG. (2) Army Buildup Progress Rpt, 6 Feb 67, Army Deployment and Support Problems—Vietnam Supplement, p. 25.

for the distribution in the pipeline of 255 days'[77] worth of supply to SEA. Plans for an effective control mechanism, including clarification of the roles of the 14th ICC and of the USARPAC ICP, were also to be included.[78]

At the time, several possibilities for Army supply support to Vietnam were under consideration. In one (Plan A), USARV requisitions would go directly to the LCO–P which would serve as a clearing house to CONUS supply agencies. In another (Plan B), the USARV would requisition directly on the CONUS NICPs, and the LCO–P would be phased out of the system. A modification of this proposal (Plan B Option) was favored by General Besson. It would consist of the basic plan as described above, but with a limited expansion of the LCO–P to permit an increased use of "management by exception" controls in assuring effective support to supply elements in the Pacific. Still another (Plan C) was the proposal put forward by Maj. Gen. Bruce E. Kendall, Deputy CG, USARYIS.

General Engler strongly endorsed Plan A but considered Plan B Option an acceptable alternative. He thought it essential that supply management within Vietnam be performed by agencies subordinate to Headquarters, USARV, and under either of these plans this would be accomplished by the 14th ICC and the 34th Group. In accordance with the plan to reduce the CONUS-Vietnam pipeline, he recommended that the requisitioning objective (225 days of repair parts) be divided as follows: a 60-day objective for direct support units (including 45 for stockage and 15 for order and shipping time) and a 195-day objective for Vietnam depots (60-day stockage and 135 days for order and shipping time).[79]

General Engler believed that the supply system for Southeast Asia should be simple and require minimum facilities and know how in Vietnam. He thought that a single agency such as the LCO–P should receive all requisitions from Vietnam, maintain master item data files, place requisitions on supply points in the U.S., and maintain followup and status information as required by Vietnam. He urged that the expansion of the LCO–P with the necessary facilities, machines, and personnel to receive, process, and follow up on all requisitions from Vietnam be supported as the Army position.[80]

This view of the role and functions of the LCO–P was not incorporated into the Army submission to the Secretary of Defense. In informal discussions between the Assistant Secretary of the Army (I&L) and the Assistant Secretary of Defense (I&L) there had been clear indications that the latter would reject the LCO–P role visualized by General Engler. A limited expansion of the LCO–P to permit an increased use of "management by exception" controls, however, was still under consideration within the Army staff.

In its submission to the Secretary of Defense early in February 1967, the Department of the Army recommended the augmentation of the 14th ICC with 127 civilians and a computer to permit it to interface directly with CONUS supply sources through the Automatic Addressing System, with an effective date sometime after 1 July and before 31 December 1967.[81] Okinawa was to be eliminated as a principal supply support base for Vietnam in favor of direct support from the CONUS. Its new supply support mission was to be essentially that envisioned by the Secretary of Defense. Supplies then on Okinawa for the support of Vietnam were to be eliminated by attrition, with certain exceptions. These exceptions included stocks of reserve ammunition, medical supplies, items under repair for Vietnam in the Okinawa maintenance program, and certain construction materials.[82]

The 14th ICC in Vietnam was to be reinforced so that eventually it could interface directly with CONUS supply sources, but until then it would continue to route requisitions through the 2d Logistical Command on Okinawa.[83] The Aviation Materiel Management

[77] This represented a reduction of the total CONUS-Vietnam pipeline by 60 days.

[78] Army Buildup Progress Rpt, 14 Dec 66, pp. 55–57

[79] CofS, AMC, Working Files, ARV 018, 5 Jan 67.

[80] CofS, AMC, Working Files, ARV 281.

[81] CofS, AMC, Working Files, WDC 2348, 23 Feb 67.

[82] (1) This included about 40,000 tons of special items for specific construction projects, projects which could not be firmly scheduled more than 45 to 60 days in advance, and which therefore had to be kept available for call forward on relatively short notice. (2) Army Buildup Progress Rpt, 8 Feb 67, p. 62, and supplement, Army Deployment and Support Problems—Vietnam, p. 25.

[83] *Ibid.*, pp. 62–63.

Center was not to be placed under the 14th ICC. It was to be retained as a separate requisitioner, responsible for controlling and managing aviation items in Vietnam.

The Department of the Army accepted General Engler's distribution objectives, by class of supply, for the reduced supply pipeline. These ranged from 90 days for bulk petroleum to 255 days for secondary items and repair parts, with the latter apportioned as described above. In the case of medical supply support, which remained a responsibility of The Surgeon General, the Department of the Army requested a waiver of the 255-day requirement. For such supplies, the existing CONUS-Vietnam pipeline was 315 days, made up of a 210-day requisitioning objective for Okinawa plus a 105-day requisitioning objective for depots in Vietnam. In view of the responsiveness of the existing system, the Department of the Army recommended that it be left unchanged.

Implementing these changes to the logistics support structure for Vietnam was an evolutionary process. The drawing down of Vietnam support stocks on Okinawa got underway during the first half of 1967. In the meantime preparations went forward for the transition by Vietnam from requisitioning through the 2d Logistical Command to requisitioning directly on the CONUS before the end of 1967. This involved assuring that the Automatic Addressing System throughout the USARPAC was capable of functioning in support of Vietnam, as well as augmenting the 14th ICC to enable it to extend its supply management function in Vietnam.

The plan provided for the centering of responsibility for the status of funds in support of shipments to Vietnam at the CINCUSARPAC in Hawaii, with these funds being managed and bills being paid on the basis of supply actions. As for communications, the Department of the Army considered the facilities available in the Pacific Command, plus those programed for completion by 1 May 1967, as adequate for the proposed logistics support structure for Vietnam.[84]

The supply support structure which subsequently developed for Vietnam consisted of a mixture of systems. In Vietnam, the focal point for Class II and Class IV items became the 14th Inventory Control Center (ICC). The 14th ICC determined requirements for the three major Army depots (Qui Nhon, Cam Ranh Bay, Saigon), and submitted requisitions to the 2d Logistical Command on Okinawa for possible fill. From Okinawa, these requisitions went directly to CONUS supply points. Requirements for aircraft, missile, and medical items went to separate control facilities in Vietnam, and requisitions for aircraft and missile items went directly to AVCOM and MICOM, respectively. In the U.S., the LCO-P continued to serve as the focal point for high priority items, namely Red Ball requisitions and requisitions for certain selected items—primarily weapons.[85]

The Army Readiness Program

The Army's highest priority program was readiness, the Vice Chief of Staff, General Creighton W. Abrams, told a Senate subcommittee early in June 1965. It had been for some time, and as a consequence the Army was in the best readiness condition it had ever been in during peacetime.[86]

During the Berlin crisis of 1961 and the Cuban Missile crisis of 1962 it had been revealed that existing reporting procedures did not provide a clear picture of the combat readiness of Army units. At the time, the Army required semiannual reports on readiness from major field commands, and by and large these reports were overly optimistic in that they tended to stress the willingess, rather than the readiness, of Army units to engage in combat operations. During the Cuban crisis much redistribution of materiel among units within the CONUS had been necessary to build up those

[84] (1) Ibid., pp. 63–64. (2) CofS, AMC, Working Files, WDC 1394, 1 Feb 67. (3) CofS, AMC, Working Files, HWA 0433, 3 Feb 67.

[85] Interv, Charles W. Lynch with Mr. John Shada, SA for Support Operations, AMC, 23 Sep 68.

[86] *Hearings* before the Preparedness Investigating Subcommittee of the Senate Committee on Armed Services, 89th Cong, 1st sess, on Investigation of the Preparedness Prog, May 13, 21; Jun 2–3, 20, 1965, pp. 86, 95.

on the troop list for Cuba, and the current reporting system had done little to facilitate this process.

As a consequence, the Army developed a new system for evaluating readiness and instituted it in the fall of 1963. The new system pinned readiness goals directly to the mission of Army units, and prescribed precise measurements for readiness in the areas of personnel, training, and logistics. It required commanders of all combat and combat support units to submit quarterly reports which reflected their readiness, as against prescribed standards in major categories.[87] Materiel reporting requirements, as set forth in AR 711–5, required every unit in the CONUS, including reserve units, to submit a full listing of its assets each month. Units overseas were required to submit similar reports on a quarterly basis.[88]

The new readiness system was a management tool, designed to achieve the highest level of readiness possible within Army resources. Its primary purpose was to point up readiness problem areas, not to provide a measure of whether or not a unit could deploy and go into combat, and to this end the standards for achieving the established levels of readiness were deliberately made tough. As of June 1965, the Army had not yet achieved the high standards it had set for itself, but General Abrams was convinced that this new system would, in time, do more for Army readiness than any other peacetime change.[89]

DA Board of Inquiry of Materiel Readiness

In May 1964, while this new equipment status reporting system was still in its infancy, Gen. Earle G. Wheeler, then the Army Chief of Staff, established a special Board of Inquiry on Materiel Readiness, known informally as the Baker Board. Headed by Maj. Gen. William C. Baker (retired), former Chief of Staff, U.S. Army, Europe (USAREUR), this board was charged with determining the fundamental causes of readiness problems within the Army and making recommendations for improvement.

This action stemmed from an examination of certain STRAC units in 1963 by the General Accounting Office (GAO). In its report to the Congress in March 1964, the GAO had charged that the combat capability of STRAC units was being impaired by inadequate maintenance of combat essential equipment and a lack of command attention to maintenance. The GAO further charged that equipment readiness reports submitted by these units portrayed a much better condition than actually existed, and that this tended to mask the seriousness of the situation and block corrective action. The GAO assumed that inadequate maintenance resulted from negligence on the part of responsible personnel at all echelons of command, and labeled this an Army-wide problem. The Baker Board was established to get at the underlying causes.[90]

When General Baker asked him for his views on the Army materiel readiness problem, General Besson commented on some of the major elements as seen from the Army Materiel Command level, the ones on which AMC command attention was focused. Contrary to some views expressed on the subject, General Besson held that neither the quality nor the quantity of equipment on hand was the major factor in unit readiness. The deficiencies reported most often concerned shortages of repair parts and insufficient numbers of technically qualified personnel to maintain the equipment in the system. Some of this equipment was old and worn, which meant increased demands on the supply system and heavier maintenance man-hours, but this was a condition which could not be avoided. Funds to provide all units with the latest equipment were simply not available and not to be expected. General Besson therefore believed that prospects for improvement lay primarily in improving man-

[87] (1) *Ibid.*, pp. 3–4, 95. (2) Four levels of combat readiness were prescribed under this new system. These ranged from Readiness Condition (REDCON) C1, under which a unit could be fully ready for combat operations within 24 hours, to REDCON C4, which was applied to units requiring more than 30 days to reach full combat readiness.

[88] (1) *Hearings* on Investigation of the Preparedness Prog, p. 110. (2) AR 711–5, 20 Sep 65, subj: Army Equip Status Reporting Sys: Unit Organization, or Activity Equip Status Reporting (Materiel Readiness).

[89] *Hearings* on Investigation of the Preparedness Prog., pp. 94–95.

[90] (1) Ltr, Gen Earle G. Wheeler, CofSA, to Maj Gen William C. Baker, Jr., 25 May 64, subj: Board of Inquiry on Materiel Readiness. (2) CSM 64-210, SGS, DA, for Dep Chiefs of Staff, COA, ACSFOR, same date and subject. (3) AMC Historical Summary, FY 1965, pp. 444–445.

agement control and reporting procedures, and in effecting such changes in funding and personnel as were needed to maintain an acceptable level of readiness.

In regard to funding, there was no disputing the fact that it was requiring more money to support a piece of equipment than it did a few years earlier. To General Besson, this meant that more flexibility in the management of revolving type funds was required if a commander were to be able to meet his responsibilities in this area. A lowering of the inventory through short funding was often not felt immediately, he pointed out, but it frequently caused an out-of-stock condition some months later because of the leadtime required to obtain repair parts. This, General Besson believed, was a problem worthy of special consideration by the Department of the Army.

Deficiencies in supply and maintenance could also be traced to the fact that the new management procedures and readiness reporting systems had experienced growing pains. Further improvements in both MILSTRIP [91] and TAERS [92] were needed before their potential for processing requisitions and for producing the data needed for effective management of maintenance and repair parts, respectively, was to be realized. As for the supply management of minor secondary items and repair parts, the AMC was seeking to acquire enough commodity managers, and to provide them with sufficient funds, to assure that needed items were in the depots at the right time.

Perhaps what the Army needed most to improve its materiel readiness posture, General Besson suggested, was a liberal reintroduction of the old maintenance and supply warrant officers. This need had been accentuated by the functionalization of supply and maintenance under the direct and general support concept, he said, and by the corollary loss of Technical Service responsibility for the various commodities. Unfortunately, under existing statutes any increase in warrant officer strength would reduce the number of general officer spaces, for the former were included in total officer strength whereas the ceiling on general officers was a percentage of the commissioned strength.[93]

Baker Board Report

The Baker Board made its report in September 1964. Its general conclusion was that the basic problem was that Army resources did not match its worldwide commitments. Either substantial increases in resources (money, men, and materiel) or reductions in the force structure and Army missions would bring resources into line with requirements, but the board recognized that neither of these alternatives represented a practical approach to the problem of improving the Army's materiel readiness posture.

The board therefore addressed itself to a third option: the development of a more realistic priority system. This would make it possible to maintain high priority units at the desired level of readiness with existing resources, though at the expense of lower priority units. The major theme of the report, however, was that combat readiness had to be improved through better supply and maintenance procedures and through better training for supply and maintenance personnel.

The board went on to deal with specifics. It noted that maintenance, the key to materiel readiness, was degraded by the cumulative effect of many adverse factors, such as personnel turbulence, shortages of trained personnel, deficiencies in the supply of repair parts, and over-commitment of units. It recommended actions to overcome shortages in officer and enlisted personnel trained in supply and maintenance fields, particularly at the company and battalion level. It recommended that criteria and procedures for readiness reporting as set forth in AR's 220–1, 750–10, and related documents be revised to provide more realistic portrayals of actual unit readiness and more informative reports. It called for revision of The Army Equipment Records System, for, as it was, the various directives on readiness and equipment reporting resulted in conflicting requirements and duplication and overlap of information, causing confusion and encouraging inaccurate reporting. The board warned, however, that any new procedures would need to be

[91] Mil Standard Requisitioning and Issue procedures (AR 725–50).

[92] The Army Equip Records System (AR 711-140).

[93] Ltr, Gen F. S. Besson, Jr., to Maj Gen William C. Baker, Jr., 27 Jul 64, *n.s.*

thoroughly field-tested before being adopted for Army-wide use.[94]

With the publication of the Baker Board Report, the Commanding General, AMC, and other major commanders were asked for their comments.[95] Addressing itself to 38 topical elements in the report, the AMC concurred in 30, recommended modification of 7, and nonconcurred in the proposal to assign identifying prefixes or suffixes to Federal stock numbers. The one positive way to end the confusion in this area, the AMC held, was to establish permanent responsibility for each item in the supply system and eliminate transfers between the DSA, the GSA, and Army NICPs.[96]

The Baker Board report and subsequent review by the DA staff and the major commanders produced numerous recommendations for improving readiness within the Army. In December 1964, specific responsibilities in connection with these recommendations were assigned to various elements of the general staff and to major commanders, while responsibility for overall supervision of the effort was assigned to the Army Vice Chief of Staff, General Abrams. Provisions were made for quarterly reports to the General Staff Council and the Army Policy Council on Army readiness.[97]

Program for Command Supervision of Readiness

The Secretary of the Army's Program for Command Supervision of Readiness, instituted early in January 1965, added emphasis to the readiness improvement program. Under it, the commander of each major command and activity was required to present a comprehensive report of his stewardship of readiness matters to the Army Chief of Staff and Vice Chief of Staff once each year. This was one of the most important presentations made by a major command, for it informed the Army Chief of Staff and Vice Chief of Staff how well the command had done in achieving its readiness posture in terms of personnel, training, and logistics. The first AMC presentation, made by General Engler in April 1965, covered AMC operations for calendar year 1964.[98]

The presentation on AMC operations for 1965, made by General Besson himself in April 1966, covered the first six months of the Army buildup. General Besson compared the current military logistical picture with that of a year earlier, and he discussed the command's supply performance for calendar year 1965. He reviewed the status of major and secondary items, described the status of the command's resources (personnel, money, equipment, and facilities) in relation to its current mission and the mobilization and contingency planning efforts, and outlined actions taken by the AMC to assure full support to U.S. and friendly allied forces in Southeast Asia. Unresolved problems requiring DA assistance were listed, and actions taken within the AMC's authority to correct current readiness shortfalls and deficiencies were covered.[99]

During calendar year 1965, 99,000 troops in 734 units had been deployed to SEA, and another 176 units with 12,000 personnel were alerted. All units had been placed in logistical Readiness Condition (REDCON) C1 before they were deployed. In this, DA Materiel Readiness Liaison Teams, established by the Office of the Deputy Chief of Staff for Logistics (ODCSLOG), had proved valuable. Composed primarily of AMC representatives, they helped commanders improve the readiness posture of their units and they served to strengthen the effectiveness of the DA materiel readiness re-

[94] Rpt of DA Board of Inquiry on Materiel Readiness Maj Gen William C. Baker, Jr., Pres, 23 Sep 64 (Baker Board Rpt), pp. 48–51, Annex A.

[95] (1) See ltr, OCofSA to CG, AMC *et al.*, 6 Oct 64, subj: Board of Inquiry on Materiel Readiness. (2) AMC comments on the Baker Board Rpt were submitted to the DCSLOG by ltrs, 23 Nov and 15 Dec 64. (3) DF, Dep Dir/Materiel Readiness, AMC, to CG, SMC *et al.*, 18 Dec 64, subj: Readiness.

[96] MFR, Lt Col J. C. McMillan, 3 Nov 64, subj: Briefing to DCG on AMC Comments to DCSLOG Regarding Rpt on "Board of Inquiry on Materiel Readiness." (2) Ltr, Maj Gen William B. Bunker to DCSLOG, 4 Nov 64, subj: Board of Inquiry on Materiel Readiness with 3 incls.

[97] CSM 64–531 to Dep Chs of Staff *et al.*, 7 Dec 64, subj: Readiness, with incl 1—DCSLOG Summary Sheet, 18 Nov 64, subj: Board of Inquiry on Materiel Readiness, and incl 2—Recommendation of Major Commanders for Improving Combat Readiness.

[98] DA ltr, 30 Apr 65, subj: Secy of the Army's Prog for Comd Supervision of Readiness—USAMC Presentation, 22 Apr 65, with incl, Transcript of AMC presentation.

[99] DA ltr, 20 Apr 66, subj: Secy of the Army's Prog for Comd Supervision of Readiness—USAMC Presentation, 5 Apr 66, with incl, Transcript of AMC Presentation.

porting system. Within the AMC, the OPRED was charged with assuring that action was taken on the materiel readiness problems they reported.

In many areas, workloads had increased sharply in the AMC during the last six months of 1965. Line item supply support, for example, had increased 45 percent, and this demand had been met initially without any significant increase in resources. Workloads were also heavy in regard to computing requirements for and effecting procurement of secondary items, the rate of obligation in Fiscal Year 1966 being double that of the previous year.

Many actions had been taken to assure effective supply support to forces in Vietnam. The mission of the AMC Logistics Control Office —Pacific (LCO-P) had been expanded to provide a central source of information on supply shipments to Vietnam, including Red Ball requisitions. AMC Customer Assistance Offices had been established in Vietnam and Headquarters, U.S. Army, Pacific, to improve communications between the AMC and its customers, thereby enabling the command to handle current and potential problems more effectively. The AMC had converted a Navy seaplane tender, the USNS *Corpus Christi Bay* into a floating aircraft maintenance facility, the Army's first. Equipped to provide depot maintenance support for Army aircraft, the ship arrived in Vietnam waters on 2 April 1966.[100]

The Weakest Link

While the Baker Board study was being staffed, General Besson was giving further thought to "our apparent inability to make significant improvements in the effectiveness of our supply support to our customers." He was convinced that the supply system was sound but disturbed by the fact that the AMC continued to receive the same complaints from its customers about "shortages of the simple nuts and bolts to hold the equipment together." He concluded that this was largely a problem of the reliability of the input data and that many of the problems afflicting the supply system could be eliminated by attacking the overall problem at this point.[101]

He had a plan for doing just that. The entire Army supply system, a sprawling data processing network which handled almost 300,000 supply transactions a day, was highly dependent on the basic computations and reports emanating from the Direct Support Unit (DSU) and General Support Unit (GSU) levels. But it was at these levels that the Gordian knots of personnel turbulence, inadequate training, short tours, and other deficiencies cited by the Baker Board were tied. When one considered the number of such units—some 65 in Seventh Army alone—the impossibility of ensuring consistency in judgment or even in the mechanical performance of routine tasks became obvious. If only five percent of the requisitions from the DSUs were improperly prepared or not properly reflected as demands, over 500,000 errors a year were being introduced into basic supply data, far more than computers at the national level could correct.[102]

The need then was for a system that did not rely on well-trained supply personnel at that level, one that was simple, mechanical, and foolproof. General Besson directed that a study group be established to develop this concept. The emphasis on simplicity was such that the project was referred to, unofficially of course, as the "Chimp System," on the basis that it should be so mechanical it could be operated successfully by a moderately intelligent chimpanzee.[103]

The plan that took shape provided for comparing the performance of two DSUs equipped with different sets of commercial accounting equipment with that of a third unit composed of experienced supply personnel and using existing manual procedures. Arrangements were made for the use of divisional maintenance

[100] (1) *Ibid.* (2) OPRED Historical Summary, FY 1966, pp. 11–12. (3) AMC Historical Summary FY 1966, p. 401.

[101] Ltr, Gen F. S. Besson, Jr. to Gen Creighton W. Abrams, 30 Nov 64, n.s.

[102] (1) Ltr, Gen Creighton W. Abrams to Gen F. S. Besson, Jr., 30 Oct 64, n.s. (2) Ltr, Gen F. S. Besson, Jr. to Gen Creighton W. Abrams, VCofSA, 30 Nov 64, n.s. (3) Recommendations of Major Commanders for Improving Combat Readiness, incl to CSM 64–513, 7 Dec 64, pp. 31–33.

[103] Fact Sheet, n.d., subj: Study to Improve Supply Effectiveness at the DSU and GSU level, prepared by AMC for the DCSLOG following the Briefing on 14 Jan 65.

battalions at Forts Hood, Carson, and Lewis, data processing equipment was selected, and the tests got underway in July 1965.[104]

By early 1966, when the results of these tests finally became available, the need for upgrading DSU/GSU capabilities in Vietnam was painfully apparent. The Army Chief of Staff therefore approved a plan to provide NCR 500 magnetic ledger card systems to such units, and the Office of the Secretary of Defense (OSD) authorized the procurement of 18 such sets, 16 of which were for Vietnam. The OSD was not convinced that this represented an adequate answer to the DSU/GSU problem, however, and directed that a thorough study of system requirements be made before proceeding with any additional acquisitions. A test initiated at Fort Hood was designed to accomplish this.[105]

In the meantime, the NCR 500 systems were procured and being used in Vietnam to mechanize DSU operations. By October 1966, General Engler saw a need for 16 more such systems if mechanization of all DSUs in Vietnam were to be realized, and he found the prospect of different hardware being introduced a cause for concern. He held it highly desirable that USARV be mechanized with a single type of equipment so as to minimize maintenance, parts, and training problems. The time element involved in waiting out competitive bids or the results of the 1005 test at Fort Hood was another factor, for early mechanization of DSUs was needed to improve the repair parts posture in Vietnam.[106]

On both sides of the Pacific, however, it was recognized that there could be considerable resistance to such a course of action. The OSD had already made its position clear, and the van-mounted NCR 500 systems which were then being deployed to Vietnam had not yet proved their worth in the environment of Southeast Asia. General Engler was anxious to avoid delays in his mechanization effort, but the indications in November 1966 were that it would take a strong case from the theater, supported by operational experience in Vietnam, to win OSD approval of additional procurements of the NCR 500 system before the tests at Fort Hood were completed.[107]

DA Board of Inquiry on the Army Logistics System

Background

One of the conclusions of the Baker Board was that the Army repair parts supply system needed major improvement at all levels. At each level of maintenance, the board reported, problems of repair parts supply were a major contributing factor where unfavorable materiel readiness posture of units was concerned. Causes ranged from deficiencies at the DSU level to fragmentation of responsibility for supply support between and in the Department of Defense and the Army.[108]

In its comments, the AMC neither agreed nor disagreed with what it viewed as "a very broad and all inclusive statement." Instead, it listed four factors which made the achievement of an effective repair parts supply system difficult. One was the turbulence caused by changing responsibilities under the reorganization of the Department of the Army; another was the extreme fluctuations of demand resulting from critical situations in Berlin, Cuba, and Vietnam; a third derived from command decisions to deploy new major items before an adequate support base was established. The inability to prestock for Military Assistance Program (MAP) requirements was the fourth factor. It caused assets intended for U.S. Army use to be diverted to other customers, particu-

[104] (1) Ltr, Gen F. S. Besson, Jr. to Lt Gen L. J. Lincoln, DCSLOG, 13 Jul 65, n.s. (2) Fact Sheet, 14 Jul 65, subj: Study to Improve Supply Effectiveness at the DSU Level. (3) Ltr, Asst Ch, Data Systems Ofc, AMC, to Special Asst, AIDS, 31 Mar 65, subj: Study to Improve Supply Effectiveness at the DSU and GSU Level of the U.S. Field Army. (4) 1st Ind, HQ, TAGO to CG, AMC, 14 May 65, subj: same.

[105] (1) Hurlbut Rpt, 17 Dec 65, p. 49. (2) CofS, AMC, Working Files, GVP 809, 7 Nov 66.

[106] CofS, AMC, Working Files, ARV 224, 31 Oct 66, and ARV 349, 18 Nov 66.

[107] CofS, AMC, Working Files, GVP 809, 7 Nov 66, and ARV 349, 18 Nov 66.

[108] Rpt of Board of Inquiry on Materiel Readiness (Baker Board Rpt), 23 Sep 64, pp. 19, 49.

larly Vietnam, who were authorized a higher supply priority than some U.S. units.[109]

Development of the Study Plan

In March 1965, the Army Chief of Staff directed the DCSLOG to draw up a plan for determining how the Army could better satisfy the materiel requirements at the company/troop/battery level. Problems stemming from outside the Army were to be documented but not pursued, for this was not to be a study of why the Army could not do its job but rather a search for internal improvements.[110]

The plan prepared by the DCSLOG provided for the most searching inquiry into the total Army logistic system since the reorganization of 1962. The plan noted that the management of equipment divided into two distinct though mutually supporting areas: acquisition management, and assets management. Acquisition management began with the qualitative materiel requirement and proceeded through design, development, test and evaluation, and type classification. At that point it was introduced into the Army materiel program and procured under Procurement of Equipment and Missiles, Army (PEMA), authority.

When the Army accepted an item into its inventory, the focus of attention shifted to asset management. Asset management began with how and to whom the Army would distribute its equipment—active Army units, mobilization reserve stocks, prepositioned stock, reserve units, or sale to MAP. The distribution of equipment to troop units set in motion the massive support complex of the logistic system involving repair parts, tools, test equipment, and personnel from unit to national level.

The break between these two areas of equipment management was sharply defined. In establishing dollar resources for assets management, the Army utilized the Operation and Maintenance, Army (OMA), and stock fund authority, while in the establishment of dollar resources for acquisition management the Army employed the PEMA authority. In addition, acquisition management was almost entirely contained within Headquarters, Department of the Army, and the wholesale supply structure (primarily AMC), whereas assets management was carried out by all echelons within the Army from the unit to national level.

Both of these areas were part of the overall equipment management effort and they depended on the overall direction provided by general management. From the concepts, policies, and practices put out by top management stemmed the structure of each segment of the logistics system.

The area which held the most promise for immediate results, the DCSLOG concluded, was that of assets management, with particular attention to the repair parts supply system. This was supported by the Baker Board, which had concluded that difficulties in obtaining repair parts was a major problem in achieving materiel readiness, and that the Army repair parts supply system was in need of major improvement at every level.[111]

Establishment of the Brown Board

The DCSLOG plan was approved by the Army Vice Chief of Staff and a DA Board of Inquiry on the Army Logistics System was established, effective 1 September 1965. Lt. Gen. Frederic J. Brown (retired) was recalled to active duty to head this effort. The Brown Board, as this study group was known, was charged with determining what needed to be done to improve materiel readiness at the company/troop/battery level, and in accordance with the DCSLOG plan it was to concentrate its efforts first on the broad area of assets management.[112]

The Brown Board began with orientation briefings by elements of AMC, including the Army Logistics Management Center and the Army Maintenance Board. Later, in October 1965, the Board asked General Besson to present what he considered to be his most important problems.[113] A canvass of the command

[109] Ltr, Maj Gen William B. Bunker, DCG, AMC, to DCSLOG, 4 Nov 64, subj: Board of Inquiry on Materiel Readiness, incl 3-A.

[110] See CSM 65-126, 26 Mar 65, subj: A Study of the Army Logistics Sys.

[111] (1) CSM 65-276, SGS, DA, to Dep Chiefs of Staff *et al.*, 17 Jun 65, subj: Board of Inquiry on the Army Logistic Sys. (2) Incl to *ibid.*, Plan for Study of the Army Logistics Sys, n.d.

[112] (1) Ltr, Gen Creighton W. Abrams, VCofSA, to Lt Gen Frederic J. Brown, OCofSA, 26 Aug 65, subj: Board of Inquiry on the Army Logistic Sys. (2) Memo, SGS, DA, to DCS *et al.*, 27 Aug 65, subj: same.

[113] Ltr, Lt Gen Brown, Chmn, Army Logistics Sys Board, to Gen F. S. Besson, Jr., 8 Oct 65, n.s.

resulted in many problems being reported, and steps were taken to assure that those within the AMC's area of responsibility received attention.[114] Problems of larger scope were reviewed by General Besson and key members of his staff, and in February 1966 the AMC submitted a list of 19 such problem areas to the Brown Board.[115]

Interim Report

Two months later, the Brown Board submitted an interim report to the Army Vice Chief of Staff. To date, the Brown Board had concentrated on assets management—the distribution system below the CONUS depot level. The purpose of the interim report was to present a number of "quick-fix" improvements which did not need to await completion of the board's investigation, and to present two matters which the board believed warranted specific action by the Army Vice Chief of Staff as soon as possible.

One was the volume of changes being directed at the NICPs. The NICPs had not yet been able to digest the many changes required under TASAMS, their degree of success ranging from excellent to poor. Those having the greatest difficulty were MEC, ATAC, and ECOM. The important point was that they were overloaded with work in connection with support to SEA, and there needed to be a moratorium of at least a year on all but the most important systems changes. Early in December 1965, General Besson had informed the Department of the Army of the serious situation at the NICPs in regard to systems changes. The AMC had identified seven major new systems (the "Sacred Seven") that would have priority at the NICPs,[116] but since that time other systems changes had been started. The Brown Board strongly endorsed General Besson's proposal that all possible systems changes be held for inclusion under NAPALM rather than implemented under the existing system. In view of the critical situation at the NICPs, the board recommended that the DCSLOG and the Commanding General, AMC, be directed to hold systems changes to an absolute minimum.[117]

The number of major and minor systems changes being imposed on the NICPs was staggering, as the situation at MICOM made clear. [See figure 2.][118] At Headquarters, AMC, it seemed obvious that there were so many changes from so many sources that no one was aware of the total. The AMC could expect to continue to be subjected to new efforts, General Bunker told the Special Assistant, AIDS, in July 1966, and only by combined efforts and strong command support could the Army get and keep the control that it needed.[119]

The other difficult situation concerned logistics transfers. At the time of the buildup, the Army (AMC) was involved in reviewing and recoding about 200,000 items for possible transfer to the DSA as single-managed items. Requirements in support of SEA had blotted up AMC capabilities to the extent it could not absorb an additional workload of this magnitude. Furthermore, this program threatened the effectiveness of troop supply, for all changes had to be broadcast through all echelons of the Army.

General Besson had tried to establish a moratorium on logistics transfers. When his request was denied, he had ordered his commands to give first priority to SEA. While this recognition of relative priority was sound, it contained a built-in danger. During January 1966, for example, 5000 items had been summarily transferred from ATAC to DSA when review proved beyond ATAC capability. This included many items which rightfully should be managed by the Army, but which now could be recaptured only through laborious administrative procedures.

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[114] (1) Memo, AMCOR-RO to CofS, AMC, 19 Apr 66, subj: Reevaluation of Brown Board Recommendations, with incl.

[115] Ltr, Gen F. S. Besson, Jr., to Lt Gen Frederic J. Brown, 16 Feb 66, n.s., with incls. (2) Ltr, DCG, AMC, to CG, SMC *et al.*, 20 Apr 66, subj: Army Logistics Sys Review Board, with 2 incls.

[116] See ltr, CG, AMC, to Special Asst, AIDS, DA *et al.*, 2 Dec 65, subj: Control of ADPE and Systems Changes.

[117] (1) Memo, Lt Gen Frederic J. Brown, Chmn, DA Board of Inquiry on Army Logistics Sys, to Gen Creighton W. Abrams, Jr., VCofSA, 18 Apr 66, subj: Interim Rpt, DA Board of Inquiry on Army Logistics Sys. (2) DA Board of Inquiry on the Army Logistics Sys, Interim Rpt, Apr 66, *passim*.

[118] Memo, Lt Gen Frederic J. Brown to Gen Creighton W. Abrams, Jr., 18 Apr 66, subj: Interim Rpt, DA Board of Inquiry on Army Logistics Sys, with incl.

[119] Memo, Lt Gen William B. Bunker, DCG, AMC, to Maj Gen J. E. Landrum, SA, AIDS, 20 Jul 66, subj: same.

The Brown Board thought the subject of logistics transfers important enough to merit the personal attention of the Secretaries of Army and Defense. A serious shortcoming in the present logistics system, the board reported, was the loss of direct Army responsibility at CONUS and DA level for the complete support of Army elements in oversea areas. Proposals for reasserting the Army's responsibility for full support of its oversea elements seemed certain to figure in the board's final report, and any further loss of items currently under Army management would only increase the difficulty of ultimate solution. The board asked the Army Chief of Staff to obtain a moratorium on logistics transfers for the duration of the SEA crisis. If this failed, the Army should try to get the frequency of such changes limited to an annual basis.[120]

AMC Comments

The AMC, of course, strongly supported these calls for moratoriums on system changes and logistics transfers. To General Besson, the problems caused by uncontrolled systems changes were of paramount importance, for the turbulence which resulted inhibited the ability of the NICPs to stabilize and perfect the basic system. He also wanted the Army to seek greater authority to acquire ADPE, for he saw the current policy as far too restrictive, and one that led to unwarranted direction in matters of Army responsibility. He recognized that a moratorium on logistics transfers was not without its drawbacks. For one thing, it would preclude action by the Army to return items which should not have been transferred. But these were difficult times, and General Besson believed that the benefits to requisitioners from stabilizing the system would far outweigh the drawbacks.[121]

It was not that the Army lacked capability to process Federal stock number (FSN) changes and to use interchangeability and substitute item (I&S) data. It was simply that such changes derived from many causes besides transfers of item management responsibility, and the total from all causes was far too many. Acting on the Brown Board recommendation, the Assistant Secretary of the Army (I&L) asked his Defense counterpart to establish a policy of reducing the volume of changes to logistics data. He asked that such changes be made on an annual basis only, and that provisions be made for stabilizing changes of price, unit of issue, and logistical transfers.[122]

The Brown Board had also discussed the problem of resources. The lag of resource decisions behind logistics decisions created a vacuum in which actions marked time. This frequently so extended administrative leadtime as to negate many of the benefits to be expected from costly high priority procedures. If a cure could be found for this lag, General Besson wrote, many of the ills of the system would be removed.[123]

The Second Phase: Acquisition Management

While its interim report was being reviewed, the Brown Board extended its inquiry into acquisition management, or AMC-level logistics. In a briefing to General Brown and his staff in May 1966, General Besson outlined the AMC's current organizational and operational relationships, and the changes which would occur under the pending merger of Headquarters, AMC/SMC. He then presented a rundown on major logistics problems, and related them to some of the difficulties being encountered by the AMC.

There were 31 such problems, the first 19 of which had been presented to the board earlier, in February.[124] General Besson grouped these into four problem areas. The first was lax supply and maintenance discipline, a problem which started at the user level and was compounded at every echelon. General Besson considered this a fundamental problem of Army logistics which no system change could solve, but he did think more could be done to

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[120] Memo, Lt Gen Frederic J. Brown to Gen Creighton W. Abrams, Jr., 18 Apr 66, subj: Interim Rpt, DA Board of Inquiry on Army Logistic Sys, with incl 2.

[121] Ltr, Gen F. S. Besson, Jr. to DCSLOG, 16 May 66, subj: same, with incls 1 and 2.

[122] Ltr, Lt Gen William B. Bunker, DCG, AMC, to Lt Gen Frederic J. Brown, Chmn, DA Board of Inquiry, Army Logistics Sys, 19 Aug 66, n.s.

[123] (1) Interim Rpt, DA Board of Inquiry on Army Logistics Sys, Anx F. (2) Ltr, Gen F. S. Besson, Jr. to DCSLOG, 16 May 66, subj: same, incl 8.

[124] (1) DF, CofS, AMC, to CG, USASMC and USAMC Directors, *et al.*, 12 May 66, subj: Brown Board Inquiry on Army Logistics Sys. (2) Army Logistics Sys Review Board, Major Problem Areas, AMC nos. 1–31, n.d.

strengthen supply discipline. He believed that some procedural changes could help by shifting much of the logistic burden from the user level to the field commands and national agencies. He also questioned whether automatic resupply might not be more wasteful than justified by the results; and he suggested that the requirements of a unit in training were inadequate for determining materiel requirements in combat and emergency situations.[125]

The second major problem area was the lack of Army control over DSA support, a subject which General Besson felt needed to be pursued at the highest level. The Army needed to be able to answer daily queries on DSA/GSA items and to measure the effectiveness of DSA/GSA supply support to the Army. Under existing procedures the AMC did not have the means to do this.[126] Other problems in this area included the split management of preferred and substitute items, the transfer of item management responsibility from the Army to the DSA, and the turbulence and increased workload created by the lack of a uniform DOD policy for controlling changes in logistic data.[127]

The third problem area cited by General Besson was the command's loss of flexibility. The imposition of controls by higher headquarters in regard to both resources (manpower and financial management) and operational responsibility allowed the command little flexibility for meeting emergency requirements.[128] In the Army Stock Fund area, the OSD/BOB policy of "procurement is a function of sales" had been continued. While this policy made for economical peacetime operations, it did not provide for meeting contingency requirements precipitated by a buildup of Army forces and their engagement in combat operations. Only item-by-item studies could provide a true picture of requirements for forces in Vietnam, not sales.[129]

The AMC needed authority to obligate funds for emergency supply actions if essential actions were not to be delayed because of financial considerations. The Department of the Army Financial Management Plan for Emergency Conditions (FMPEC), which had continued largely unchanged since February 1960, did not provide this authority. Consequently, the AMC had to resort to expedient measures to support the Vietnam buildup, and General Besson believed that a revision of the FMPEC was an urgent need.[130] Giving the AMC authority to prestock materiel in anticipation of International Logistics (Grant Aid and Military Sales) demands, for example, would enable it to improve its supply support to all its customers.[131]

Operational restrictions derived from an overlapping of AMC and DA staff responsibilities in a number of areas. A major objective of Project 80 had been to force the General Staff to concentrate on policy and guidance, and to assign operating-type responsibilities in the logistic field to the AMC. While AR 10–11 appeared to be quite clear in making this division of responsibilities, the DA staff had continued to exercise operational control over new supply and maintenance systems, thereby restricting the AMC's latitude in carrying out its operational responsibilities. In view of its worldwide responsibility for supply and maintenance, the AMC believed that DOD Project 80 objectives would be further served if some of the functions which had been assigned to the Office of the Chief of Support Services, DA, were transferred to the AMC, and if authority for the selection of Automatic Data Processing Systems were vested in the proponent agencies rather than in the DA (AIDS).[132]

The fourth problem area presented by Gen-

[125] *Ibid.*, Problem No. 2, Supply and Maintenance Discipline, and Problem No. 6, Automation and DSU GSU Proficiency.

[126] Problem No. 21, USAMC Dependency Upon DSA and GSA.

[127] (1) Problem No. 22, Split Mgt of Preferred and Substitute Items. (2) Problem No. 24, FSC Transfers to DSA. (3) Problem No. 25, Stabilization of Logistics Data for Repair Parts Item Identification.

[128] (1) Problem No. 26, Manpower Requirements. (2) Problem No. 12, Financial Mgmt Plan for Emergency Conditions. (3) Problem No. 13, Consumer Funding, Funding Constraints Inhibit Capability to Attain Ready Posture.

[129] (1) Problem No. 20, Army Stock Fund Obligations/Sales Ratio. (2) Problem No. 13, Funding Constraints Inhibit Capability to Attain Ready Posture.

[130] Problem No. 12, Financial Mgmt Plan for Emergency Conditions.

[131] Problem No. 8, Pre-Stockage for Intl Logistics Programs (Grant Aid and Mil Sales).

[132] Problem No. 30, Areas of Overlap in USAMC and DA Staff in Maint and Related Supply Activities. (2) Problem No. 28, Worldwide Depot Maint Prog. (3) Problem No. 31, Lack of USAMC Responsibilities for Staff Visits.

eral Besson was in the form of a question: "Why can't we have enough ADP of the proper size." Only the day before this briefing the AMC had given the Department of the Army a detailed statement of the difficulties presented by the fact that proposals for increasing ADPE capabilities at the NICPs had been rejected. In its earlier report, the Brown Board had highlighted the fact that current procedures did not provide timely response to needs, and presented this as a condition which was susceptible to and in need of a "quick fix" solution.[133] To the AMC, this was one of the most pressing problems of the Army Logistics System. The system had always been a flexible, changing entity, but its dynamic nature was more pronounced than ever before. The combat situation and the force buildup were causing system adjustments at a time when the state-of-the-art of system design and automation was in a period of rapid change.

At the beginning of the buildup, between 25 June and 31 August 1965, the AMC had submitted ADPE augmentation plans for four NICPs (MEC, ATAC, WECOM, and AVCOM) and on 25 November it submitted a fifth plan for ECOM. Each of these requests was based on a demonstrated deficiency in ADPE at the time of submittal, but DOD/DA decisions on these requests failed to materialize. In the interim, existing deficiencies at the NICPs had grown, compounded not only by normal growth in computer requirements, but also by requirements for new systems and systems changes engendered by DOD and DA. Even more important to the AMC was the fact that many months of planning, system designing and programing had been lost because of uncertainty as to what would be approved.[134]

Final Report

The final report of the Brown Board, covering all phases of logistic management, was issued in six volumes between November 1966 and March 1967. Volume I, consisting of an overall summary and an implementation plan, was the last to appear. Volumes II–IV were devoted to asset management, acquisition management, and general management, respectively. Volume V was on personnel, training, and organization, and Volume VI, entitled Logistics Systems, presented an approach to an overall, cohesive logistics system. Among other things, it recommended that the "systems analysis approach" be applied to Army logistics.

The main thrust of the Brown Board report was that improvement in the materiel readiness posture of the Army could best be achieved by more emphasis on "systems management." Efficient systems management, the board concluded, would require new organizational patterns, new funding techniques such as total package funding, and a realignment of review responsibilities, all of which would require management information to be directed to higher and higher levels.

Early in March 1967, the AMC Board was directed to review the report and present a précis of the philosophies and findings of the Brown Board. This presentation was given to General Besson and other members of the AMC Board on 5–6 April 1967. It covered logistics responsibilities, logistics structure, logistics functions, and logistics personnel as viewed by the Brown Board, as well as the proposed Readiness Oriented Logistic System for 1975 (ROLS–75) concept.

While it was apparent that a new way of life was in store for the AMC, it was difficult to bring the picture proposed by the Brown Board into clear focus. This derived from the sheer number of its recommendations (over 700), and from a lack of cohesiveness within the report itself. It also derived from the fact that approval of the Brown Board recommendations was being accomplished incrementally by the Army Chief of Staff, and some of these decisions were not in agreement with all of the board's recommendations. The AMC, CDC, CONARC, and DA Staff were all given an opportunity to comment on Brown Board recommendations, and if all were in accord the recommendation was considered approved. Where differences existed, both viewpoints were presented to the Army Chief of Staff, and in many such cases a decision on these matters was being deferred.[135]

[133] (1) Interv, Charles W. Lynch with William C. Kremann, AMCOR-RA, 27 May 66. (2) Ltr, DCG, AMC, to Special Asst, AIDS, OCofSA, 16 May 66, subj: Augmentation of ADPE at NICPs.

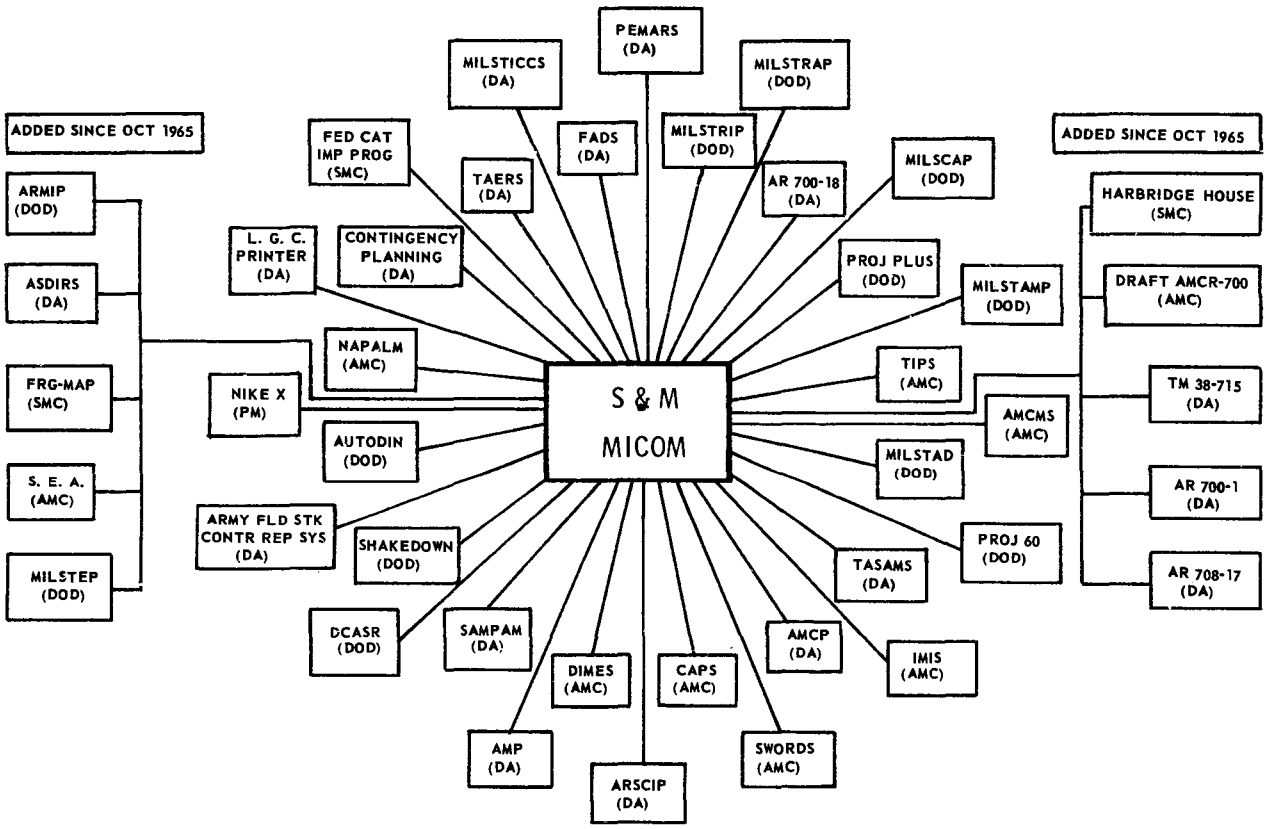
[134] *Ibid.*

[135] (1) Ltr, Gen F. S. Besson, Jr. to Lt Gen L. J. Lincoln, DCSLOG, 6 Apr 67, n.s. (2) Rpt, AMCB, 25–26 May 67, subj: Philosophies of the DA Board of Inquiry on the Army Logistics Sys, pp. 2–69.

Summarizing its findings, the AMC Board staff noted that a clear pattern existed which would result in the DA General Staff assuming more and more operating decisions and receiving more and more management information. Logistics doctrine would be controlled by the DCSLOG, but the AMC's role in the development of doctrine would be expanded. Organization for logistics at the national level, as well as that in CONUS and oversea armies, would be structured along functional lines, with the AMC gaining greater worldwide responsibilities and authorities. An emphasis on logistics systems tailored to weapons systems was also discerned, and this seemed to portend a debate between advocates of simplification and those wanting to return to the key depot concept.[136]

[136] (1) *Ibid.*, p. 67. (2) The machinery for staffing the Brown Board Rpt was established in CSM 66-508, 21 Nov 66, subj: Staffing of the Rpt of the DA Board of Inquiry on the Army Logistics Sys.

FIGURE 2: INTERIM REPORT, DA BOARD OF INQUIRY ON ARMY LOGISTICS SYSTEM, 18 APR 66, TAB A



READINESS CRISIS IN VIETNAM

It pays to spend your logistic dollar before you get into the active theater.

GEN F. S. BESSON, Jr.
Association of the U.S. Army
Washington, D.C.
10 October 1966

CHAPTER XI

READINESS CRISIS IN VIETNAM

Handling Cargo

The automatic resupply and spare parts support for units deployed to Southeast Asia (SEA) was provided for in an outline plan issued by the Army Materiel Command (AMC) in May 1965.[1] Under the plan, as amended some 30 times during the first year of the buildup, 180 days of all classes of supply were furnished for the Vietnam units with an additional 30 days of supply being maintained on Okinawa as theater stockage.[2] The total amount of supply support was based upon troop lists supplied by the U.S. Army Strike Command and equipment status reports rendered by the deploying units. The bulk of the support supplies, equipment, and spare parts furnished during the early months of the buildup that began in July 1965 were supplied by this automatic push supply system.[3] It was a period of guns first and a time when there was no combat theater logistics organization to program resupply requisitions.

At the outset of the buildup, General Besson directed the AMC Board to evaluate the planning efforts of his command in relation to its wartime mission. Regarding the Vietnam resupply program, the board found that a dearth of trained logistics personnel at the receiving ports and depots in Vietnam had caused numerous problems for the AMC commodity commands and materiel centers.[4] Pre-buildup planning had been based upon at least a partial mobilization of Reserve Forces. When this did not materialize, an imbalance of Regular Forces was apparent. The Army was well fixed with divisions and brigades but support forces were lacking. These had to be created from elements of the Active Army, necessitating a relocation of skilled personnel and special training. However, the board also learned that of many complaints from Vietnam concerning the absence of spare parts, utimately, the parts were found to be in theater warehouses and that much materiel that had been shipped to Vietnam could not later be located.[5]

Coincidentally, a special mission headed by Maj. Gen. O. E. Hurlbut, then the Chief of Staff's Special Assistant for Southeast Asia Supply and Maintenance, filed its report concerning logistics problems in SEA on 17 December 1965, the same day that the AMC Board filed its report. General Hurlbut's group had been in the theater during November—December 1965 to monitor, review, and make recommendations concerning matters of importance affecting the Army's supply and maintenance situation in SEA. Concerning spare parts, the mission reported that most of those that had been available in Vietnam as a result of the automatic resupply system or requisition had been expended.[6]

It was also reported that the theater lacked essential asset data upon which repair parts requirements could be forecasted. Inadequate data processing and communications equipment, it was noted, denied the logistics system in Vietnam the means for developing and maintaining responsive and accurate supply and distribution facilities. The report decried the

[1] AMC OPLAN SEA, 21 May 65.

[2] AMCHO Historical Summary, FY 1966.

[3] Speech, Gen F. S. Besson, Jr., to the Association of the U.S. Army at its annual meeting, Sheraton Park Hotel, Wash., D.C., 10 Oct 66.

[4] Final Rpt, AMCB, The Potential of AMC to Accomplish Its Wartime Mission, 17 Dec 65, p. 71.

[5] *Ibid.*

[6] Trip Rpt, Special Asst to CofS, SEA, Supply and Maintenance, 17 Dec 65, p. 4. (The Hurlbut Rpt.)

absence of adequate ports and facilities in Vietnam and the resultant lack of capacity and capability to handle expeditiously the amount of cargo then on hand (December 1965) or being shipped in from major ports in the United States. As of 2 December 1965, over 290,000 measurement tons of cargo aboard 145 deep draft ships were scheduled for discharge at Vietnam ports. Of this total, 29 ships were being discharged, 37 were in port awaiting discharge, and 79 more were awaiting call from holding areas. This was the month of the all time peak for shipping backlog in Vietnam ports. Some improvement in port facilities and controlled sailings from CONUS eased the situation over the next couple of months so that by the end of March 1966 while 21 ships were being discharged only 20 were waiting discharge at Army cognizant ports including Saigon, Cat Lai, Vung Tau, Cam Ranh Bay, Nha Trang, Vung Ro, and Qui Nhon. Of these, only Saigon had the capability to receive vessels at dockside. Before the logistics bottleneck would be completely solved, Army and Navy engineers would construct deep water ports at five of these places including one adjacent to Saigon appropriately named Newport.[7]

Containerization

Although the Hurlbut mission made many recommendations aimed at correcting the logistics bottleneck in Vietnam and specifically called for improved palletization and stowage of cargo to facilitate discharge at the port of destination, their report offered no advice concerning improved containerization or an increased use of container express (CONEX) as a means of easing supply and distribution problems. But General Besson believed that some of the logistics problem highlighted by the AMC Board, the Hurlbut Mission, and his own observations could be solved through a greater use of CONEXes—large metal containers to transport and store a greater variety of supplies. He was particularly interested in their use for shipping and storing spare parts and other support items. When he visited the SEA theater the first half of January 1966, General Besson expressed great concern over the wastage of materiel in Vietnam that had been caused by the lack of covered storage and by severe environmental conditions. He concluded that the absence of warehouses and trained logistics personnel in the theater called for the utmost sophistication in the zone of interior packaging. He particularly decried the extensive use of cardboard containers for shipping materiel that frequently led to losses through deterioration and pilferage. He was so disturbed over the situation that before he returned to Washington, General Besson radioed his headquarters on 14 January from Hawaii, that the use of CONEXes in SEA was the "single most impressive factor in transportation, warehousing, and troop supply storage throughout the theater." He then directed his staff to take certain measures aimed at increasing the outloading of CONEXes from the continental United States (CONUS) to 500 per day.[8]

When the United Sates entered the Southeast Asia conflict, the U.S. Army had approximately 80,000 metal CONEX containers in its logistics inventory. The CONEX had the weight and cube restrictions of 9,000 pounds and 295 cubic feet. The weight suited the five-ton lift capacity of ship's booms at the time that the cargo carrying metal transporters were first conceived and put to use in 1952 during the Korean War. In November of that year thirty CONEXes loaded with engineer spare parts were shipped from CONUS to the Far East Command.[9]

CONEXes were initially designed to fit lengthwise on trucks and sidewise on railroad gondolas or flatcars. Specifically, they measured 8 feet 6 inches x 6 feet 3 inches and were 6 feet 10.5 inches in height. There were half-size and full-size CONEXes, the half-size transporters had just one-half the length of

[7] (1) Hurlbut Rpt, pp. 30, 33. (2) Army Buildup Progress Rpt, OCofS, 1 May 68, p. 57. (3) Speech, Gen F. S. Besson, Jr. to Armed Forces Mgmt Association, San Antonio, Texas, 18 Apr 68.

[8] Msg, CofS, AMC, Working Files, 14 Jan 66. By Oct 1966, the outloading of CONEXes had reached 3,500 per month and in 1967 the monthly average soared to 7,000. Based upon production figures of containers and other factors, it was calculated that 500 per day outloading of CONEXes was an obtainable goal; however, in mid-1967 the decision was made to shift to larger containers. (Based upon interview between Myles G. Marken with R. L. Vekroff, Dir/Transportation, HQ, AMC, 8 Jun 67.)

[9] CONEX, A Milestone in Utilization, DA, OCofT, 12 Mar. 57.

the standard full-size CONEX. Both types had large double doors on the front to permit easy entrance after the protective seals were broken. Within the containers, warehouse bins were often constructed so that selected spare parts could be stored conveniently until required, or the CONEXes could be used to transport bulkier types of cargo from CONUS to storage and distribution areas in the theater. They could be stacked on top of each other in the depot storage areas, thus saving valuable warehousing space. Made of corrugated steel, the CONEXes were able to withstand the severe environmental conditions in Vietnam (intense heat, sand, and alternating wet and dry seasons) and provide their own warehousing thus relieving an already overtaxed theater logistics sytem of this necessity.[10]

Specifically, General Besson ordered his commanders to eliminate the movement of paper covered shipments to SEA as rapidly as possible including shipments of rations which were to be shippped in CONEXes and to explore the use of CONEXes for shipping and storing ammunition as a means for solving the handling and storing problems caused by climatic conditions in Vietnam. General Besson had been disturbed at seeing junk loads of loose bombs during his trip to SEA.[11]

Additionally, the AMC commander directed that re-packaging at terminals and depots be standardized to maximize the utilization of CONEX containers and standard size modules that would fit into them. General Besson emphasized that the plywood modules should be so designed that upon their arrival at the forward troop areas they could be taken apart to provide construction materials for improving combat troop accommodations.[12] The acute lack of construction material in Vietnam gave birth to this consideration. The modules were not to be considered as accountable.

Spurred by nature of the emergency and the direct interest of the Commanding General, AMC, by mid-1966, more than 83,000 new CONEX containers had been purchased and by the close of that year approximately 65,000 loaded CONEXes had been shipped to SEA.[13]

By mid-1968 about 160,000 loaded CONEXes had been shipped to Vietnam and by the close of that year the total reached almost 200,000. Of this total, some 150,000 remained in Vietnam. In General Besson's words "The fertile GI mind has come up with countless uses for the CONEX. They'll pile sand bags on and around them and turn them into protected command posts. They convert them into mailrooms, dispensaries, and supply rooms. Somebody is always coming up with a new idea. However used, the quantity of CONEXes shipped to Vietnam gives us over 7 million square feet of covered storage—almost equal to what has been provided by construction."[14]

By October 1966 General Besson was able to evaluate the Army's experiences with the increased use of CONEXes in attacking the logistics problems that had plagued the Vietnam operations. In doing this, he spotlighted the CONEX as being the most noteworthy tool that had been used to help alleviate the problems of inadequate facilities, insufficient numbers of skilled logistics personnel, faulty packaging, and poor documentation. He praised the CONEX design which he said suited the movement of documented supply, not cargo, so that issue problems in the combat theater were minimized, so that port, transport, storage and inventory problems were lessened. He explained that within CONEXes, warehouse bins loaded with spare parts accounted for by locator cards prepared in CONUS and shipped with the containers, eased the storage and documentation

[10] Speech, Gen F. S. Besson, Jr. to Association of the U.S. Army, Sheraton Park Hotel, Wash., D.C., 10 Oct 66.

[11] Msg, CofS, AMC, Working Papers, 13 Oct 66. (Except for test purposes in Jun 1967, no shipments of ammunition or rations were made to SEA in CONEX. Because of the heat and humidity in Vietnam, the storage of either ammunition or rations in CONEXes was out of the question and the density of ammunition proved too great for shipping in CONEX.)

[12] Msg, CofS, AMC, Working Files, 14 Jan 66.

[13] (1) AMC Historical Summary, FY 1966. (2) Gen F. S. Besson, Jr., U.S. Army, "Logistics Keeps the Army Rolling in Vietnam," *Transportation Proceedings*, Apr 1967.

[14] (1) Briefing, Walter W. Duke, Dir/Transportation to the AMC Depot Commanders Conf, Ft McNair, Wash., D.C., 7 May 68, entitled "Improving Transportation Performance." (2) Speech, Gen F. S. Besson, Jr. to the Cincinnati Chapter of the American Ordnance Association, Hotel Sheraton-Gibson, Cincinnati, Ohio, 14 Nov 68.

problems in Vietnam. Whole CONEXes were positioned as portions of the Vietnam storage depots at which time the locator cards were removed and interfiled at inventory control points.[15] The system was part of General Besson's formula of placing the logistics burden where the capability was, in this case with logistics personnel in CONUS.

Then in April 1967, one month after contracts had been let for 108,000 of an authorized 120,000 CONEXes, General Besson revealed that the Army was planning to replace, at least in part, the CONEX container as soon as possible. General Besson had in mind to extend to Vietnam the use of the 35-foot commercially owned and transported Sea Land container that was already being used for shipments from CONUS to Okinawa. It was proposed that eventually Army-owned sea vans measuring 8 feet x 8 feet and up to 20-feet long and capable of transporting loads of up to 40,000 pounds would be in use. The container would actually be a trailer to be placed upon bogeys and chassis for transport from the initial destination. The use of aluminum in place of steel for the container was also to be considered.[16]

Roll-On-Roll-Off Ships

In March 1966, as a result of General Besson's urgings, the Military Sea Transport Service (MSTS) had entered into a contract with the Sea Land Corporation, a commercial containership firm, to provide containership service from west coast ports to Okinawa. To achieve optimum utilization of this service, General Besson directed the establishment of a special containerization sub-depot at Sharpe Army Depot at Stockton, California where shipments of less than release unit cargo were separated by destination, loaded into sea-van trailers, documented and then moved approximately 50 miles to Oakland for loading aboard containerships. Then in July 1967, through the encouragement of AMC, MSTS contracted for expanded containership service to Da Nang and then in October to Cam Ranh Bay.[17] Before this could be done, it was necessary to arrange for adequate berthing space, heavy duty cranes to lift the heavier loads and open area storage space to accommodate the shipments.

The CONUS to Da Nang schedule provided for a sailing every 15 days and carried mostly Navy cargo. The major service was established to Cam Ranh Bay with the same 15 day frequency. Sea Land's ships carry on the average about five-hundred 35-foot containers. The ships on the Okinawa run were self sustaining, but at Cam Ranh Bay two gantry cranes were required on the pier to lift the containers off the ship and put them on trailers on the docks or load them into self-sustaining ships for further movement by water. A unique feature of the operation was the possible onward movement of containers to Saigon and Qui Nhon by shuttle containership service from Cam Ranh Bay.[18]

Augmenting the container service were the Roll-on/Roll-Off (RO/RO) ships—all except the gas turbine powered ship, *Admiral William M. Callaghan,* were committed to SEA. The RO/RO concept combines the U.S. Army Trailer Service Agency with MSTS RO/RO type ships to facilitate the movement of general cargo. The service has been used for providing scheduled and depot-to-depot delivery of combat support items, and fast/flexible response to theater logistics requirements. It has reduced exposure of ship and cargo to enemy action, reduced oversea supply point requirements, and reduced shiploading-discharge time. RO/RO lessened the requirement for permanent port and rail facilities. The MSTS ships used in this service were the *Comet, Transglobe,* and *Taurus,* along with 2,400 trailers. The U.S. Navy Ship *Comet,* a typical RO/RO ship had the capacity to transport: 127 RO/RO trailers; 135 CONEX containers; 75 military vehicles of 2½-ton size; and 150 military vehicles of ¾-ton size. The RO/RO service which had been operating to Europe was transferred to Okinawa to support operations in Southeast Asia. Since March 1966, the RO/RO service

[15] Speech, Gen F. S. Besson, Jr. to the Association of the U.S. Army at its annual meeting, Sheraton Park Hotel, Wash., D.C., 10 Oct 66.

[16] (1) *Transportation Proceedings,* Apr 1967, "Logistics Keeps The Army Rolling in Vietnam," Gen F. S. Besson, Jr. (2) AMCB Minutes of Meeting, 11-12 Dec 68, p. 7.

[17] (1) Submission, AMCDT-PP to AMCHO, 17 Dec 68. (2) Speech, Gen F.S. Besson, Jr. to Cincinnati Chapter of the American Ordnance Association, Hotel Sheraton-Gibson, Cincinnati, Ohio, 14 Nov 68.

[18] *Ibid.*

has operated from Okinawa to Cam Ranh Bay, Saigon, Qui Nhon, and Bangkok.[19]

Though the CONEX, the pioneer in containerization, proved to be so valuable in Vietnam, the movement toward a larger sized container was in keeping with industry advances over the past decade which had established the practicability of the trailer size load. Also, the move to the new configuration places the Army, by intention, into the development pattern of not only national but international standardization. The 8 feet x 8 feet x 20 inches container is also compatible with the diverse capability of land and sea carriers and, while the weight of the new container does not lend itself to the most economical air transportation, its dimensions are compatible with the new aircraft configurations such as the new C5A. To overcome the weight restrictions of airlift, studies have also been made of the 8 feet x 8 feet x 6 2/3 feet container, a modular unit, which, when assembled in quantities of three, would also be handled as a 20-foot-long container.

It was visualized that the new containers would be employed much like the CONEX container when the Army owned its own and was no longer dependent upon commercial carriers. Pre-stowed "project" shipments and binned supplies would be issued from the vans as they were retained in oversea areas. Also, like the CONEX, it was visualized that Army-owned sea vans, when available, could be kept in troop areas for storage of their contents, either to provide continued mobility or to be an alternative to the construction of warehouses.[20]

Responding to General Besson's decision of April 1967 to terminate further purchases of CONEX in favor of the commercial sized containers for any additional procurements, the following June the Assistant Secretary of Defense requested that no more containers be procured until Army requirements could be reviewed. An analysis of the Army's need for an in-house container system was also requested. Consequently, AMC re-evaluated all its containerization efforts and re-oriented its entire study program into a comprehensive "Army Containerization Program" aimed at developing a containerized materiel distribution system which would provide the Army with the information necessrary to compute the hardware requirement for supporting the system through 1985. The American Power Jet Company was engaged to conduct a small portion of the overall study aimed at justifying the Army's need for a current procurement of the new type containers.[21]

The American Power Jet Study completed in August 1968 concluded that 55 percent of the dry cargo moving to Vietnam was susceptible to containerization. If all were containerzied, it would require an inventory of approximately 50,000 military containers—a potential saving of $63 million annually was possible. The study established a minimum requirement of 3,400 8 feet x 8 feet x 20 feet containers to provide for a pilot test operation involving shipments to Vietnam. On 21 February 1968, the Assistant Secretary of the Army was apprized that a minimum 6,700 containers would be needed to provide continuing support to Vietnam and also permit a test and evaluation of the new equipment in actual use. The Army received DA (Department of the Army) approval to acquire 6,700 containers and associated equipment for the pilot test, and to replace the depleted Vietnam CONEX capability; however, funds for only 2,000 containers were available. Contracts for this initial procurement were let at the end of November 1968 with delivery expected to begin in March 1969. The American Power Jet Company was also engaged to provide a plan due the last day of December 1968 for the pilot test operation projected for a 21-month period.[22]

The procurements were to be for complete packages, each consisting of a container, a coupleable chassis, and a movable bogey. The chassis would be towable any place the normal semitrailer could operate. The new containers were to be transportable via the Army's stand-

[19] Submission, AMCDT-PP to AMCHO, 17 Dec 68.

[20] (1) Briefing, Walter W. Duke, Dir/Transportation to the AMC Depot Commander Conf, Ft. McNair, Wash., D.C., 7 May 68, entitled "Improving Transportation Performance." (2) Ltr, Dir/Transportation, AMC to MTMTS, 17 May 67, subj: Terminal Capacity to Support Sea Van Shipments.

[21] (1) Briefing, Walter W. Duke, Dir/Transportation to the AMC Depot Commander Conf, Ft. McNair, Wash., D.C., 7 May 68, entitled "Improving Transportation Performance."

[22] Submission, AMCDT-PP to AMCHO, 17 Dec 68.

ard CONEX transporter and other proposals such as the tilt bed truck and rough terrain cranes were under consideration for the handling and transportation of the new standard container in unimproved areas. AMC was also cooperating with industry in developing containers suitable for military shipments of ammunition and reefer cargo. Though General Besson, who had viewed logistical congestion through three wars, could see a containerization breakthrough on the horizon, he characterized the progress of the program as "frightfully slow." Throughout 1966 and 1967, General Besson had seen the continuously expanding employment of CONEXes, making ever increasing use of the vastly superior CONUS logistical structure while simultaneously easing pressure on the less adequate facilities of the SEA theater, making possible the supply of Vietnam, and thus thwarting a possible logistics disaster. In April 1967, General Besson expressed the conviction that, without the CONEX container, the logistical effort in Vietnam would not have succeeded. He believed that the feasibility of containership service into the combat support area had been proven.[23]

Customer Assistance

"Fostering, instilling, and retaining the fighting man's confidence in AMC is the very bedrock of maximum effective AMC logistic support."[24] This was General Besson's policy statement concerning AMC customer assistance and, more than that, it exemplified the AMC Commander's primary concern and purpose for establishing several significant customer assistance programs. Believing that there was no substitute for field level contact in the area of technical assistance, General Besson established Customer Assistance Offices (CAO) in several oversea areas to assist users of AMC materiel in securing and maintaining satisfactory materiels readiness postures.

The Customer Assistance Offices were established to serve as focal points for their theater for solving nonroutine logistical matters. The first such office was established in Europe in July 1965. Since then, and resulting from the expanding need for supply and maintenance assistance for U.S. Army, Pacific (USARPAC), and for SEA in particular, five more offices were formed in Hawaii, Okinawa, Korea, Vietnam, and Thailand.

Historically, each Customer Assistance Office has maintained a small nucleus of personnel representing AMC to the oversea commands. The chief of each CAO served as General Besson's personnel representative. As needs dictated, staff technical representatives from each of AMC's major subordinate commands and selected project manager offices or other AMC Headquarters elements temporarily joined the CAOs to aid in the identification and solution of major logistical problems. The many logistical problems that plagued the Army in SEA following the buildup were often eased or solved completely through the efforts of the CAO staffs and assigned technical people who, if required, were in daily contact with CONUS logistics headquarters.

The need for effective AMC liaison offices in-theater emerged shortly after AMC was organized in 1962 when it became obvious that many senior logistics officers overseas lacked a clear understanding of the delineation of responsibilities between AMC, SMC, (Supply and Maintenance Command) and the commodity commands. Recognizing that there was a problem, in 1964 the AMC Board studied the situation and proposed the establishment of AMC liaison offices in oversea commands and General Besson approved the recommendation that November. As subsequently modified, the CAO concept called for a small staff of AMC (actually SMC) representatives, headed by a colonel, at each theater headquarters. These staffs could be augmented as needed with technical personnel from AMC major subordinate

[23] (1) *Transportation Proceedings*, Apr 1967, "Logistics Keeps the Army Rolling in Vietnam," Gen F. S. Besson, Jr. (2) Speech Gen F. S. Besson, Jr. to the Nat'l Defense Transportation Association at its Annual Transportation and Logistics Forum, Wash., D.C., 14 Oct 68.

[24] AMC Policy No. 700-3.

commands.[25] The plan was presented to the U.S. Army, Europe (USAEUR), and USARPAC commanders in March 1965 and ultimately offices were established on 1 July 1965 at Orleans, France, and on 1 September 1965 in Hawaii.

In the meantime, there had evolved, out of the growing U.S. commitment in Southeast Asia, a concept for establishing a third CAO in Vietnam. An AMC liaison office had been organized in Vietnam in April 1964 headed by Maj. John L. Gardner of the Iroquois Project Manager's Office. Major Gardner's task was to advise AMC concerning logistical support of Army air items; however, Major Gardner soon found that more and more time was being devoted to non-aviation items and another officer, Lt. Col. Robert C. Engle was dispatched to Military Assistance Command, Vietnam (MACV), in July to assist in the liaison and coordination effort. Then in April 1965, the need for even greater liaison led to an AMC proposal that a sub-office of the CAO-Pacific be established at MACV. This drew no response from the theater but in August 1965, Lt. Gen. Jean E. Engler, then Commanding General of SMC, but soon to become Deputy Commanding General of USARV, proposed that a small group of 4 or 5 AMC people operate under the supervision of U.S. Army, Vietnam (USARV). Brig. Gen. John Norton, Deputy Commanding General of USARV strongly endorsed General Engler's proposal. A staff study was presented to General Engler on 2 November recommending the establishment of an AMC CAO-Vietnam patterned after those formed earlier but tailored to meet the special needs of the combat area. Following the approval of the major USARPAC commands and the allotment of eight military spaces by the Chief of Staff, the CAO-Vietnam was established on 3 February 1966.[26]

Then in February 1967, the USARPAC asked that additional CAOs be established in Thailand and Korea. It also asked that procedures be established for informing the theater of all significant logistical actions within its area of responsibility. While the AMC appreciated the theater's need to be kept informed, it was concerned over possible interference with direct and rapid communication between the CAOs and AMC elements. At a meeting in March 1967 AMC/USARPAC representatives agreed on certain principles by which CAOs in the Pacific (CAO-PAC) would operate. The CAO-PAC was recognized as the senior AMC office in the theater with access to all CAOs in its area, but on day-to-day matters, direct communication between the CAOs and the AMC was authorized, information copies being furnished the CAO-PAC as appropriate.[27] When Customer Assistance Offices were established on Okinawa and Korea in October and November 1967, respectively, and in Thailand in April 1968, they were brought under this working agreement.[28]

Drafting a single regulation to cover all oversea CAOs, proved rather more complicated than expected. One was finally published in September 1966,[29] but it was not sufficiently explicit concerning the responsiblities of the commodity commands, project managers, and other subordinate AMC elements with regard to the customer assistance program. As a consequence, the CAOs were not kept fully informed of customers assistance activities within their areas, and the CAO concept as envisioned at AMC Headquarters was compromised.

In December 1967, AMC undertook to correct this. In a letter to its subordinate elements, the AMC Chief of Staff explained the CAO concept as envisioned in the headquarters, and instructed the subordinate elements to attach representatives to each CAO in whose area they had customer assistance personnel. The purpose was not only to assure adequate control of the program but also to protect customers from the harassment of multiple visits. The main point to be remembered was that "the desires of the customer are

[25] AMCB 5-64, 8 Dec 64, subj: AMC Oversea Comds Relationships, pp. 2–3, 30.

[26] AMC Historical Summary, FY 1966, p. 110.

[27] (1) Ltr, CofS, AMC, to Maj Gen O. E. Hurlbut, ACofS, G4, USARPAC, 2 Mar 67, n.s. (2) MFR, 14 Mar 67, subj: Operation of AMC CAOs in USARPAC.

[28] (1) AMC GO 4, 18 Jan 68. (2) Ltr, CofS, AMC, to Lt Col John R. Leary, Ch, U.S. Army CAO, Thailand (AMC), 3 Apr 68, subj: Instructions for Ch, CAO-Thailand. Except for country designation and designation of rating and endorsing officers, this letter of instruction was identical.

[29] (1) AMCR 10-56, 19 Sep 66, subj: Organization and Functions, U.S. Army CAOs, Overseas. (2) Interv, Charles W. Lynch with Nelson R. Denton, MSO, SMC, 18 Mar 66.

paramount."[30] The guidance of this letter was to be incorporated in any revision of the regulations; however, it seemed likely that this would await the results of AMC studies concerning better ways to manage the command's several programs for customer assistance then underway.

As AMC customer assistance activities accelerated during 1966, it became evident that a better system of managing the command's various assistance programs was needed. The oversea and CONUS programs were dissimilarly organized, the former being managed by AMC Headquarters while the latter was under the U.S. Army Maintenance Board (USAMB), a subordinate element of the command. Furthermore, the commodity commands utilized various organizational concepts in rendering individual programs of technical assistance.

The net result was that the command's customer assistance concept was not working as intended. A cohesive relationship among AMC elements performing customer assistance in a given geographic area was lacking, and great numbers of AMC personnel from the commodity commands, the USAMB, and other elements were conducting visits without informing the area CAO. This caused duplication of effort, customer confusion, and complaints regarding an apparent lack of a coordinated assistance program. Similar deficiencies were found in the CONUS portion of the program. The program conducted by the USAMB had achieved a great measure of success but it was costly and its potential as a media for promoting systems improvement was not being realized.[31]

In January 1967, the Theaters Division of the Operational Readiness Office (OPRED), suggested some actions for effecting short-range improvements. Under the existing system, AMC Headquarters, and the USAMB were not the only elements managing customer assistance. Customer assistance provided by International Logistics Field Offices, Logistics Management Offices, and scientists and engineers were all managed under separate programs. The fact that Defense Supply Agency (DSA) and General Services Administration (GSA) coordination with AMC programs was ill-defined further confused the picture for the customers. Proposals for short-range improvements therefore included providing the customers with a focal point for their nonroutine logistical problems by centralizing customer assistance activities under the Chief, OPRED. They also included a proposal for restructuring CAO organizations under a "Type CAO" concept which would provide a single type of AMC Customer Assistance Office but one which could more readily be adapted to fit local requirements.

These recommendations for centralizing customer assistance and for restructuring Customer Assistance Offices were designed to put management of these activities on a program basis. They were not implemented for reasons which illustrated the conflicting requirements of management. Some of the directorates held that they were responsible for assistance in their functional area, and to centralize these activities on a program basis would superimpose another channel over a portion of their operational mission.[32] OPRED had not considered its suggestions as more than short-range improvements. It had noted that AMC had some 2,000 personnel engaged in customer assistance at the time of its study, with direct costs of nearly $40 million a year. To develop longrange improvement objectives, it recommended that the Directorate of Management Systems and Data Automation undertake a study covering the full spectrum of mission, money, and manpower involved in these activities.

Such a study was completed by a team consisting of representatives of several directorates and OPRED in September 1967. It contained some 25 findings and conclusions, and some nonconcurrences were encountered during staffing. As a consequence, it lay dormant as the reorganization involving the consolidation of the Directorates of Major Items and Supply was being accomplished. As of July 1968, there was recognition of the fact that AMC custom-

[30] Ltr, CofS, AMC to CG, ATAC *et al.*, 8 Dec 67, subj: AMC Customer Assistance Prog.

[31] (1) Staff Study, Configuration of AMC CAOs, Lt Col Philip H. Taft, Theaters Div, OPRED, 11 Jan 67. (2) DF, Actg Ch, OPRED, to Dir/MSDA, 11 Jan 67, subj: same.

[32] (1) Staff Study, Configuration of AMC CAOs. (2) Cmt 2, DMI to C/AMCMS-MO, 21 Feb 67, subj: same.

ers had a need for one interservice support agreement covering customer assistance. There was also recognition of the need for more effective management of the AMC customer assistance program as a whole, but it was not yet clear just when or how these things would be accomplished.[33]

As of 15 October 1968, some 1,700 AMC personnel, representing ten different command elements including AMC Headquarters, separate installations and activities, and subordinate commands were performing duty overseas. Slightly more than 1,400 of these individuals were in oversea areas on permanent change of station for periods ranging up to three years; others were on temporary duty (TDY) varying from a few days to six months. A small portion (19) of the overall total represented personnel from AMC Headquarters. They participated primarily in liaison-type functions to facilitate the rapid interchange of information that was so necessary to assure positive support to the units in the field. Other personnel were involved in training and technical assistance activities from operating units to command levels in the oversea areas they served. As a result of the emphasis given to the retrograde of materiel from Vietnam and the assistance provided by the Project Counter teams and the AMC retrograde teams, thousands of retrograde items were received in Okinawa. The 2d Logistical Command in Okinawa asked AMC Headquarters for assistance to identify and classify the retrograde materiel. AMC furnished a 16- and a 20-man team to supervise a day and night shift in Okinawa. During the period December 1967—May 1968, $89 million in serviceable materiel was reclaimed.[34]

In addition to the technical assistance provided for equipment maintenance and support, AMC customer assistance personnel also served as instructors in providing training to include formal classroom instructions and on-the-job training (OJT). Examples of the magnitude of this assistance was exemplified by the following statistics for the month of May 1968 which were representative of the continuing activity in this area. In Europe, OJT and formal classroom instruction was provided to 4,328 USAREUR personnel. In Korea, 1,890 8th U.S. Army Personnel received OJT and formal classroom instruction. Instructions covered in these training efforts ranged from maintenance of generators, automotive equipment, missile systems, aircraft, and sensitive electronic equipment to repair parts supply procedures and the Army Equipment Records System.[35]

Still another form of technical assistance provided to the oversea theater was the Quick Reaction Assistance Team. To provide for prompt response to the numerous requests for assistance which emanated as a result of increased tactical operations and accelerated logistical support requirements in Southeast Asia, General Besson directed that a quick reaction assistance program be developed within AMC. This was accomplished in January 1966. Under a key provision of this program, AMC subordinate commands, national inventory control points (NICP), and depots maintained rosters of volunteers, in various grade and skill levels within approximately 40 functional areas of supply and maintenance operations and management, who were available for quick reaction assistance teams. Individuals identified on the rosters possessed current passports, visas, and medical inoculations necessary for immediate TDY departure. Implemented initially to provide logistical assistance to Vietnam, this program proved beneficial to users of AMC materiel in other areas of Southeast Asia. The first quick reaction assistance team was dispatched to Vietnam in 1966; others were sent to various areas of Southeast Asia immediately upon request by commanders concerned. As of December 1968, 898 individuals had provided supply and maintenance technical assistance to Southeast Asia, as follows: Vietnam—731; Okinawa—122; Thailand—30; and Korea—15. Their efforts contributed materially to the mission of the commanders and units that received the services of these teams. Some 500 AMC personnel were maintained in a "ready" position to provide similar assistance to Southeast Asia immediately upon request.[36]

Many varieties of logistic specialist were re-

[33] (1) Study, Mgmt Survey Rpt of the AMC Customer Assistance Prog, Sep 1967, Cutomer Assistance Div, OPRED, files. (2) Interv, Charles W. Lynch with A. S. Penniston and W. S. Steed, Customer Assistance Div, OPRED, 23 Jul 68.

[34] Submission, AMCOR-TS to AMCHO, 9 Dec 68.

[35] *Ibid.*

[36] *Ibid.*

quired in areas of supply and transport, storage operations, warehousing, inventory, shipping, receiving, care and preservation, materiel classification, maintenance engineering and procedures, quality assurance, data processing and systems development, stock control and others concerning all types of materiel support and especially spare parts. Commenting upon the performance of the teams after they had been in use for about one year, General Besson called the response to the program as outstandingly successful and one that had received high praise from USARV. In fact, their success had created an even greater demand in SEA and, though AMC was hard pressed for talent at home, General Besson informed his commodity commanders that "regardless of the number of personnel involved we must continue to provide this vital assistance until our forces in Vietnam attain the capability to cope with their own logistical problems."[37]

In response to a large number of frequently recurring requests for the same specialized skills for resolving complex logistical problems in Vietnam, AMC Headquarters developed its portion of the Project Counter concept, a system implemented early in the second half of Fiscal Year 1967 to assist USARV in conducting location surveys and inventories. The identification and classification of materiel and the training of theater personnel in the review and purification of prescribed load lists and authorized load lists were also tasks performed by Project Counter teams. To assure positive support and maximum effectiveness, plans provided for a large number of military and civilian personnel to spend six months TDY in Vietnam at varying times to perform these services.

The AMC Operational Readiness Office was charged with the responsibility of providing the AMC civilian specialists for this project. Required military personnel were furnished from the U.S. Continental Army Command. Project Counter I completed its six-month tour in Fiscal Year 1967. Project Counter II, consisting of military personnel only, provided assistance during the first and second quarters of Fiscal Year 1968. Project Counter III concluded its tour in Vietnam during the first quarter, Fiscal Year 1969. Project Counter IV was scheduled to complete its six-month tour in January 1969. The 63 men on Project Counter IV bring the number of individuals who have served on Project Counter teams to 890, including 213 civilian specialists. Generally, they were separated into small groups or detachments whose composition was determined by skill requirement, and they provided technical assistance simultaneously to organizations such as the Saigon Support Command; Cam Ranh Bay Support Command; Qui Nhon Support Command; and the 34th General Support Group. Based upon previous and contemporary experience, AMC possessed the capability to provide additional Project Counter teams immediately upon request by the oversea command.[38] Putting the capability (Project Counter Teams) where the burden was (in SEA), was another example of one of General Besson's principal logistical axioms.

Too Many Models

In December 1965, the Army was faced with one of the most perplexing logistics problems in its long history. While some 145 deep draft ships were awaiting discharge at Vietnam ports, much of the equipment ashore that could be used to hasten the unloading of the cargo of these vessels was deadlined for the want of repair parts. Ironically, in many cases, the repair parts needed to repair the deadlined engineering and materiels handling equipment (MHE) were aboard the ships awaiting discharge.

At the beginning of the buildup, the Army was hard pressed to come up with enough engineering equipment to build the logistics base and sufficient MHE to cope with the flood of cargo that was to pour into Vietnam. Consequently, tractors, scrapers, cranes, and forklifts of all makes and varieties were pulled

[37] Ltr, Col D. L. Sallee, Actg Ch, OPRED, HQ, AMC to CINCUSARPAC, 6 May 66, subj: Quick Reaction Assistance Teams—Vietnam. (2) AMC msg 52901, Gen F. S. Besson, Jr., to AMC Subordinate Comds, 19 Jan 66, subj: Quick Reaction Assistance Teams to Vietnam.

[38] *Ibid.*

from depots and units throughout the United States and shipped to Vietnam. As a consequence, in January 1966 there were 47 different makes and models of materiel handling equipment and 12 makes and models of bulldozers. A committee of officers appointed to investigate the problem recommended a standardization plan aimed at reducing the number of makes and models of MHE to a single make/model for each of 5 types required and in the case of bulldozers a reduction to 3 makes and models. At this time, 36 percent of 186 bulldozers and 26 percent of 432 pieces of MHE were deadlined.[39]

While the Red Ball Express had proven very effective for removing certain types of materiel from deadline such as aircraft (91 percent) and to a lesser extent for such items as the 175mm Gun (48 percent) and the 2½-ton cargo truck (34 percent); because of the many makes and models involved and the diversity of repair parts needed, less than 20 percent of the MHE and bulldozers were rescued from deadline through Red Ball furnished repair parts.[40]

Then, early in February 1966, the Mobility Equipment Command's program for the standardization of MHE and construction equipment in Vietnam was reviewed by USARV. USARV emphasized its continuing requirements for rough terrain forklifts in the Saigon Support Command (formerly Saigon Logistic Area), as well as Qui Nhon, Nha Trang, and Cam Ranh Bay. In addition, the Commanding General of the 18th Engineer Brigade considered the caterpillar D–7 tractor as too small for many units with large earthmoving requirements and felt that the D–8 or some item of equipment of comparable capacity was required.[41]

The theater's rough terrain forklift requirements were appreciated in AMC, and 150 converted scoop loaders and 65 U.S. Army Air Defense Command reconditioned forklifts were already in Vietnam or in the pipeline. From new production, about fifty-five 6,000- and about thirty 10,000-pound forklifts were to become available each month, beginning in March 1966, with total program quantities of 443 and 159 respectively. In addition, 303 of the smaller machines were included in the supplemental budget, which was soon to be acted upon, and AMC had asked the Department of the Army for authority to proceed with this additional procurement.[42]

In regard to tractors, AMC believed that the D–7 was the more practical choice even though the new D–8 was more powerful, and the Chief of Engineers had concurred in the D–7 as the standard tractor for Vietnam. A major consideration was the weight of the D–8 (approximately 10,000 pounds) and the fact that the Army had no suitable low-bed trailer for transporting it overland. A current contract for the procurement of 279 D–7s for Vietnam was scheduled for completion during March 1966.[43]

For these reasons, AMC planned to standardize full tracked tractors with the caterpillar D–7, but the deadline rate, in Southeast Asia was so high that as an interim measure AMC found it nexessary to ship 118 Allis Chalmers tractors (HD–16M) to Vietnam. To simplify repair parts support for these interim tractors, AMC recommended that they all be utilized in the Cam Ranh Bay area, if possible.[44] Theater requirements were such, however, that they had to be split between Cam Ranh Bay and Saigon.[45]

In the meantime, AMC took a reading upon a USARV request[46] regarding rough terrain forklifts available from USAREUR reserve stocks and excess. AMC found that there were 105 in reserve stocks, of which only 46 were in serviceable condition and these were 6 to 7 years old. In addition, there were 35 unserviceable units rated as excess; these were being returned to CONUS for rebuild. Any withdrawal from the USAREUR other than excess would require approval by the Secretary of Defense or his deputy, and would require a statement of requirement from the theater.[47] The theater

[39] (1) Army Buildup Progress Rpts, 2 Feb 66, p. 48; and 19 Jan 66, p. 56. (2) Reprint of speech, Gen F. S. Besson, Jr. to Sustaining Members Luncheon Association of the U.S. Army, Wash., D.C., 11 Oct 67, *The Early Years*, AMC, 1968 p. 78–7.

[40] Army Buildup Progress Rpt, 6 Apr 66, p. 50.

[41] CofS, AMC Working Files, MAC 875, 1 Feb 66.

[42] CofS, AMC, Working Files, GVP 063, 3 Feb 66.

[43] *Ibid.*

[44] CofS, AMC, Working Files, GVP 114, 28 Feb 66.

[45] CofS, AMC, Working Files, MAC 1722, 2 Mar 66.

[46] CofS, AMC, Working Files, MAC 665, 25 Jan 66.

[47] CofS, AMC, Working Files, GVP 079, 10 Feb 66.

decided that it would not seek forklifts from Europe, that new production, along with AMC's actions to standardize such equipment in Vietnam, offered quicker and more effective relief for the MHE problem.[48]

At this time, early February 1966, action was underway in AMC to standardize conventional type forklifts in port operations. A shipment of 402 forklift trucks, consisting of four models, was being readied for dispatch to Southeast Asia. Nearly half this number had already been shipped to Brooklyn Army Terminal for loading aboard the *Transglobe*, and Sharpe and Atlanta Army depots were standing by for complete shipping instructions.[49]

The existing contracts for the procurement of rough terrain forklifts experienced production delays, however, and by the end of March 1966 it appeared that significant quantities of these items would not reach Vietnam until late in the calendar year. As an interim solution, AMC suggested stabilizing work areas in and around field depots to facilitate the use of conventional forklifts, reserving the rough terrain forklifts for such unimproved areas as the beaches and ammunition dumps. To stabilize such working areas, AMC suggested the use of M8A1 solid steel plank. In the meantime, action was underway in AMC to standardize the commercial materials handling equipment used in Vietnam. This was Phase I of the MHE standarization program and involved confining such equipment to four models of forklifts and one 4,000-pound warehouse tractor.[50]

The stabilization of working areas offered no solution to USARV, for all available construction effort in Vietnam was already heavily committed for the foreseeable future. Furthermore, the initial shipments of solid steel plank were programed for high priority aviation projects. Pending the arrival of rough terrain forklifts in quantity, commercial forklifts would be used in stabilized depot areas as much as possible, and until such time as AMC's standardization program in regard to such equipment would eventually ease the equipment maintenance problems in Vietnam.[51]

Concerning the standardization of bulldozers, since 12 February 1966, 118 HD–16M full track tractors (bulldozers) had been shipped to Southeast Asia. All 118 were expected to arrive prior to 15 April 1966 at either Saigon or Cam Ranh Bay.[52] Of 294 D–7 full track tractors (bulldozers) shipped from the manufacturer "Caterpillar" at Peoria, Illinois, 68 had gone to Granite City Army Depot and 226 to the Sharpe Army Depot, California. None were scheduled to depart CONUS for Southeast Asia until adequate in-country logistic support had been accumulated (about 90 percent). As of early April 1966, approximately 31 percent support was on hand; it was estimated that the complete package (equipment and spare parts support) would be ready for shipment during the latter part of the month. Two D–7s had been airlifted to Saigon for training purposes. Three technicians—one maintenance, one supply, one factory representative—started on-the-job training courses on 18 March 1966.[53]

A total of 131 290M wheeled tractors (bulldozers) had been shipped from the manufacturer "Clark" to Army depots. These pieces of equipment would not be shipped to Southeast Asia until after confirmation and comparison-type testing had been completed. Testing was being conducted on a three-shift basis and was to be completed by the end of May 1966. Spare parts to support the equipment was to be ready by that time. It was expected that 45 "Euclid" scrapers, which could be attached to the 290M bulldozer, would also be available and supported with adequte spare parts.[54]

[48] CofS, AMC, Working Files, MAC 1244, 13 Feb 66.
[49] CofS, AMC, Working Files, GVP 079, 10 Feb 66.
[50] CofS, AMC, Working Files, GVP 190, 29 Mar 66.
[51] CofS, AMC, Working Files, (M8A1 matting file), n.d.
[52] Army Buildup Progress Rpt, 6 Apr 66, p. 50.
[53] *Ibid.*
[54] *Ibid.*

Table 8. Status of Commercial Type (Phase I) and Rough Terrain (Phase II) MHE, 6 April 1966

Type	Manufacturer	Status
		PHASE I
4,000 lb. Gasoline Pneumatic Tire	Tow Motor	145 shipped to SEA between 6–22 Feb 66.
4,000 lb. Electric Solid Hard Tire	Baker	98 shipped to SEA between 11–28 Feb 66.
6,000 lb. Gasoline Pneumatic Tire	Baker	130 shipped between 6–22 Feb 66.
15,000 lb. Gasoline Pneumatic Tire	Hyster	29 shipped between 28 Feb–12 Mar 66 and are still en route to Saigon. This piece of equipment was urgently needed to handle large CONEX containers. An additional requirement was placed for 100. The Army had 65 on hand and planned to obtain the remaining 35 by a further drawdown on CONUS units.
Tractor Warehouse 4,000 lb. Gasoline Pneumatic Tire	United	109 shipped between 22 Feb–13 Mar 66.
		PHASE II
Rough Terrain 6,000 lb. Gasoline Pneumatic	Anthony	443 on contract, one had been shipped to SEA. One preproduction model and one production model were undergoing test. A revised and optimistic delivery schedule indicated 5 for shipment in Mar 1966 and 20 to 30 in Apr 1966 and 55 monthly thereafter.
Rough Terrain 10,000 lb. Gasoline Pneumatic Tire	Pettibone-Mulliken	9 shipped in Jan 1966 and 6 in Feb 1966; 53 were to be shipped from overhaul depot during Apr 1966 for a total of 62. Shipment of 159 on contract would start upon completion of testing. The production schedule was for 15 in Mar 1966 and 30 in Apr 1966 and each month thereafter.
Scoop loader		150 modified scoop loaders with forklift attachment had been shipped.[55]

By the latter part of May 1966, USARV had 786 pieces of commercial materials handling equipment (Phase I), including 190 nonstandard items. The latter category did not include 87 pieces of nonstandard MHE which had been "washed out." As part of the program to standardize such equipment in Vietnam, the USARV had recently directed all units in South Vietnam to cancel any outstanding repair parts requisitions for nonstandard commercial MHE, including Red Ball requisitions. USARV planned to use this equipment as long as it was running, but as items broke down and parts for their repair were not available in Vietnam, the unserviceables would be shipped to Okinawa.

Since it had been necessary to supply 118 of the new HD16M tractors as an interim item until enough of the new D–7s became available for requirements in Vietnam, standardization of bulldozers was not quite so simple. The Vietnam area standardization plan called for the use of the Allis-Chalmers HD–16M until such time as they could be replaced with D–7s. USARV would have to continue to submit Red Ball requisitions to support these items until the new D–7s started to become available about July 1966. In the meantime, the 180-day repair parts packages for MHE and tractor dozers had begun to arrive in-country.[56] Thus for all practical purposes, USARV would have a dual standard for tractor dozers for some time to come; that is, both the HD–16 and the D–7 would be used.[57]

[55] Ibid. p. 55.

[56] CofS, AMC, Working Files, MAC 4153, 24 May 66.

[57] CofS, AMC, Working Files, GVP 351, 1 Jun 66.

At the beginning of June 1966, AMC had 336 caterpillar D–7 tractors from a prior year contract at Sharpe Army Depot, but the decision to release these for shipment was withheld for two reasons. One was the parts support buildup was not complete, though it was expected to reach 90 percent completion during the last half of June. The other was engine failures which were still being evaluated as to cause and frequency of occurrence. An on-site evaluation by Caterpillar representatives was expected before mid-June. Normally, a 90-day prepositioning of repair parts was required for new engineer items such as the D–7 to assure proper support. If USARV desired an earlier deployment of D–7s, it would have had to send, through channels, a message authorizing the concurrent shipment of repair parts, stating what it considered to be an acceptable percentage level of such parts.[58]

AMC authorized the release of the 336 D–7 tractors at Sharpe on 16 June, and the project officer for tractors notified CINCUSARPAC that 268 of these were available for shipment to Vietnam. The remaining 68 were to be retained in CONUS for issue to units deploying to Vietnam.[59] In requisitions submitted through the 2d Logistical Command in Okinawa, the 1st Logistical Command in Vietnam asked that these 268 tractors be shipped to three destinations in Vietnam.[60]

Two other critical items for the standardization of engineer equipment in Vietnam were the Clark 290 wheeled tractor and the Le Tourneau 18-yard scraper. As of early June 1966, AMC had a total of 840 of the wheeled tractors on contract with Clark and had received 250 from production. However, three critical engineering deficiencies were still unresolved, and repair parts were not expected to reach the required 90 percent level before mid-July. AMC had also received 25 scrapers from Le Tourneau against a contract for 330. Repair parts for this item were expected to reach the required level by early July.[61] Testing of the Clark 290 tractor and the Le Tourneau Westinghouse 18-cubic yard scraper by TECOM was scheduled for completion late in August 1966.[62]

For all practical purposes, Phase I of the program to standardize the 5 makes and models of materiel handling equipment was completed by 1 June 1966. The following chart indicates what had been accomplished:[63]

Table 9. Status of Commercial Type MHE Standardization, 1 June 1966

Forklift model	Shipped	On hand in Vietnam	To be shipped
4,000 lb. Electric, Solid rubber tire	98	2	0
4,000 lb. Gas, pneumatic tire	237	24	0
6,000 lb. Gas, pneumatic tire	130	22	0
15,000 lb, Gas, pneumatic tire	138	57	11
4,000 warehouse tractor	109	10	0

As a result of the above, the Commanding General, USARV, directed all units in Vietnam to cancel their outstanding repair parts requisitions for nonstandard commercial MHE. All Red Ball requisitions for nonstandard commercial MHE were also to be canceled by the 1st Logistics Command. Beginning on 31 May 1966, commercial nonstandard MHE was not included in weekly deadline statistics.

Efforts to standardize MHE in Vietnam continued at an accelerated pace and by January 1967, though the number of pieces of MHE in Vietnam had reached 1,486, the quantity of makes and models and been reduced to 10. At this time, it was decided to apply the closed loop support concept to MHE in USARV and elsewhere in USARPAC. Repair parts support for the rough terrain forklift were giving the most trouble. Concern over the problem caused USARPAC to hold a conference during 30 January and 3 February 1967 that was attended by representatives from ACSFOR, DCSLOG, AMC, including the MHE project officer; the 1st and 2d Logistical Commands; and USARV. The conference established actual MHE requirements and identified MHE assets on hand in USARV and other USARPAC subordinate commands together with the programed MHE assets input from new procurement. From

[58] CofS, AMC, Working Files, GVP 359, 3 Jun 66.
[59] CofS, AMC, Working Files, WDC 7465, 25 Jun 66.
[60] CofS, AMC, Working Files, MAC 5388, 29 Jun 66.
[61] CofS, AMC, Working Files, GVP 359, 3 Jun 66.
[62] CofS, AMC, Working Files, WDC 7465, 25 Jun 66.
[63] Army Buildup Progress Rpt, 1 Jun 66, p. 44.

these figures, the new rate of MHE standardization in USARV was determined and new recovery dates for each of the USARV standard models were projected. Concurrently, MHE assets other than rough terrain forklifts becoming available for redistribution as a result of the standardization program were to be made serviceable and resissued by USARPAC to commands other than USARV.

Results obtained under the standardization program were good. By the end of September 1967, the goal of complete standardization by having only 7 makes and models of MHE had been achieved and the fantastic MHE repair parts support problem in Vietnam was greatly reduced even though the inventory had grown by 800 percent or to a total of 3,319 pieces of MHE. In General Besson's words, "This is one headache that we think we've solved."[64]

Red Ball Express System

The containerization, customer assistance, and standardization programs initiated in Southeast Asia were measures contemplated to ease the logistical problems pertaining to theater supply and maintenance; however, it was unrealistic to assume that these measure would be of much immediate value in solving the gargantuan spare parts problem that existed in Vietnam in December 1965. Under the most favorable conditions, the difficult nature of military logistics finds full expression in the problem of repair parts. Tens of thousands of item types are involved combined with a variety of factors to determine, ultimately, what the requirements for each of these items will be, and when. Wear-out rates based upon routine tests and experience provided a point of departure, and these factors, coupled with often incomplete equipment density information derived from rapidly changing and difficult to acquire lists of units nominated for deployment from CONUS, provided the basis for computing the automatic resupply of spare parts requirements for SEA. In Vietnam, however, various other factors combined to determine actual requirements. Among these were unexpectedly high attrition rates from combat actions and accidents, and accelerated wear-out rates resulting from conditions of temperature and humidity and such other factors as mud, sand, and inexperienced operators and maintenance personnel. In General Besson's view, it would have been "virtually impossible to stock the parts required by random failure in sufficient numbers and locations."[65]

When General Hurlbut went to Vietnam as Special Assistant to the Army Chief of Staff, General Johnson instructed him to give special attention to spare parts. At the time, equipment deadline rates in Vietnam were very high and still rising and little relief was in sight. Much of the automatic supply computed and shipped by AMC to Vietnam could not be readily unloaded because of the lack of port facilities. Also, there was little capability in Vietnam for locating among the jumble of materiel on shore, or upon the ships awaiting discharge, those items most critically needed. Nor was there complete assurance, given the conditions under which they were computed and shipped, that the automatic support packages would adequately meet requirements in Vietnam even if the capability for locating the parts had been present.

The cold hard statistics of the period were very grim. For, at the time, early in December, about 19.4 percent of the 1,647 aircraft in USARV were deadlined. Among other rates were: 36 percent of the 186 bulldozers; 26.1 percent of the 432 pieces of materials handling equipment, and 58 percent of the 100 lighter amphibious resupply cargo (LARC) on hand. The situation regarding deadlined equipment was such that immediate measures had to be taken and the only solution seemed to be to draw the needed repair parts from the United States by airlift on an expedited basis. Essentially this was the Red Ball Express System that was put into operation, effective 2 December 1965.[66]

[64] *The Early Years*, AMC, 1968, p. 78–7.

[65] *Transportation Proceedings*, Apr 1967, "Logistics Keeps the Army Rolling in Vietnam," Gen F. S. Besson, Jr.

[66] Army Buildup Progress Rpt, CofS, Army, 19 Jan 66, pp. 52–53.

As ultimately implemented, the Red Ball Express was a system through which high priority items, mostly spare parts, were flown from CONUS depots directly to Vietnam. The system as first proposed by General Hurlbut provided for Red Ball requisitions to go from Vietnam to Okinawa for possible fill and from there, if not filled, to supply points in the United States. From the United States, the priority items would be flown to Okinawa in the large C–141 aircraft, and then placed upon smaller aircraft and shuttled to various points in Vietnam. There were few airfields in Vietnam at the time that could accommodate the C–141s.

This plan was modified by the Secretary of Defense to provide for the airlift of high priority repair parts from Travis Air Force Base in California direct to Saigon, where the C–141s could land at nearby Tan Son Nhut airfield and thence to other locations in Vietnam aboard smaller aircraft. In support of this operation, the Logistics Control Office-Pacific (LCO-P) in Oakland, California, was given a key role. The LCO-P would receive the Red Ball requisitions directly from Vietnam, and inform both USARPAC and Travis Air Force Base of the incoming requirements. Within the United States, the requisitions were to receive top priority.[67]

The Red Ball system proved to be one of the most efficient and responsive supply systems established in support of Southeast Asia. The service was inaugurated on 8 December 1965 and before the end of that year, 402,206 pounds of cargo had been airlifted to Vietnam in 35 aircraft. By the end of the first week of the next year, 481 aircraft had been removed from deadline as a result of Red Ball. This was an average of 20 per day since the start of the service.[68]

During the early months of its existence, though the system was very successful in removing aircraft from deadline, it could not perform miracles and in many other categories of equipment, Red Ball could only arrest the rates at which equipment was becoming deadlined for parts in Vietnam. The fault, however, lay in the non-availability of repair parts and components rather than with the system. A most conspicuous example was the 175mm gun system, the repair parts for which involved long procurement leadtimes. Even three months after the establishment of Red Ball, fully half of the 175mm guns in Vietnam were either unable to move or to move and shoot.[69]

Subject only to the availability of spare parts, the Red Ball Express proved highly responsive to the requirements of Vietnam. The key to the success of the operation was the tight control and monitorship provided throughout the supply and distribution process. The system operated outside of existing Military Standard Requisition and Issue Procedures (MILSTRIP). In Vietnam, requisitioning was centralized within a Red Ball Express office in Saigon, that also controlled the receipt of incoming Red Ball. The LCO-P at Oakland served as the central control agency in CONUS for all Red Ball requisitions. The LCO-P placed the requirements upon the appropriate supply source in the United States and arranged for their airlift to Saigon by daily reserved flights. The LCO-P monitored the requisition at every step until receipt was acknowledged in Vietnam. It was this closed loop, close control, and audit of the system at every point in time that provided the combined supply and transport status information to the requestor that made the system so effective. All sources of supply: AMC NICPs, DSA, and GSA supply centers and shipping depots were prepared to process and ship Red Ball Express requirements around the clock, seven days a week. The target time for filling the requisition and getting the item to the requesting unit was seven days, a goal that had been met 93 percent of the time.[70]

The other services in Vietnam used a different system, the 999 procedure that had been authorized for use worldwide. For the 7th Air

[67] (1) Army Buildup Progress Rpts, CofS, Army, 21 Dec 65, p. 55; 5 Jan 66, p. 59. (2) Briefing, Lt Col Lawrence Edholm, Ch, Plans Br, Dir/Supply, SMC, for Brig Gen Frederick Austin, Assist Dir/Supply, SMC, 10 Jan 66; (3) Interv Charles W. Lynch, with Col V. O. Smith, Ch, Dir/Supply, Operations Br, Stock Control Div, SMC, 28 Mar 66.

[68] Army Buildup Progress Rpt, CofS, Army, 12 Jan 66, p. 43.

[69] Msg, CofS, AMC, Working Files, 9 Mar 66.

[70] (1) Msg, CofS, AMC, Working Files, 30 Oct 66; (2) Submission, AMCDT-PP to AMCHO, 17 Dec 68. (3) Speech, Gen F. S. Besson, Jr. to the Association of the U.S. Army, Sheraton Park, Wash, D.C., 10 Oct 66.

Force, a central control facility at Tan Son Nhut, plus a highly effective communications system, facilitated the use of the 999 system, and the Air Force reported complete satisfaction with it. The Naval Forces in Vietnam (NAVFORV) also used the 999 system and seemed satisfied with it. The only significant change being recommended by the NAVFORV involved the establishment of two, rather than one, central screening facilities. Because of the dissimilar missions of the Naval support activities at Saigon and at Da Nang, the screening facility at Saigon would limit its support to boats while the other, at Da Nang, would support all other equipment. The 999 procedure was also in use within the III Marine Amphibious Force, with apparently satisfactory results.[71]

Following his trip to Vietnam in October 1966, the Secretary of Defense, The Honorable Robert S. McNamara, directed that the Army's Red Ball Express system be expanded to include the other services in Vietnam, and in response to this requirement the Joint Chiefs of Staff issued, on 25 October, a proposal for expansion of the Red Ball Express procedures. The new proposal envisioned the decentralization of Red Ball airlift both within the CONUS and within Vietnam. Red Ball material would be airlifted from one of five aerial ports in the United States, the one closest to the source of the item, to one of several ports of debarkation in Vietnam.[72]

To Army authorities in Washington and in the theater, the proposed procedure merely provided for the use of Project 999 procedures by all services in Vietnam, while adding a Red Ball label to it. The result would be to identify 999 requisitions from Vietnam for additional expediting actions, thus in effect creating a priority within a priority. Unfortunately, the proposal would eliminate the very feature that had proved so successful in insuring prompt response to Army requirements in Vietnam, the closed loop control feature. It would also preclude the positive receipt of combined supply and shipping status information by the requisitioner, and make it impossible for USARV to control and manage the use of these exceptional procedures effectively. Finally, it would provide for shipment from CONUS by the first available aircraft rather than by reserved daily airlift. The Air Force had never been happy over the Army's authority to preempt daily airlift from Travis to Tan Son Nhut for Red Ball requirements, but it was obvious that Red Ball cargo fragmented to five aerial ports in the United States and held there for flights to one of several ports in Vietnam would not command the priority space allocation it had been receiving under the existing Red Ball procedures.[73]

While Secretary McNamara was in Vietnam, the expansion of the existing Red Ball system in regard to three features desired by USARV had been discussed. These included increasing the existing airlift capability, authorizing USARV to requisition in anticipation of deadline, and authorizing USARV to requisition parts for assemblies and subassemblies to provide for more responsive support at the direct and general support levels. The first two of these proposals were approved by the Secretary of Defense before he left Vietnam.[74]

The Department of the Army endorsed the concept for increasing the airlift capability for critical repair parts, but not at the expense of the Red Ball Express system as then constituted. In a position paper passed to the Secretary of Defense on 26 October, the Secretary of the Army, The Honorable Stanley R. Resor, stated that the purpose of the McNamara directive—improving supply in anticipation of deadlined equipment rather than by a loosened and uncontrolled Red Ball requisitioning—could be achieved without nullifying the control and expediting benefits of the proven Red Ball procedures. Mr. Resor recommended a modest expansion of the existing system to provide for the supply of items required for the repair of assemblies and subassemblies as well as major items.[75]

These would be separately identified and controlled to differentiate these items from requirements in support of equipment in the hands of the troops, and the items to be so covered would be negotiated between Headquarters, Department of the Army, and USARV so as to hold the volume of specialized actions to

[71] Msg, CofS, AMC, Working Files, 30 Oct 66.

[72] CofS, AMC, Working Files, 22 Oct 66.

[73] (1) *Ibid.* (2) CofS, AMC, Working Files, 30 Oct 66.

[74] CofS, AMC, Working Files, 30 Oct 66.

[75] *Ibid.*

the minimum. The purpose was to reduce the maintenance cycle in direct and general support units and increase the availability of critical assemblies, components, and float items at the unit level. In short, the Department of the Army recommended that each service develop its own detailed procedures for expedited repair parts support, and that the Army retain its existing closed loop control procedures. This position received the full support of Army forces in Vietnam.[76]

Then in November 1966, the Assistant Secretary of Defense for Installations and Logistics, directed the expansion of the Red Ball Express procedures to include the requisitioning of repair parts 15 days in advance of the date that equipment was expected to be deadlined. General Westmoreland, the Commanding General, USARV, implemented the expanded Red Ball Express procedures on 8 January 1967 with instructions that the non-availability of the requisitioned items in the 2d Logistical Command in Okinawa be established prior to submitting Red Ball Express requisitions to the LCO-P. The first requisitions were submitted to the 2d Logistical Command under these procedures on 15 January 1967.[77]

Though highly successful in transporting high priority items to SEA, the Red Ball Express was not always able to provide all the airlift that was requested. For instance, the normal average weekly backlog of Red Ball awaiting airlift at Travis AFB was approximately 376 short tons. However, in August 1966, because of a shortage of C–130 space allocation and an inability of the airfield at Cam Ranh Bay to receive the C–141, the backlog of air cargo at Travis had climbed to 963 short tons. This situation forced the Pacific Air Movement Agency to request MACV to accept 500 short tons by surface shipping. MACV agreed and sent a priority list for diverting the cargo.[78]

Considering the significance of Red Ball some 10 months after it had been inaugurated, General Besson praised the effort as one that had broken the back of the spare parts emergencies and one that "keeps our equipment rolling and flying." Pointing out that some 7,000 aircraft had been removed from deadline as a result of Red Ball shipments, the AMC Commander added that this meant that each Army aircraft in Vietnam had received a Red Ball part two or three times. Also, during this same period some 4,000 trucks and hundreds of tractors, M48A3 Tanks, M113 Armored Personnel Carriers (APCs), LARCs, 105mm Howitzers, 175mm Guns, and pieces of materiel handling equipment had been returned to operational status by Red Ball parts.[79]

After three years of Red Ball, more than 49,000 short tons of cargo had been airlifted to Vietnam and approximately 4,000 Red Ball requisitions were being received each week. During the week ending 29 November 1968, 471 short tons of cargo was flown which more than doubled the amount flown the like week three years earlier. Since the inception of the Red Ball Express System, CONUS supply sources had filled over 634,000 requisitions. Though the statistics were impressive, the significance of the Red Ball system was in its timeliness, and in the nature of the support it gave to the U.S. Army units. Its importance was not in its bulk but in its responsiveness to critical requirements—for it must be remembered that the special supply system accounted for only approximately 3 percent of the total Vietnam supply support.[80]

It was anticipated that Red Ball shipments would continue even after the fighting stopped when post-hostility stockage levels to support the residual forces would be established, and only materiel required to sustain combat capability during withdrawal and to support residual forces would be shipped to Vietnam.[81]

[76] (1) *Ibid.* (2) CofS, AMC, Working Files, 26 Oct 66 and 31 Oct 66.

[77] Army Buildup Progress Rpt, CofS, Army, 1 Feb 67, p. 45.

[78] Army Buildup Progress Rpt, CofS, Army, 7 Sep 66, p. 53.

[79] Speech, Gen F. S. Besson, Jr. to the Association of the U.S. Army, Sheraton Park, Wash, D.C., 10 Oct 66.

[80] Army Buildup Progress Rpts, CofS, Army, 27 Nov 68, p. 37; 4 Dec 68, p. 36.

[81] Army Buildup Progress Rpt, CofS, Army, 27 Nov 68, p. 59.

The rapid logistical expansion, especially aircraft, during the escalation of the Vietnam War placed an extremely challenging burden upon the Southeast Asia in-theater maintenance capabilities. It was not only the logistics support requirements associated with this inventory, but also the employment of new aviation concepts resulting in increased maintenance requirements that forced the theater to institute immediate and positive measures to meet the challenge.

It was found that the maintenance capability of in-theater maintenance units was inadequate to meet the demands of trying to stay operational in a hostile environment and at the same time fulfill the maintenance requirements. It was also found, that even under the best of conditions, the military personnel would have lacked the required proficiency in their military specialities necessary to sustain acceptable maintenance standards. Through no fault of their own, they were untrained. And the buildup resulted in aircraft deployments, mostly helicopters, the like of which had never before been experienced by the Army. Procedures had not been established for such a massive aircraft movement from CONUS and procedures were developed on the spot. Wooden cradles were fabricated for the aircraft deck tie down and later reports revealed that the tie down had caused structural damage to the aircraft necessitating repair immediately upon arrival in Vietnam.[82]

The solution to the shortage of maintenance units and personnel in SEA was sought through the provision of civilian contract maintenance to supplement the available military capability. Some civilian repairmen were available from Army facilities in the United States as a result of the Defense Department policy of requiring a minimum of on-hand depot maintenance capacity to assure a ready source of technical competence to meet contingencies. However, at this time, depot workloads were on the increase and the availability of civilian maintenance personnel from depots was extremely limited. However, a number of commercial firms such as Lear Seigler Service, Incorporated; Dynalectron Corporation; and Lockheed Aircraft were found to have aircraft, armament, and avionics repairmen available on a contract basis. The usual method was to have the oversea Aviation Support Command execute contracts to cover the skills required by the theater, a demand which by the end of 1968 saw over 2,000 civilian contract aircraft maintenance personnel working in Vietnam, a most costly operation when compared to maintenance support normally furnished in previous wars by adequately trained support units on the scene in sufficient numbers to perform the required tasks.[83]

Visualizing combat operations under conditions similar to those experienced in Vietnam: adverse climatic conditions, primitive road networks, the absence of harbors, and other logistically unfavorable conditions; in August 1962, AMC asked the Transportation Materiel Command to explore the possibility of using a ship as a floating shop to provide helicopter maintenance in the Far East. In January 1964, General Besson approved the Floating Aircraft Maintenance Facility (FAMF) concept using a Navy seaplane tender which was easily converted as the floating base for the aircraft maintenance ship. The Army Chief of Staff also approved the concept in March 1964 and the USS *Albemarle* was selected from the Navy Reserve Fleet anchorage in James River in Virginia and towed to the Army Depot at Charleston, South Carolina, in early August for a detailed survey and development of the conversion requirements. After conversion, which entailed the construction of helicopter pads, both forward and aft, with numerous maintenance cubicles in between, the ship, on loan to the Army under a specially managed project known as Operation Flat-Top, was sea tested in November 1965 and pronounced ready the following February. Renamed the USNS *Corpus Christi Bay* the vessel arrived on site in Vietnam in April 1966. Operating as a joint Army-Navy venture, the ship was run by civilians under the Military Sea Transport Service with the maintenance facilities operated by the 1st Transportation Corps Battalion (Aircraft

[82] Submission, AMCMA-PA to AMCHO, 11 Dec 68.

[83] *Ibid.*

Maintenance Depot [seaborne]), an Army unit. Measuring 538 feet from stem to stern, the FAMF included about 67,000 square feet of shop space and 112,000 square feet of storage space.[84]

The 1st Transportation Battalion was activated on 6 October 1964 and assigned to the control of the Commanding General, AMC. The primary mission of the battalion has been to provide depot maintenance on Army aircraft components, avionics equipment, aircraft armament systems and parachutes to units in Vietnam. The U.S. Army Materiel Group No. 1 was activated in May 1966 and established as the control element and replacement unit for the 1st Transportation Battalion and its replacement training battalion at Corpus Christi, Texas. The Project Manager, Flat-Top, served as the group commander. The administrative logistical support for FAMF has been from the U.S. Army Aeronautical Depot Maintenance Center, U.S. Naval Air Station, Corpus Christi, Texas. The operation of the floating facility by Military Sea Transportation Service has been by agreement with the Director of Transportation, Deputy Chief of Staff for Logistics (DCSLOG), Department of the Army. The Army's need for such an aircraft maintenance facility increased in proportion to the increased use of aircraft and airmobile organizations such as the 1st Cavalry Division (Airmobile) and the 101st Airborne Division (Airmobile), both in Vietnam.

After the positioning of the *Corpus Christi Bay* offshore in Vietnam, the men of the maintenance battalion have continuously performed all varieties of maintenance in the ship's repair and rebuild shops including the fabrication, test, and airframe repair or overhaul of airplanes and helicopter engines, avionics armament, and other aviation components. They provided laboratory support, calibrated instruments, and even conducted a limited manufacturing program which included the fabrication of even non-aviation items.[85]

The advantages of a mobile maintenance facility were readily discernible. The cost of moving a land-based depot was prohibitive, making the floating facility economically and tactically more desirable. The floating facility has maintained a high degree of operational readiness and self sufficiency. It has proven to have security advantages over the fixed depot. More specifically, the proximity of the *Corpus Christi Bay* to the Vietnam operations has allowed a highly significant reduction in pipeline requirements between CONUS and Vietnam, a return of components to use with a minimum of teardown and processing requirements, and an increase in availability of operable aircraft in Vietnam. FAMF provided a readily available emergency support with complete mobility and flexibility. Placed strategically astride the CONUS retrograde pipeline, it proved extremely useful in its test and inspection, and repair and overhaul of deadlined aircraft and components needed in Vietnam operations. The most recent figures available for Fiscal Year 1968 indicated that during the year, the maintenance battalion of the *Corpus Christi Bay* had repaired or overhauled and/or manufactured items valued at $43,594,414. The cost of operating the facility over the same period was $6,810,725.[86]

In February 1966, AMC was directed to conduct a study to determine the feasibility of employing floating maintenance facilities for materiel other than aircraft which was later limited by DCSLOG to electronics and mechanical equipment. Studies were conducted at the U.S. Army Electronics Command and the U.S. Army Tank-Automotive Command and on 1 December 1967 both studies concluded that based upon cost, savings, and operational considerations the concept was feasible and on the 14th of December, Lt. Gen. William B. Bunker, Deputy Commanding General, AMC forwarded to DCSLOG the AMC recommendation that the FAMF concept be approved for mechanical and electronic equipment.

During this same period an additional facility known as FAMF II was under consideration for use in Vietnam. However, action of the Secretary of the Army on the request for a second facility, which was looked upon favorably by the Office of the Army and Department of Defense

[84] (1) SFC James Stuhler, "Repair Shop Afloat," *Army Digest*, Feb 1968, pp. 24–25. (2) "Maintenance Around the World," *Army Digest*, Feb 1967, p. 53. (3) Submission, Proj Mgr Flat-Top to AMCHO, 2 Jan 69.

[85] (1) SFC James Stuhler, *op cit.* (2) Intv, Myles G. Marken with Col H. B. Blanchard, 7 Mar 69.

[86] Submission, Proj Mgr Flat-Top to AMCHO, 2 Jan 69.

level, was deferred because of a budget squeeze of July 1967 and a cost and effectiveness study being conducted on FAMF I. Another Navy seaplane tender, the *Currituck* was under consideration for conversion as FAMF II and additional ships were made available by the Navy for Army use as floating facilities.

In September 1967, the Department of Defense requested more cost effectiveness data and the American Power Jet Company was contracted to compile the necessary data. Later a small aircraft carrier, a vessel with a different hull, the USS *Rabaul* (ARV) was chosen and the American Power Jet Company contract was revised calling for a cost effectiveness study for the vessel as FAMF II. The vessel was to provide both airframe and aircraft component repairs. An AMC program change request was planned for submission in April 1969 regarding the conversion in the Fiscal Year 1971 program. It was visualized that FAMFs II, III (electronics), and IV (mechanical) would provide needed assistance to the theater in that they would help fill additional existing gaps in the logistics pipeline.[87]

New Maintenance Support

The establishment of the Red Ball Express system in December 1965 and the preparation of the Floating Aircraft Maintenance Facility, the USNS *Corpus Christi Bay*, for positioning offshore in Vietnam in April 1966, were measures contemplated to ease the growing maintenance burdens in Vietnam. However, they were never viewed as complete solutions to the expansive repair, overhaul, and rebuild requirements of the Army in Southeast Asia, a theater lacking in depots and short of maintenance units and personnel. Cries from the theater for maintenance help increased with the growing deadline rates caused by enemy action, the usual environment, inadequate preventive maintenance programs, inadequately trained operators and technicians, equipment released to the theater insufficiently tested beforehand, and because equipment had been improperly used or used for unanticipated purposes.[88]

For instance, early in March 1966, USARV appealed for help in solving its maintenance troubles regarding materials handling equipment (MHE) and engineer construction equipment. General Engler inquired into the possibilities of contracting with some experienced U.S. firm to take on his maintenance task.[89]

To AMC, such an arrangement appeared feasible, and one that could be made a part of a plan under preparation in AMC for the overall maintenance support of Southeast Asia. The plan contemplated the performance of higher echelon maintenance of construction and general equipment by contract, to the maximum extent possible in the Western Pacific area, and the integration of the Vietnam general support maintenance with this offshore depot type overhaul for the same equipment under a single contractor made sense. The Vinnell Corportion, of Alhambra, California, had been identified by the Chief of Engineers as having particular qualifications for such a contract.

A tentative AMC conclusion was that tactical vehicle support could best be furnished on an exchange of engines and transmissions. Under this arrangement, AMC would furnish new or rebuilt engines and transmissions in exchange for losses and reparables, with rebuild being accomplished under contract by proven producers in the United States. End items requiring repairs above fourth echelon would be submitted to controlled cannibalization, either in Vietnam or on Okinawa. AMC planned to overhaul all artillery, signal, and electronics equipment in the United States because of the low density or low weight of these items. Any "total losses" of major end items would be replaced from stock and/or new procurement. Items for overhaul, however, would have to be turned around, hopefully within a six-month time frame. This

[87] (1) AMCPM-FL to DCSLOG, 27 Jul 67, subj: Temporary Storage of USS *Currituck* (AV-7). (2) AMCPM-FL to DCSLOG, 14 Dec 67, subj: Feasibility Studies on FAMF (Mechanical and Electronics). (3) Presentation, Gen F. S. Besson, Jr., CG, AMC, 25 Jul 67, Pentagon, subj: Secy of the Army's Prog for the Comd Supervision of Readiness, p. 22. (4) Submission, Proj Mgr Flat-Top to AMCHO, 2 Jan 69.

[88] AMCB Proj 4-46, "Lessons Learned in Logistic Support of SEA," Aberdeen Proving Ground, 30 Jun 66, pp. 43-45.

[89] CofS, AMC, Working Files, MAC 1745, 3 Mar 66.

meant that to get its plan into operation, AMC would have to pre-position, out of stock or from procurement, six months turn around quantities of major items involved. AMC asked General Engler for his views concerning this approach and—since asset data reporting from Southeast Asia was very sketchy—the validity of the density data being used by AMC in developing these plans.[90]

Retrograde for Overhaul

In view of the success of the Red Ball Express operation, AMC suggested Operation Boomerang for the retrograde shipment of reparables from the oversea theater and the return, by air if indicated, of rebuilt replacement items. In addition, the whole question of in-theater maintenance policy remained under consideration. It was obvious that requirements, particularly for MHE, heavy construction equipment, and similar high-usage items would exceed the depot maintenance capabilities of the 2d Logistical Command on Okinawa. Several proposals had been received from civilian contractors for the establishment of contractor-operated rebuild facilities in the Philippines, Taiwan, or elsewhere. The development of an overall maintenance coordination policy between USARPAC and AMC in regard to these proposals and other matters was essential.[91] USARPAC saw the use of contractor-operated facilities in the Western Pacific as highly desirable to handle overflow work in the future, but also believed that immediate efforts should be directed toward supplying the parts and equipment necessary to fully utilize the capabilities currently available in Okinawa and Japan.[92]

General Engler considered the Red Ball Express a good system for expediting the movement of available parts, and credited it with outstanding improvements in reducing deadlined aviation equipment. In other categories, however, the effect of Red Ball had not been remarkable.

Operation Boomerang was the victim of conflicting instructions. Through command channels the 1st Logistical Command had been directed to ship everything to Okinawa, whereas AMC was proposing to ship most unserviceables to CONUS. Since there was some rebuild capability on Okinawa, what was needed was one agency to control the retrograde flow on an item-by-item basis, with the objective being the shortest turn around time. In the meantime, the theater had begun to collect generators for airlift to Sharpe Army Depot under Operation Boomerang.[93]

Early in March 1966 General Besson dispatched Gen. Paul F. Yount (retired) on a special assignment to Hawaii to discuss with USARPAC the possible establishment of a contractor-operated program in Vietnam for the overhaul of major items of construction equipment. He was accompanied by the Director of Maintenance, SMC, who was charged, among other things, with assisting the G–4, USARPAC, in reviewing the maintenance aspects of SMC's Okinawa Support Plan, and with developing a plan for the provision of "sweep-up teams" to assist General Engler in Vietnam. These teams, to be composed of well-qualified personnel, would be charged with screening deadlined items of equipment and expediting the return of reparables to CONUS. The Director of Maintenance was also instructed to be prepared to address the question of actions to be taken in preparation for the heavy influx of reparables at West Coast terminals under Operation Boomerang. Included would be the establishment of necessary controls and the provision of qualified liaison personnel from the principal NICPs to assist in screening out unreparable items and routing reparable items to the proper maintenance facility.[94]

About this same time General Besson had suggested that a system be established for the return of reparable items to CONUS facilities, and that action to implement a formalized system get underway in Vietnam. As a beginning, General Engler ordered the loading of the RO/RO ship *Comet*, which was returning to the CONUS for crew replacement and refitting, to be loaded with every possible reparable item beyond the USARV capability. These items were to go to Sharpe Army Depot, and then

[90] Ltr, Lt Gen William B. Bunker, DCG, AMC, to Lt Gen J. E. Engler, DCG, USARV, 9 Mar 66, n.s., CofS, AMC, Working Files.

[91] (1) CofS, AMC, Working Files, GVP 135, 7 Mar 66. (2) CofS, AMC, Working Files, GVP 137, 7 Mar 66.

[92] CofS, AMC, Working Files, HWA 0869, n.d.

[93] CofS, AMC, Working Files, MAC 1918, 9 Mar 66.

[94] Memo, Brig Gen Thomas H. Scott, Jr., Actg CG, SMC to Dir/Maint, SMC, 9 Mar 66, subj: Maintenance Support of Vietnam, CofS, AMC Working Files.

transshipped to appropriate CONUS facilities for repair. General Engler also arranged for the airlift of 100 generators and power units from Saigon to Sharpe; Okinawa was already overloaded with reparable generators.[95]

In the meantime, a maintenance support plan for SEAW as announced in June 1966 authorizing an increase in the support capabilities in Okinawa. AMC prepared the detailed plans and guidelines to augment the overall plan which would use, as necessary, the supporting maintenance resources of Japan, Okinawa, Taiwan, CONUS, and Vietnam in expediting the retrograde of all reparable equipment. After USARPAC agreement, representatives of DCSLOG and the CONUS NICPs visited Okinawa the same month to discuss the assistance required in support of the plan. AMC had already taken action to provide the required equipment, some of which was delivered in July. On 10–11 August, representatives of AMC, DCSLOG, and USARPAC met in Hawaii to prepare specifications for a contract effort to expand the support capacities in Japan and Okinawa. To insure full utilization of Sagami's existing capacity, DA had furnished USARPAC guidance and authorization for evacuating M48 tanks to Japan and approval of additional combat vehicle component overhaul in support of Vietnam.[96]

Closed Loop Support

By October, retrograde materiel had been flowing from Vietnam to Okinawa, Japan and the United States at a stable rate. During the period since May, over 3,000 short tons of reparable equipment had been retrograded to CONUS by air and 40,000 tons by sea. On 12 December 1966, the Commanding General, U.S. Army, Japan informed DA that production techniques had so improved the M113 APC and M48 Tank repair program that there was a need for unserviceable assets at Sagami. On 28 November, a meeting that included DA, AMC, and Theater representatives was called to discuss the M113 APC and M48 overhaul requirements. It was at this meeting that the concept of the closed loop support system was revealed. The concept had its beginning in several other programs including project Boomerang. The closed loop concept envisioned intensive management of equipment through the entire cycle of retrograde, overhaul, and return to the supply system or the user. The retrograde of reparables continued to receive emphasis and by April of the next year the system was well established with several closed loop conferences having been held since November to formulate plans for the support of materials handling equipment, communication equipment, and aviation items. Another meeting in April in Saigon addressed the M48 Tank, the M88 Recovery Vehicle, and the M113 APC, all of which required intensive management by closed loop procedures throughout the buildup.[97]

Under the Closed Loop Support (CLS) system, prescribed numbers of items were always kept available at the unit level either from theater or CONUS rebuild or new supply. As viewed by General Besson, the essence of the program was the "joint forecast of the flow of serviceable and unserviceable assets and firm commitments by the oversea theater and by AMC."[98] Specifically, the objective of CLS was the restoration of selected reparables for return to the user or the supply channel on a planned, reported, and efficiently controlled and closely monitored basis. AMC participated all along the line, even to the extent of dispatching teams to USARV to assist in locating, preserving, and retrograding critically needed rebuild and repair items out of Vietnam for overhaul and restoration.[99] Regulations prescribing methods to be employed in monitoring the flow of equipment through CLS including movement or failure to move reports and "problem flashes" denoting slippages were published in October 1967.[100] Initially established for CONUS-USARPAC, the system soon expanded for use into U.S. Army, Alaska, and U.S. Army, Europe, and was anticipated for worldwide use.

Between January 1967 and June 1968, approximately 158 items had been selected for CLS for USARPAC, mostly for Vietnam. By

[95] CofS, AMC, Working Files, MAC 2055, 13 Mar 66.

[96] Army Buildup Progress Rpt, 7 Sep 66, p. 29.

[97] Army Buildup Progress Rpts: 12 Dec 66, p. 29; 6 Feb 67, p. 23; 1 May 67, p. 25; 16 Oct 68, pp. 9, 11–12.

[98] Presentation, Gen F. S. Besson, Jr., CG, AMC, 25 Jul 67, Pentagon, subj: SA's Prog for Comd Supervision of Readiness, p. 21.

[99] Transmittal, AMCOR to ACSFOR, 9 Nov 67, with incl, Operations Report-Lessons Learned, 31 Oct 67, Item 10, p. 4.

[100] AR 700-69, "Mgmt of Critical Items-Closed Loop Support," 25 Oct 67.

the close of the year 176 items were under CLS. Both components and end items were included for all major categories of materiel except munitions which were controlled under another system. Under the crunch of such an enormous workload, there was bound to be slippage. For instance, when General Besson stopped at Okinawa on his trip to USARPAC and SEA in March 1968 to appraise the supply and maintenance situation in the theater, he was briefed concerning the 2d Logistical Command's (Okinawa) contributions to the CLS program and was informed that there had been a 65 percent slippage because of a shortage of repair parts and/or the "failure of the retrograde schedule to materialize." Reparables were not arriving from Vietnam in accordance with schedules drawn to fill the recently increased rebuild capacity in Okinawa. Of some 1,680 electronics and communications items scheduled for repair in the 2d Logistical Command, only 541 were received—90 percent of which were restored. Of some 2,801 pieces of Mobility Command type of equipment, such as generators, engines, materials handling equipment, construction equipment, etc, only 1,132 were received and of these only 333 were completely repaired because of a shortage of repair parts.[101]

Genral Besson was not pleased with the situation believing that reparable items were being junked or thrown away. He believed that this could only be corrected through command emphasis and at the unit level. In September of 1968, the AMC Commander speaking to a group of newly appointed general officers, urged them to render emphasis to the CLS program in their new assignments cautioning that "common sense tells us that reparable items must be returned, but command emphasis must be applied."[102]

Command emphasis through the CLS program had achieved success in many equipments areas. For example, during Fiscal Year 1968, more than 1,100 M48 or M60 Tanks were returned to service through the CLS program for the 1790 Series Tank Engine. As a result of CLS management, an ever increasing tonnage of critically needed reparables were being salvaged and returned to the SEA pipeline and inventory. This reduced the necessity for new procurement and, together with Red Ball, FAMF, and other supply and maintenance support activities, the Closed Loop Support system was making heavy inroads toward solution of the tremendous Southeast Asia supply and maintenance problem.[103]

[101] (1) Submission, AMCDT to AMCHO, 17 Dec 68. (2) Fact Sheet, 2d Logistical Comd, 11 Mar 68, subj: Closed Loop Support.

[102] Speech, Gen F. S. Besson, Jr. at CofS's Conf for Newly Appointed General Ofcrs, Pentagon, 18 Sep 68.

[103] *Ibid.*

APPROVED CLOSED LOOP SUPPORT PROGRAMS

(Effective 8 May 1968)

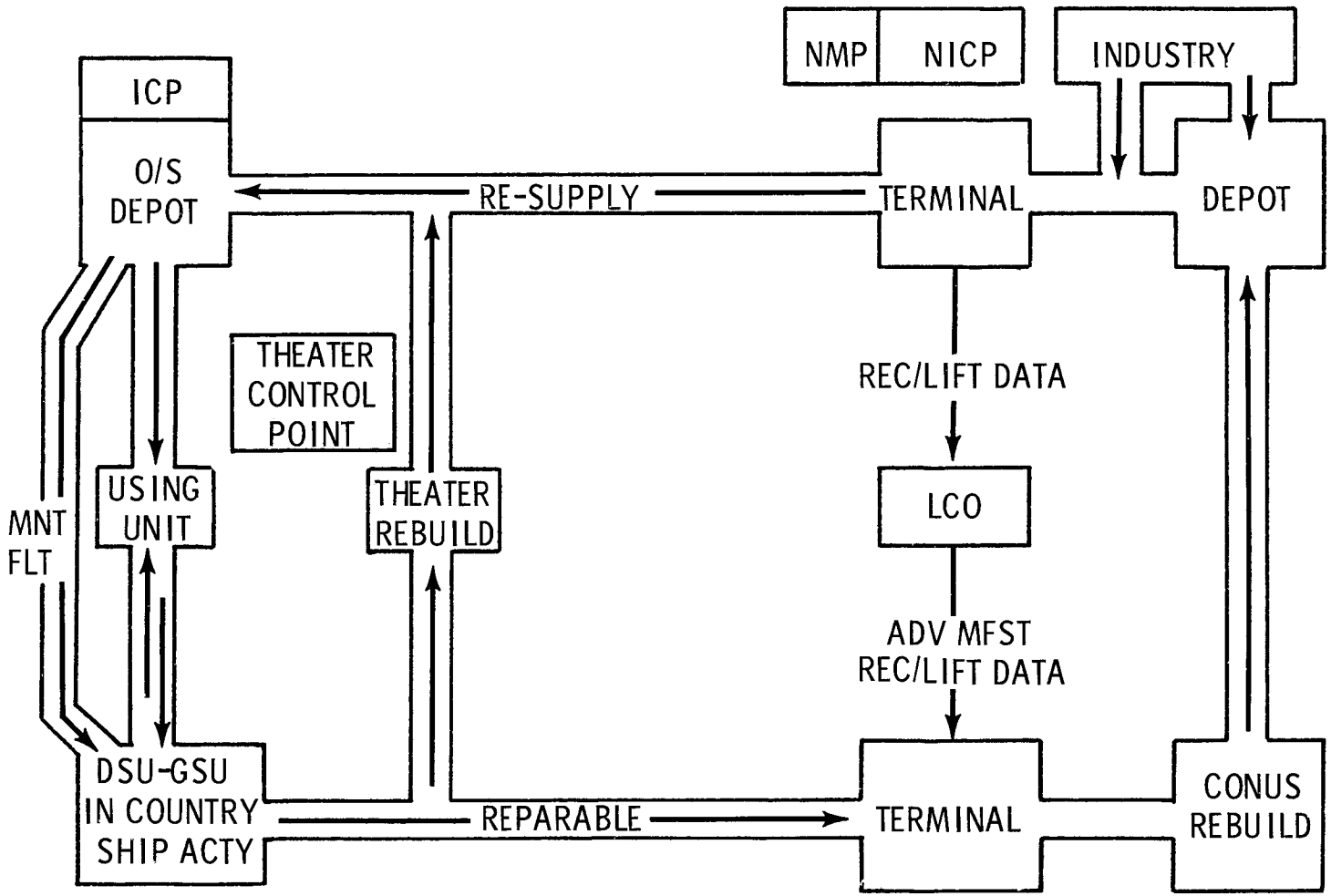
COMMODITY	COMMAND	PROJECT CODE
Aircraft Armament Sub-System	Vietnam	MZD
Aircraft Turbine Engines (T53/T55)	Vietnam	MZB
APC M113	USARAL	NJK
APC M113/113A1	Vietnam	MOU
APC M116	USARAL	NJL
Army Aircraft	Vietnam	MZC
Artillery-Self Propelled	Vietnam/EUSA	NEA
Artillery-Towed and Crew Serviced Wpns	Vietnam	NEB
Avionics Items	Vietnam	NHU
Engineer Construction Equipment	Vietnam/Thailand	MYP
(M578 Recovery Vehicle, Light Armored; M108 Howitzer, Light, 105mm SP; M109 Howitzer, Medium, 155mm SP)	USARAL	NJM
Fire Control Instruments	Vietnam	NEC
Gun, SP, 40mm, M42A1	Vietnam	LGA
Hawk Missile System	EUSA	MXG
Hawk Missile System	USARYIS	MXF
Materiels Handling Equipment	Vietnam/USARYIS/Thailand	MOY
Military Standard Engines	Vietnam	NPB
Power Generators	Vietnam/Thailand *USARYIS/EUSA	MXH
Recovery Vehicle, M88	Vietnam	LGB
Tactical Communications & Electronics	Vietnam	MOT
Tactical Wheeled Vehicles (Multifuel Engines LDS427, LD465–1, and LDS465–1)	Vietnam/Thailand **EUSA/USARYIS	NLX
Tank, M48A3/M48A2C	Vietnam	MOI

*Only the Generator Set, 45kw/400 cycle.

**Applicable to the LDS427 only, programed during the USARPAC Closed Loop Conference.

Figure 3

CLOSED LOOP SUPPORT NETWORK



WHAT WAS AND MIGHT BE

Together we've established a logistical system that is unparalleled in the annals of warfare . . . facilitating the development of that logistic base is the reason we're in business.

GEN F. S. Besson, Jr.
Armed Forces Management Association
San Antonio, Texas
18 April 1968

CHAPTER XII

WHAT WAS AND MIGHT BE

SEVEN YEARS' EXPERIENCE

Eighteen years after General Brehon B. Somervell tried it and eight years after Secretary of Defense Lovett proposed it, Secretary McNamara decided to back into the buzz saw of Army Technical Service reorganization. The saw's cuts in 1961–1962 were not quite as painful as Secretary Lovett had imagined they would be. In fact, the anticipated political reaction was so mild that the Congress allowed the Army reorganization to take place without a formal declaration of its opinion. But the bite of the buzz saw was felt by those who reorganized the Army and established the Army's new major commands. In the case of the Army Materiel Command (AMC), organized and established by the people of the Technical Services which it supplanted under the leadership of General Besson, chief of one of those services, the bite was a staggering workload—assuming and consolidating Technical Service and other materiel responsibilities, devising new management systems and procedures, responding to Department of Defense (DOD), and Department of the Army (DA) demands for management, cost reduction, production, and information and satisfying a basic reorganizational requirement for improved planning and forecasting.[1]

As AMC tasks were formidable, so were its resources. Most of the logistics management talent of the discontinued Technical Service chiefs' offices was available to the command headquarters, and to a lesser extent, to the major subordinate commands. The logistics management and operating skills and facilities in nearly 300 Technical Service subordinate commands, depots, arsenals, proving grounds, laboratories, and other installations and activities were available to AMC major subordinate commands, and to a lesser extent, to the headquarters. In all, AMC inherited more than 22,000 military and nearly 170,000 civilian employees. AMC also inherited a funding program which, after adjustment, amounted to $8.015 billion, including more than $1.25 billion for research and development, and nearly $4 billion for major procurement.

The problem was to weld these resources and the programs and systems they repesented into an integrated wholesale logistics organization capable of meeting current demands and of projecting future requirements efficiently and economically. The problem was complicated by the very scope of the operation, by the uncertainty of limits and authority in some areas, by the inertia of varying old procedural systems and organizations, and even by lack of precision in the definition of wholesale logistics.

Attack on the problem began in General Besson's Materiel Development and Logistics Command planning group. Here it was decided that the headquarters organization and that of the major subordinate command headquarters would be functional, in the pattern of most of the Technical Services. But to provide for intensive management of critical items and systems, and to insure transfer without loss of important Technical Service work in progress, General Besson adapted the concept of project management to his own purposes. He delegated commodity management and operational support of intensive management, subject to his control of resources, to his major subordinate commanders. Finally, the planning group scheduled the assumption of various functional and program responsibilities for the earliest possible period after the accelerated activation.

The seven years after activation saw an al-

[1] This section is based on the preceding chapters and additional materials from the Review of AMC Programs, FY 1963–1968, and from the AMC Historical Summaries, FY 1963–1967.

most constant process of shakedown and shape-up in one or several functions or forms of management. These years also saw significant accomplishment in the logistics support of the Army during normal times, if any time is normal, and in periods of crisis.

Fiscal Year 1963

AMC's first year was Fiscal Year 1963. It started with the "bang" of activation, and at the end of the first month the command was operational. First priority was given to intensive and functional management. General Besson established 30 project managerships covering the materiel range from aviation through guided missiles, electronic communications, combat and general-purpose vehicles to rifles, ammunition, and other weapons. During the year he added six to the total and terminated two. As he later pointed out, AMC "slipped into the driver's seat without major upheaval or slippage in our prime responsibility—support of the Army" largely because of the efforts of these project managers.

Basic tenets and extended codes for AMC project management had been worked out by or at the behest of the planning group. The first year's application brought about little change in doctrine, except for the establishment of a special assistant for project management in the headquarters. Project managers assumed General Besson's authority in their areas of effort, and they reported to him weekly. Twelve of them reported directly and the rest reported through major subordinate commanders, but all project managers had "red line" authority to communicate directly with General Besson when emergencies arose. Project managers controlled 54 percent, or $2.3 billion, of the first year's combined PEMA (procurement of equipment and missiles, Army), and RDTE (research, development, test, and evaluation) funds. They accomplished acceleration in development, testing, and fielding schedules for aircraft weapons, as well as for rotary- and fixed-wing aircraft and components; improvement in coordination and planning for missiles, rockets, combat vehicles, and communications-electronic systems; and, notably in the climate of that time, savings in elimination of marginal components and in improved allocation of resources.

In the functional area, consolidation of management systems and programs and development of standardized systems naturally took first priority. Needs ranged across the board: a new RDTE management system; a remodeling of the procurement structure and program; a consolidation of the supply and maintenance system; a new system for the determination of materiel requirements and readiness; and a new concept for the acquisition, control, and use of command information.

Managerial accomplishment in research and development included negotiating an agreement with the new Combat Developments Command (CDC) on areas of responsibility in research, development, and testing, and on procedures for processing materiel and development requirements, reviews, visits, and reports. Agreements were also arranged with the Chief Signal Officer and the Chief of Engineers, newly designated DA staff officers, in areas of mutual interest. AMC consolidated the Army's nuclear effects research and development programs, established AMC-CDC committees to review and eliminate non-productive or marginal projects and tasks, secured transfer of the Army Food Radiation Laboratory from the Atomic Energy Commission to Natick Laboratories, established a focal point and uniform procedures for processing research and development determinations and findings, and activated a Materiels Advisory Group to aid materials research management. Also, and significantly, AMC established a long range technical planning organization and consolidated technical intelligence activities in the Foreign Science and Technology Center.

The first year's RDTE program amounted to $1.254 billion, representing all but seven percent of the Army's RDTE funds. Obligation of $1.17 billion of that program brought about a number of accomplishments, including Nuclear Defense Laboratory development of a fast neutron source, Natick Laboratories assumption of a full scale irradiated food program, and completion of the Missile Command's (MICOM) high burning ratio solid rocket propellant development. Also, the Mobility Command (MOCOM) completed development of a night vision intensifier tube; the Weapons Command (WECOM) proved the suitability of a new 105mm howitzer; and the Electronics Com-

mand (ECOM) type-classified the first of a family of new single sideband tactical radio sets.

Accomplishments in procurement in Fiscal Year 1963 contributed significantly to a growing establishment of command identity. Ordnance procurement districts were converted into Army (AMC) procurement districts and combined with other-technical Service procurement agencies to form the AMC procurement structure. AMC Headquarters issued 85 percent of AMC procurement instructions which standardized the system and implemented DOD and DA instructions. Procurement offices executed $4.2 billion worth of contracts and increased both value and number of contracts administered by more than 50 percent over Fiscal Year 1962. Despite the additional workload, the cost of procurement office operation increased by only 1 percent and personnel declined by 12.7 percent from the previous year.

PEMA obligations amounted to $3.2 billion of a $3.9 billion AMC PEMA program. The use of price competition increased significantly with a $77.6 million savings attributable to resulting lower prices. Use of formal advertising also increased while the use of letter contracts declined—both were favorable trends.

AMC's Supply and Maintenance Command (SMC), bearing both the headquarters staff and a large part of the field operating responsibilities in those areas, found, as anticipated, that consolidation of seven Technical Service systems presented enormous problems. SMC launched a study of supply and maintenance systems, began consolidation of depot activities (leading to the early deactivation of five depots), began transfer of nearly 6,000 personnel spaces to the new Defense Supply Agency depot and distribution complex, and attacked the problem of improving supply and maintenance performance.

Performance improvement was immediately complicated by the advent of the Cuban crisis. While 159,900 requisition line items had been due for shipment in July, there were 488,600 line items due for shipment in October, and the year's monthly average was 343,600. The percentage of on-time shipments varied from 50.8 percent in August 1962 to 68.5 percent in May 1963 for a yearly average of 61.6 percent. The percentage of on-time shipments was considerably short of the 80 percent objective, but a large part of the difference was accounted for by depletion of stocks on 10,554 stocked items and by unduly short targets under military standard requisitioning and issue procedures. Unusually heavy demands constantly increased the number of stocked items out of stock during the year with the result that line items back ordered increased nearly sixfold. Maintenance (major overhaul) performance was satisfactory with $132 million spent to rebuild $782 million in value of equipment. Depot care and preservation performance came within two percent of the goal. In all, despite the Cuban crisis and systematization problems, supply maintenance performance was creditable.

In the field of materiel readiness and requirements, the first year's problems were even more complex than in the closely related supply and maintenance field. The initial, and continuing problem of "Who does what, when?" was probably the base of many other problems. AMC's initial attack on the base problem, at the behest of the Deputy Chief of Staff for Logistics (DCSLOG), was to establish a system for control of principal item distribution to U.S. forces and to formulate procedures for the development and flow of principal item distribution planning studies. The established system made the commodity commands responsible for determining authorizations and recommending distribution. Selected combat essential principal item distribution planning studies which accounted for requirements, issue priorities, and the forecast availability rates for new items were to be prepared by commodity commands, and after DA review and approval, were to be assigned to major commands for implementation. To permit commodity commands to assume requirements determination responsibilities, such functions of the Major Item Management Supply Agency (MISMA) at Letterkenny Army Depot were parceled out to the commodity commands, and AMC converted MISMA into a Major Items Data Agency (MIDA) charged with compilation of asset data and with gross requirements computations in support of the commodity commands. The principal items system was a beginning, but, as later events were to prove, only a beginning.

MIDA's first requirement was a computer,

and that agency borrowed computer time until its own automatic data processing setup became available. MIDA's was the only one of the many requirements in the complex and burgeoning data systems area in which AMC had inherited 69 automatic data processing installations and 67 punch card machine installations. What AMC inherited could not be considered a data system since it consisted of many diverse and largely uncoordinated computer applications using a variety of computer gear. Few computer installations were compatible with other installations as most had been designed for specific local purposes. The first task, therefore, was to establish a master plan which would identify command management information requirements, carry on the DA initiated process of standardization, and respond to DOD and DA demands for systems introduction. AMC's main emphasis was on computer hardware. The AMC plan produced, but not approved, in the first year provided for all of these objectives, and in the optimism of the period, designated the years 1964 to 1968 for development of the complete AMC system.

There were probably too many cooks preparing the defense data system soup, and there were certainly inadequate means of projecting the nature and rapidity of advances in computer technology. Nevertheless, AMC made a substantial first year beginning in data systems work. Pursuant to SMC's supply systems study, Project SPEED, an integrated electronic equipment system for depot work, began to be installed, and work started on a standard AMC NICP (national inventory control point) automatic data processing configuration. In keeping with the early emphasis on project management, work was done on project manager PERT/COST procedures and on successor DOD Line of Balance costing techniques. Also AMC initiated operation of a system responding to DOD requirements for procurement and industrial planning information, and set up its own standardized electronic accounting machine operation for procurement district contract administration.

Midst all of Fiscal Year's 1963 standardization, systematization, and operational tasks, AMC reduced the number of its installations and activities by 68, its military strength by approximately 2,000, and its civilian strength by a little more than 10,000. Cost reduction efforts under Mr. McNamara's program were eminently successful with the goal of $227.5 million being exceeded by more than $200 million.

In sum, the year that had started with a bang by no means ended with a whimper. Although the dimensions of the workload in some areas were just beginning to be realized and in some other areas were not yet conceived, significant progress had been made in standardization and systematization, operation was in full swing, and the Cuban crisis had been creditably weathered. The command had begun to acquire an identity, an identity necessary to further integration of the Army's logistics processes.

Fiscal Year 1964

It is a probability that a number of AMC employees hoped that project management would fade away in the command's second year when the transfer of projects from Technical Service management was complete. If so, they were disappointed. There was no diminution in the need for intensive management, and project management had become an AMC hallmark. Project manager projects established in the first year remained, with very few exceptions but some adjustments, and a new project manager for the advanced aerial fire support system (later Cheyenne) was appointed. Project managers again controlled a little more than half of the combined RDTE and PEMA funds. They were responsible for improvements in Army aircraft design, for more than doubling the number of aircraft weapons subsystems in service, and for planning a quick deployment, floating Army aircraft maintenance facility. They also accelerated initial production of the new M16 rifle, made significant contributions to tactical and strategic communications systems, and brought about the deployment of new combat vehicles. Project managers in the rockets and missiles field completed a second year of development of the Lance missile, improved the deployed Sergeant and Hawk missiles, and commenced definition of the Nike-X system.

Since project management had been proved both in concept and practice during the first year, second year management emphasis fell more heavily on commodity and functional

management. SMC's recommendations resulting from the first year study were approved by General Besson, and the establishment of the Army Supply and Maintenance System (TASAMS) began. TASAMS involved the establishment of one NICP and one NMP (national maintenance point) in each commodity area. Each commodity command, except MOCOM, was to have one NICP/NMP. MOCOM was allotted an NICP/NMP for each of its commodity areas, tank-automotive equipment, mobility equipment, and aviation materiel. MOCOM already had subordinate tank-automotive and aviation materiel centers as subordinate commands. Partly in response to TASAMS, the Mobility Equipment Center was then created by transfer and reassignment of former engineer, quartermaster, and transportation functions and NICP responsibilities. This establishment precipitated further study leading to assignment of the Commanding General, MOCOM, as Deputy Commanding General for Mobility, AMC, and to authorization for MOCOM subordinates to communicate directly with AMC Headquarters concerning specific commodity functions.

TASAMS thus combined three NICPs into one at the Mobility Equipment Center, combined the Chemical, Biological, and Radiological Agency NICP with that of the Ammunition Procurement and Supply Agency to form the MUCOM (Munitions Command) NICP, and combined the Fire Control NICP at Frankford Arsenal with the WECOM NICP, reducing the number of NICPs by four. TASAMS also vested stock control, formerly a depot function, in the commodity commands and discontinued the Overseas Supply Agencies in order to centralize control of the entire commodity supply operation in each commodity command.

With the first year definition of major item requirements and distribution planning responsibilities and the prospective TASAMS centralization by commodity of supply, maintenance, and stock control functions, dimensions of the commodity command workload were becoming clearer. MUCOM started the year with a headquarters restructuring, replacing its commodity-oriented organization with a functional organization complementary to the AMC Headquarters structure. ECOM restructured late in the year to improve its life cycle commodity management, and the MOCOM realignment was announced to become effective at the beginning of Fiscal Year 1965. Restructurings helped in fixing responsibilities, in defining the area of life cycle commodity management, and in improving lines of communication, but the crying need in the commodity commands as well as in AMC Headquarters was firm information upon which to base plans, programs, and executive decisions.

A key plan demanding timely and accurate requirements and assets information was the Army Materiel Plan (AMP) which established materiel acquisition, rebuild, and support objectives for conversion into programs, other plans, and new concepts. In the second year, as previously, the commodity commands laboriously and manually prepared their portions of the AMP from materials available in a multitude of supply control studies. Obviously, much of the requirements and assets data were out of date before they reached AMC Headquarters en route to DA. Furthermore, MIDA was still not in full swing in support of the commodity commands. MIDA's was the perpetual problem of determining a force basis and current equipment authorization upon which to compute gross requirements. AMC moved on the one hand to set up a completely automated system of force basis, equipment, and logistics data files at MIDA, and on the other, to study the development and preparation of the AMP to determine how it might be automated and kept current.

Otherwise in the requirements and readiness field, the second year was a year of considerable progress. Studies got underway or directives were issued concerning intra-command interchange of requirements data, ammunition training requirements, replacement factors (a major and perennial problem), and tactical vehicle requirements. Concentration was still in the major items area, and there were still a number of manifestations of the "Who does what, when?" problem, particularly as it concerned the division of requirements responsibilities between Headquarters, AMC; and SMC.

As to supply performance, even before the implementation of TASAMS, things were looking up. The precentage of stocked items out of stock was reduced almost by half in the second

year. Concomitantly, the back order and lines delayed for shipment situation improved. On time shipment performance improved strikingly, by more than 14 percent over 1963, to a point almost on the 80 percent goal line in the last month of Fiscal Year 1964. These improvements did not, however, offer a firm base for predicting future performance since the monthly average of lines due for shipment in the year had been 45,000 less than the previous year's average. Whether the year's increase of $700 million in the value of AMC-owned inventories would serve to cushion the shock of future crisis remained to be seen.

Research and development management gained and passed a number of milestones in the second year. For example, further work was done on standardizing the research and development life cycle, and the Test and Evaluation Command (TECOM) was given the authority to become an independent AMC test and evaluation agency instead of a service element directed by the commodity commands. Importantly, AMC published its long-range technical objectives and laid the groundwork for integrating its long-range technical planning program with DA and CDC plans and requirements. The year's RDTE program rose to $1.438 billion, of which 88 percent was obligated. Research accomplishments included a breakthrough in electronic microminiaturization, pioneer work in fluid amplification, and new work in explosives, propellants, optics, materials, and high altitude research. Development accomplishments were recorded in aircraft navigation and protection, in military computer technology, in night vision, target acquisition and fire control equipment, and in ammunition and weapons development.

Fiscal Year 1964 was again an important procurement and production year. While awards in the $3.9 billion PEMA program fell slightly short of the $3.2 billion goal, competitive procurement was again increased, cost-plus-fixed-fee and letter contracts were reduced, and formal advertising was increased over both previous fiscal years. Value of contracts administered increased by 15 percent over Fiscal Year 1963 to $4.5 billion without a commensurate increase in costs of personnel. A sign of things to come was the introduction, with AMC assistance, of a pilot test on OSD (Office, Secretary of Defense) Project 60 which proposed the transfer of all contract administration to districts to be set up under a Defense Contract Administration system.

In the data systems area, AMC kicked off NAPALM (National ADP Program for AMC Logistics Management) during the second year. NAPALM was set up as an effort to standardize all of the systems, especially the NICP systems, bearing upon commodity management and, through this standardization, to centralize logistics (primarily supply and requirements) data for command executive use. Fiscal Year 1964 Phase I tasks were to provide standard and compatible data processing equipment systems for the NICPs by the end of the following fiscal year. Other data systems efforts included mechanization of PEMA procurement schedules, establishment of an automated AMC talent bank, development of the Standard Work Ordering and Reporting Data System, and development of a command automated procurement system.

Fiscal Year 1964 saw a further reduction in the number of AMC installations and activities and a further decline, by a total of more than 7,000, in military and civilian strength. The total AMC funding program amounted to $7.789 billion, and toward the end of the year mutual security requirements for Vietnam were rising. As the second year ended, it was clear that progress had been made in both functional and commodity management and that support to the Army, at least as good and perhaps better than the Technical Services, had been provided at less real cost than prior to 1962. Just how much progress had been made and just what needed to be done to improve the command's responsiveness was still a question. General Besson called for a study of headquarters organization and functions and a study of commodity management to seek a partial answer to these questions, and early in Fiscal Year 1965 he directed the AMC Board to assess AMC's potential to accomplish its wartime mission in order to provide other answers.

Fiscal Year 1965

AMC's third year might have been considered the calm before the storm of Southeast Asia requirements since total funding was down

slightly at $7.533 billion, and total personnel strength at 161,207 down another 10,000 from the previous year, but it was in fact anything but a calm year. Throughout the year the headquarters and much of the command as a whole intensified the process of realigning and transferring missions and functions. Late in the year the Dominican crisis broke, and at the same time increased Southeast Asia support requirements began to appear.

The greatest change arose from the fact that SMC had, in a sense, worked itself out of a job. With TASAMS going into effect, concentrating stock and supply control in the commodity commands, and with the transfer during the year of SMC's transportation and terminal responsibilities to the newly formed Military Traffic Management and Terminal Service (MTMTS), it became increasingly apparent that SMC's functions belonged in AMC Headquarters. Pending completion of a headquarters reorganization, General Besson directed the collocation of AMC and SMC Headquarters and named Lt. Gen. Jean E. Engler, SMC Commander, to the additional post of Deputy Commanding General, AMC for Support.

Late in the year the Operational Readiness Office was established in the headquarters as a direct arm of the Command Group to preside over materiel readiness (as distinct from requirements) and planning, and to coordinate and staff supervise customer support activities. Technical Data and Combat Surveillance Offices were also established in the headquarters—the first to provide a form of intensive management through staff supervision and coordination of command efforts to collect and standardize military characteristics, engineering, procurement, and materiel performance data, and the second to provide a similar form of intensive management with respect to research, development, and project coordination in the combat surveillance and target acquisition field.

In the procurement area, contract administration was transferred to the new Defense Contract Administration Service Regions (DCASRs) since the Fiscal Year 1964 Project 60 pilot establishment had proved successful. The Army procurement offices were accordingly disestablished or began their translation into contract execution services elements. Contract execution in each commodity area became the responsibility of the appropriate commodity command, where only part of the job had previously been assigned. Strengthening of commodity command procurement elements, an uphill job in the tight labor market, began.

A further shift in mission involved the transfer of strategic communications responsibilities to the U.S. Army Strategic Communications Command (STRATCOM). ECOM provided support to STRATCOM, and the AMC project managers in the strategic communications field worked under joint AMC-STRATCOM direction.

General Besson established nine new project managerships during the year, one in electronics, five in the rockets and missiles field, two to manage vehicle systems, and one for the expanding and critical night vision project. Project managers again controlled half of AMC's combined PEMA and RDTE funds. While, from the first, considerable unofficial currency had been given to the idea that the project manager's role was principally to expedite development, project manager funds had always been heavily weighted toward PEMA. Again in Fiscal Year 1965, project manager PEMA funding, at $1.86 billion, more than doubled RDTE funding at $734 million, but for the first time RDTE funding ($549 million) exceeded PEMA ($376 million) in the missiles and rockets area. It is not the point that project management was more heavily committed in the procurement area, but it is the point that project managers, like the commodity managers, reflected AMC's concern with the materiel life cycle as a whole, and their funding, like that of the commodity managers, shifted as emphasis shifted but was generally approximately two to one (later six and more to one) PEMA-RDTE. In other words, project management was not an adjunct to the AMC management system, but an integral part of it.

As from the beginning, actual operation, whether under project manager, commodity, or functional control, was carried on in the commodity/functional organization. The RDTE portion of this organization was funded at $1.625 billion in the third year. Research accomplishments included the development and field testing of an analytical model for cross-country mobility, improvement in performance

of aircraft rotor propulsion lift systems, and advances in individual and aircraft armor protection technologies. There were also improvements in the strength, ductility, and weight of metals; in fuel cell and thermoelectric generator design; and in fuel and engine technologies. Development accomplishments included application of armor to aircraft, improvement in aircraft performance, application of microelectronics developments to tactical communications, and further improvements in mobility support equipment. While these technical accomplishments were in process, further gains were made in RDTE management with improvements in technological forecasting, information systems configuration management, and life cycle guidance. Notably, late in the year, a survey of technical management and effectiveness in Army laboratories was begun.

AMC commodity commands found their first year in exercise of complete responsibility for contract execution a harrowing one. But, despite the added complication of late release of 22 percent of the program, their PEMA execution performance (77 percent of a $3.627 billion program) was about the same as the previous year. While the award of incentive contracts was also about the same, competitive procurement was further stressed, and the use of letter contracts again declined. A significant gain was made in the use of multiyear contracting. In addition to the more sweeping changes in procurement and production management taking place, Fiscal Year 1965 saw the initiation of the AMC plant equipment replacement program under which badly worn and obsolete Government-owned production equipment would be replaced at the rate of five percent of total equipment each year.

The third year was still a year of trouble in the preparation of the AMP. Guidance to AMC was provided late and in increments rather than in a package. Force basis information did not include recent authorizations for electronic equipment. MIDA found that its files did not agree with data maintained within the NICPs. Gross requirements computation therefore had to be adjusted before detailed requirements could be computed. Work on refining and streamlining the requirements system resumed. Meanwhile, AMC and DA preplanning for PEMA obligation and AMC concentrated management in each of the commodity areas produced a Fiscal Year 1966 PEMA budget which was 99.1 percent acceptable to OSD. The scale of funding was to prove of great importance in the following year.

The supply system in transition maintained its Fiscal Year 1964 record with respect to on-time shipments for five months and bettered the record for two months, nearly meeting its new 85 percent objective in January 1966. But the shock of accountability change, increasing requisitions from Southeast Asia (SEA) and for Dominican crisis forces, and a new increase in items out of stock and on back order lowered performance in the last five months of the year. Even with these problems, the on-time shipment level was 74 percent in the final month of the year. Back orders had reached their second AMC peak, 44,000 more than the Cuban crisis peak, but this was only the beginning of the back order problem.

Another aspect of supply, which extended into the acquisition area as well, was international aid. At activation and in the first year, AMC acquired an international aid program consisting of $1.24 billion in Grant Aid and $1.16 billion in Military Assistance Sales. First year deliveries amounted to $562 million in Grant Aid and $397 million in military sales. Second year deliveries were $452 million and $247 million against a program total smaller by $200 million. The third year program was $1.17 billion in Grant Aid and $1.04 billion in military sales, not a significant change, but deliveries approached the first year level at $547 million in Grant Aid and $373 million in military sales. In short, the international aid programs were continuing major programs requiring concentrated management. Throughout the third year the nature of headquarters management, divided among the Mutual Security Office, an activity working with and through that office, and SMC elements, was under study.

By the end of the year the study of international aid functions, studies of all aspects of the AMC-SMC collocation, and the AMC Board's study of AMC's potential to accomplish its wartime mission had culminated in a headquarters reorganization. While further consolidation and standardization of functions and responsibilities throughout the command

and further definition of the AMC logistics system was the basic aim in this reorganization, General Besson, his staff, and his commanders also incorporated specific provisions for a dramatically increased workload. AMC was to provide for the support of operations (force mobilization and commitment) plans even when timely troop lists were not available. Furthermore, AMC's operations planning would include stating resupply requirements for theater based forces, forecasting additional nonrecurring materiel requirements for units to be deployed, and establishing automatic resupply requirements for deployed forces. In other words, a quick reaction requirements and supply system minimally dependent on precise force and specific item requirements information was necessary. Such a quick reaction system demanded that AMC forecast limitations in procedures and authorities, that it improve readiness reporting and AMP preparation, that it be prepared to redistribute stocks throughout the world to meet special demands, and that it develop its own liaison system with commanders in the field. The quick reaction system also demanded development of automatic resupply packages and bills of materials for oversea base construction. It demanded improved secondary item control as well as refinement in major item control.

While major item control was mainly a function of the commodity commanders, secondary item control was almost entirely in their hands. The mechanisms of control had been increasingly standardized through adoption of like subordinate command structures, through consolidations of TASAMS, through assignment of new procurement responsibilities, and through continuing implementation of DOD, DA, and AMC information, data, and management systems. Also, and importantly, General Besson had, in the second year, directed a study and formed an ad hoc committee on commodity management. During the third year commodity management offices were established or realigned in the commodity commands and centers to serve as focal points for exceptional and intensive life cycle commodity management of critical major items. Under the terms of a commodity management regulation completed by the committee in the third year, these offices became permanent as did arrangements for appointing commodity managers. Commodity managers were conceived of as performing project manager-like functions at the level of criticality just below project management. The potential for major item management was thereby improved, but the functional system was left to deal as best it could with secondary items.

So ended the third year. AMC's accomplishments in designing and operating a peacetime logistics system had been many. While there were weak spots, performance had not suffered critically from revolutions in the system. Wartime potential was a problem, but there was a good conception of important needs in working toward a solution of that problem.

Fiscal Year 1966

As General Besson later said, a lesson of the Southeast Asia support experience was that crises should always come at the beginning of a fiscal year. The SEA crisis did come at the beginning of AMC's fourth year when total funding was expected to be $9.728 billion. Considerable juggling of tasks and funds characterized the next few months when most of the initial program was obligated. By year's end total programs amounted to $14.157 billion with about three quarters of the increase in PEMA. The final funding was only a partial indicator of workload. The first year of the Southeast Asia crisis was one of demand for immediate supply, first for deploying forces, and secondly, but almost concomitantly, for automatic resupply and for supply of repair parts and other secondary items.

The Army Stock Fund, funding source for many secondary items, including repair parts, was a revolving fund in which sales to using units paid for replenishment of stocks. During peacetime operation, controls were placed on purchase in order to keep stockage austere by doing more selling than buying. Anticipating problems in working with austere peacetime stockage, General Besson late in Fiscal Year 1965 directed a change for Fiscal Year 1966 in the usual procedure of buying quarterly those items whose stocks had been reduced below authorized inventory levels by actual sales. He first ordered purchase of the entire anticipated Fiscal Year 1966 allotment for a selected group of high value (hence long leadtime) items with

a stable demand history. Shortly after the beginning of the year, when the funding program was approved, he directed a full year's purchase of all programed items. Subsequently he directed the NICPs, who compute requirements and issue purchase orders for both stock fund and PEMA secondary items, to use shortcut methods to convert eight program changes, all increases, into stocks at the earliest possible time according to expected demand rather than actual sales. By the end of the year, actual sales, at $930.2 million, were up 53 percent over the previous year, and total obligations and commitments had reached $1.765 billion, 164 percent above the previous year. PEMA secondary item obligation had meanwhile gone up to $511 million, or 229.7 percent more than Fiscal Year 1965. Despite a six to twelve month production leadtime, early obligations substantially increased deliveries from early in the year on, thus improving the stockage position, but sales continuously exceeded deliveries, making repair parts supply a problem, as it had been a problem in World War II and the Korean War.

The basic repair parts problem was an almost identical descendant of its ancestors—peacetime stocks are always deficient in a wartime situation, and demands raised by new equipment, new uses of equipment, new terrain problems, and new tactical problems can be only uncertainly predicted. But in the Southeast Asia crisis, quick response and anticipation had lessened the problem. OSD also introduced Red Ball Express which, unlike its World War II predecessor, was a project for rapid communication of critical repair parts requisitions, rapid filling of those requisitions, and air lift of supply. AMC at once swung aboard the Red Ball Express. Items were drawn from stock and from procurement, and the Continental Army Command withdrew available items from the continental United States (CONUS) troop supply when AMC could get them in no other way. Red Ball worked; AMC supplied 93 percent of requests within the due-date, generally targeted for 168 hours from requisition in Vietnam to delivery in Vietnam.

Red Ball was of course exceptional; the vast bulk of supply, at an average for the year of 287,000 line items or about 175,000 tons shipped monthly, could not be handled in Red Ball fashion. With the monthly average of lines due for shipment up by 105,000 over the previous year, the percentage of on-time shipments naturally fell, to a yearly average of 68 percent per month. Lines delayed for shipment and back orders peaked (back orders—about 436,000 lines) in December 1965. Thus many problems, largely problems of stating requirements, funding, leadtime, unusual volumes of priority requisitions, and improving the readiness base, remained, but the supply situation as a whole was good. Materiel was getting to Vietnam and to deploying troops, if necessary at the expense of other customers. Push, that is automatic, supply was working. AMC during the year computed 18 push packages and shipped more than 800 packages for a total line item volume of substantially more than 1,000,000.[2]

To improve supply in the Pacific area, AMC secured the transfer from European service of roll-on/roll-off service ships capable of handling trailers and trucks rolling onboard from supplying depots and rolling off directly to issuing depots in Vietnam. Two ships operated by the Military Sea Transport Service with cargo trailers managed by the MTMTS began to sail from Okinawa to Vietnam in March 1966. AMC assisted in determining and furnishing cargo loads and priorities. By the end of the fiscal year, these ships had completed 20 sailings from Okinawa carrying 1,871 vehicles; 1,214 trailers; and 772 CONEX (container express) containers loaded with 81,866 measurement tons of materiel. Roll-on/roll-off procedures avoided the work, delay, and documentation of no fewer than five intermediate handlings from supplying to issuing depots. The CONEX containers were themselves a boon to supply and using forces. These shipping containers simplified packing and cargo stowage and handling. Once overseas they served in lieu of covered storage and were shipped and used for binned storage of small parts. They were also used as offices and stockrooms. During the fourth year, AMC shipped more than 110,000 CONEX loads and exhausted the CONUS supply of CONEX trans-

[2] There were, for example, roughly 1,500 line items in each 15-day increment of resupply for an infantry brigade.

porters. Procurement was expedited on these now essential containers.

AMC's huge Fiscal Year 1966 supply effort did not eclipse but rather highlighted other areas of AMC management. Expedited replenishment of stocks was obviously necessary. New items were in even greater demand than before, and the unusual nature of combat in Southeast Asia generated needs for items still in development, commercial items not in the Army system, and modifications to standard items. International aid requirements again rose. Requirements, particularly for munitions, caused reopening and refurbishing of production plants in standby. New work and more work required more employees, new techniques, and new delegations of authority.

In the face of this workload, the reorganizations, readjustments, and realignments of the third year paid off. The new headquarters Major Items Directorate, a translation of the Materiel Readiness Directorate, got a better hold on major items requirements, and established AMC procedures for the DA-directed Army Asset Reporting System, a vital tool for AMC. An automated system was devised for comparison of authorization and assets data from equipment distribution planning studies in order to improve those studies. Preparation of the AMP was still a problem, but improvement of computer facilities at MIDA helped, and steps were being taken to automate AMP preparation in the NICPs.

The new Operational Readiness Office (OPRED) was in full swing in the headquarters, and counterparts were being organized or designated, and heavily loaded with work, in the commodity commands. The establishment of AMC Customer Assistance Offices under OPRED monitorship in oversea commands significantly aided in interchange of operational information and in AMC quick reaction to technical and other logistics assistance requests. Quick Reaction Assistance Teams were formed and deployed where AMC could give intensive help in scientific, engineering, maintenance, and requirements problems. Supply assistance teams were also organized to assist oversea commanders in the solution of large scale supply, maintenance, and logistics support problems. In CONUS, materiel readiness liaison visits began.

Vietnam placed new requirements on the project managers, 44 of them managing 46 systems by the end of the year. Those in aircraft and electronics saw the Southeast Asia conflict becoming an aerial and communications war, and expedited fielding and updating of fielded systems. Flat-Top, the floating aircraft maintenance facility, received an OSD priority assignment which resulted in ship delivery in January 1966 and arrival on Southeast Asia station in April 1966. Helicopter armament was provided for two helicopters standardized during the year. Projects were established in the munitions field for the production of bombs and 2.75-inch rockets. The Project Manager for Rifles stepped up delivery of the M16 rifle and began limited procurement of a new 40 mm grenade launcher. All terrain and swimming vehicles were much in demand, and a new project managership for Amphibious Lighters was established, as was a project managership for POL (petroleum-oil-lubricants) Distribution Systems.

In RDTE, where the annual program amounted to $1.66 billion, previously programed projects, including those project managed, occupied the bulk of effort, but frequently under acceleration. Some development items, like riot control agents and munitions, were quickly fielded, and other special requirements, like tunnel destruction and denial devices, were rapidly developed. Integration and development of the AMC RDTE system continued, and a position of Deputy (to the Commanding General) for Research and Laboratories was established to emphasize research management, particularly long-range and coordinated research planning.

The procurement version of an expedited action is the letter contract. The Southeast Asia crisis accordingly sent the numbers of letter contracts soaring, to 514 contracts (vs. 14 in Fiscal Year 1965) obligating $1.59 billion. While this was not the preferred way of doing business, it was a necessary way, and cannot therefore be said to represent any slippage in management. Procurement management in fact improved, aided to some extent by the volume of business, with 148 incentive-type contracts awarded for a value of $1.46 billion, double the number and value of such Fiscal Year 1965 contracts, and with competitive procurements

accounting for $3.32 billion or 38.4 percent of total awards. While competitive procurements represented four percent less of the total award amount than in Fiscal Year 1965, quick response also required more sole source negotiated contracts. Multiyear awards, good because of the flexibility of the procedures, numbered 29 at an obligation value of $96.1 million, and small business awards, good for a balanced national economy, exceeded the $716 million goal by nearly $.5 billion.

Despite the rush of SEA business, AMC in the fourth year again exceeded its OSD cost reduction goal, $618 million, with savings of $888.2 million. SEA took its toll in other economy areas, however: eight Government-owned, contractor-operated plants were reactivated, and General Besson authorized overhire and overtime in order to get the work done. Throughout the command, 21,215 permanent and temporary civilian spaces were specifically identified as earmarked for the Southeast Asia support workload, but some of the command's harried workers very unofficially estimated that anywhere from 40 to 80 percent of AMC's total effort was in that workload.

AMC's fourth year failed to end, except on the account books. Development, procurement, and supply efforts were in full stream, sometimes flood. Integration and definition of systems continued apace, as did implementation of DOD, DA, and AMC plans, projects, and systems. A reorganization had taken place, but speeding change could alter that. The DA Board of Inquiry on the Army Logistics System, the Brown Board, had been investigating during most of the year, and in May 1966, after a preliminary report, had moved into AMC Headquarters for final investigation and compilation of a final report. One of the matters considered by the Brown Board was the limits of the wholesale logistics system. These boundaries had become increasingly vague as AMC had moved into the theater on requested missions of technical assistance. Also, while the theory behind TASAMS had posited direct communication between oversea requisitioner and NICP, practice proved the theory worked only when everything was going according to plan and the requisitioner knew with which NICP to communicate. For Red Ball, push packages, and for requisitions involving a number of commodities, a clearinghouse was needed, and there was clearinghouse work in determining the commodity and priority basis for shipments. AMC Logistics Control Offices in port of embarkation areas served temporarily as clearinghouses, but the necessity for similar permanent arrangements was still in question. Despite the questions, an enormous job was being done, and done well.

Fiscal Year 1967

Although the fourth year did not end, AMC's fifth year did begin. But the point at which it began is uncertain. Its characteristics were discernible, at least by hindsight, in Fiscal Year 1966, but many characteristics did not become readily apparent until late in Fiscal Year 1967. In Army logistics management, it was a year like 1944 when production and supply leveled off on a high plateau, various controls began to be imposed or tightened, and the dimensions of many logistics problems began to be known. It was, as General Besson's Deputy, Lt. Gen. William B. Bunker, informally remarked, the last year in which AMC could claim to be an adolescent; after five years' growth, the command should be mature enough to understand its capacities and its weaknesses and to accept the adult responsibility of planning its own future and that of centralized Army logistics management.

Fifth year expectation was for a total program about $3 billion less than the Fiscal Year 1966 total program of just over $14 billion. Although by year's end the program had risen slightly higher than the previous year, to $14.419 billion, appropriations and allocations were late in coming, so AMC had to try to live even under expectation for some time. Since AMC, like the Technical Services before, had always scheduled awards or obligations according to released program, late release led, to put it mildly, to scheduling confusion. This experience provoked a search for a new scheduling mechanism.

In the PEMA major items area the admittedly somewhat risky method of smoothing scheduling was to plan against anticipated releases and check by milestones. That scheduling plan could not be put into effect in Fiscal Year 1967, but it was planned for the following fiscal year. A complicating fifth-year problem, as General Besson pointed out, was that

the first period of a buildup crisis, in this case Fiscal Year 1966, is a contracting time, while the second period, in this case Fiscal Year 1967, is a production time. Since contracting continued unabated in the second period, AMC procurement personnel had to divide their energies between contracting and production. Procurement detachments and re-established depot elements helped with procurement, handling 17 percent of AMC line item actions, and General Besson added 2,300 personnel spaces to handle such contract administration (as for ammunition loading plants) not transferred to DCASRs, to handle production testing, and to follow up on production problems reported by the Defense Contract Administration Service. Thus aided, the commodity commands weathered the year and equalled the previous year's program award record of 87 percent. Out of 22,000 major end items, they provided close production manaement for 1,300 items and intensive management for 235. Production of 119 major items was still critical by the end of the year.

Other performance indicators, in addition to amount awarded, established a good procurement record for the fifth year. Multiyear procurements were up in value over the previous year although off four in number. Competitive procurements were down slightly both as to value and percentage of total awards, but competitive procurement actually increased in the sole source dominated aircraft area. Incentive contracts increased both as to number and value, and small business awards dropped less than one percentage point to 13.5 percent of total awards.

Real trouble came in the secondary item area. Army Stock Fund sales were up 39 percent over the previous year to $1.33 billion, and obligations and commitments were up to $1.809 billion (four percent over Fiscal Year 1966). But neither sales nor commitments tell the story. Obligation authority was so erratically received that monthly obligations varied from $108 to $172 million in the first six months of the year, from $24 to $112 million in the next four months, to $35 million in May, and finally to $247 million in June. No amount of juggling could compensate for this wild fluctuation, and clearly some means needed to be evolved through which OSD could be convinced that leadtime demanded program availability on a reasonable schedule well in advance of field requirements statements. AMC, through a contractor, had been working since 1964 on a method of secondary line item stratification which would identify line items by quantity, value, and time period, and factor against this basic information back orders, leadtimes, stockage objectives, and requirements. The first line item budgets accordingly computed were presented early in Fiscal Year 1967. General Besson proposed to carry secondary item stratification several steps further to permit intensive management by system, to predict out-of-stock situations, to indicate shortages and excesses, and to provide input for financial reports and special management projects—in short—to give more visibility to secondary items and their management. His proposal was to be one of the factors leading to a reorientation of the requirements and programing process.

General Besson's buildup periods after contracting and production were times of concentration on repair parts and maintenance. As contracting and production periods had characterized the fifth year, so did the repair parts and maintenance periods. The secondary item problem was in large part a matter of repair parts, and maintenance problems came soon thereafter. The closed loop system was evolved to handle maintenance. Under this system using units turned in end items for rebuild and were furnished rebuilt items already in the system. Since AMC maintenance had been austerely funded from the beginning, and since there was little relaxation in the OMA (operation and maintenance, Army) 2300 funding which covered maintenance, the command was illy prepared to take on an expanded maintenance mission which required availability of facilities, workers, and components for rebuild. Maintenance was of course undertaken on a hand-to-mouth basis considering that Fiscal Year 1966 funding was $391 million, Fiscal Year 1967 was $446 million, and the Fiscal Year 1968 projection was $474 million against an estimated total fiscal year requirement estimated to be $656 million. Considerable reprograming was necessary as requirements mounted. The Army having taken to the air in Vietnam, aircraft rebuild requirements frequently

exceeded expectations. Flat-Top was a major asset in aircraft maintenance since it reduced the parts pipeline, and permitted the early return of rebuilt components to use. From the customer's point of view, Flat-Top substantially increased availability of operable aircraft, provided a ready source of emergency support, and allowed for a mobility and flexibility of support beyond any previous experience.

Despite the achievements of the fifth year, the maintenance problem remained. General Besson predicted accelerated wearout of most principal items under the intensive use and rigorous environmental conditions in Southeast Asia. The problem was the lack of good means of anticipating and projecting requirements. A number of programs to acquire and use maintenance data were stepped up, and a plan to integrate maintenance requirements planning with both major and secondary items planning was intensified. The closed loop support system was expected to generate much useful data, as was the projected AMC program control of worldwide depot maintenance.

Supply, aside from the secondary items difficulties, offered no immediate problems. The monthly average for on-time shipment in the fifth year went up one percentage point over the previous year, and month-to-month variations were small. Under the heavy requisition volume, this was a good record. Back orders reached a new peak of 442,000 in November 1966, but this peak was only slightly higher than the previous year's peak, and the end of the year total was slightly less than that of Fiscal Year 1966. Meanwhile, the stockage list had increased by 13 percent to 396,000 items, and stocks on hand had increased by 18 percent to 373,000. The percentage of items out of stock had dropped to six. Depot receipts were climbing, but depot shipments, at 2.044 billion tons, were still greater than receipts. Furthermore, a large amount of goods, estimated at 300,000 to 400,000 tons, was shipped directly from producer to customer. Red Ball was even more effective than in the previous year, ending Fiscal Year 1967 with 96.6 percent on-time fill. The year's Red Ball requisition total amounted to more than 150,000.

Fifth year RDTE funding amounted to $1.7 billion, 50 percent project-managed. Quick reaction to Southeast Asia special requirements continued to be an important part of both development and testing effort but was not of great funding significance. Although RDTE was and had been a more stable funding area than any other, even there the demand was for more control and more visibility. AMC accordingly designed procedures for better control of these obligations and carryover and stepped up work on the Army/AMC RDTE Information System, an Army plan for an automated program and management information system. Research accomplishments included significant advances in materials for lightweight personal and vehicle armor, development of paints affording countermeasure protection for combat vehicles under electro-optical surveillance, and application of new test equipment theories. Technical accomplishments included the provision of new means of tactical missile guidance, control, and propulsion; development of grenade launcher ammunition; provision of a light, flexibly packaged food packet for long range combat patrols; development of light body armor; and numerous other developments in every commodity field.

The leveling off of several programs in the fifth year in contrast to the year's roaring pace of work, apparently ever mounting requirements, and the number of problems encountered and foreseen kept many of the old questions in the foreground and raised some new ones. Could AMC continuously do more with less? Were turbulence and uncertainty ineluctable features of program and requirements management? Could AMC do the forecasting which had been one of the aims of its organization? Could a management information system be developed which would give a better warning of problems to come? Could better slices or interfaces among functional, commodity, project, and resources management be arranged? What were AMC's responsibilities in the design of the Army logistics system? Fiscal Year 1967 problems seemed to indicate that answers to these and other questions could be found only when each element of the workload could be precisely described and quantified, and only when enough information had been accumulated to verify the utility and efficiency of each equipment system and each logistic service.

For example, in the area of description and quantification there was the problem of man-

power. AMC had done more with less for several years when the Southeast Asia crisis came. To meet that crisis, overhire and overtime had been used. In Fiscal Year 1967 the command reached activation level personnel strength. New manpower limitations were imposed, and overtime was put under a ceiling more limited than the previous year. While the extent of workload, hence manpower requirements, was painfully apparent to AMC personnel who got the work done somehow, the traditional means of quantifying workload had little meaning for OSD. The search for a quantification system began.

During the year the Brown Board rendered its final report on the Army logistics system. AMC interest in the report was broad, and the Chief of Staff, Army, shortly directed the implementation of many Brown Board recommendations. These implementation tasks were so many and so varied that no clear pattern soon emerged. It was clear, however, that the Brown Board believed changes in the commodity and materiel information structures would be to AMC benefit. ECOM headquarters was accordingly restructured along the lines recommended by the Brown Board, and many other changes began to be put into effect. Just how many answers to questions this activity provided was not known, at least not in the fifth year. The prospect was one of further shakedown and shapeup while continuing to handle a total program estimated to be about $100,000 less than that of the fifth year. To these ends, an effort was being made to get NAPALM out of the bog of systems, priorities, equipment, and personnel shortages into which it was slipping. Also, OPRED and other elements of the command had stepped up immediate and logistics systems planning, and General Besson had created a long-range planning element in his comptroller's office. A renewed effort, with much urging from General Bunker, was being made in the discovery and application of new management techniques, such as mathematical modeling and systems analysis. The sixth year, the first year of adulthood, promised to be an interesting year even if not a more comfortable period than its predecessors.

Fiscal Years 1968 and 1969

The sixth year was not a comfortable year in AMC, but it was another year of substantial accomplishment. Total program again ascended, to $15.275 billion. The PEMA portion of that program was $9.645 billion by the end of the year, and it was 88 percent awarded. Since program releases came earlier and in larger amounts than the previous year, program turbulence was not as great, but fluctuating distribution demands created their own turbulence. No critical major item problems other than those normally caused by the continuing need for production management and for anticipation of requirements were outstanding at the end of the year, but there was no assurance that unanticipated or only vaguely anticipated major item requirements might not arise.

The milestone procurement plan devised in the previous year worked well, as indicated by the award rate. The procurement plan in action consisted of forecasting program releases, obtaining advance requests for military interdepartmental purchases, and completing as much administrative work as possible short of award prior to program approval. The use of letter contracts rose to a new high—670 contracts at a value of more than $2 billion. At the same time the value of incentive contracts increased to $1.76 billion but on fewer contracts than in the previous year. Price competition again decreased slightly, partly because there were large volumes of procurement in weapons, combat vehicles, ammunition, and aircraft areas to which competition was not applicable.

Supply for Southeast Asia continued to be good, but the total of on-time shipments dropped from Fiscal Year 1967's average of 69.4 to 60.6 percent. On the other hand, the number of line items delayed for shipment generally declined after a high in August to a year end total less than the previous year. Back orders hit a new peak, 460,000 in the August high, and likewise declined to the end of the year. Tonnage shipped again exceeded tonnage received.

Turbulence was again the name of the game in the Army Stock Fund program, and secondary items continued to be a major AMC problem. Stock fund sales were off slightly at $1.3 billion as were obligations at $1.6 billion. Once more the problem was erratic funding and the failure to convince OSD that leadtimes made

the direct relationship of sales to obligational authority impractical. Stratification of stocks was well underway, but prediction of requirements still in many cases required more clairvoyance than computer time. Computer time and information to feed it was, however, a problem. Essentially, item usage factor, assets, and requirements information had to come from using units, or from units in direct support of using units. Whatever the field information system might become, in Fiscal Year 1968 it was certainly not adequate to the demands placed upon it. Computers in AMC and elsewhere were continually overloaded and undermanned. Data systems development, programing, and information verification were problems everywhere. AMC's extension of ownership for high dollar secondary items into field depots, which began to be tested in Fiscal Year 1968, offered a ray of hope that AMC would be able to supply its own assets and usage data at least to that point.

Information was also a problem in maintenance. Forecasts of assets available for repair often proved deficient, and difficulties arose from the fact that the condition of equipment put into the maintenance system could often not be estimated until it arrived at a maintenance depot. AMC put teams in the field to help improve the flow of equipment for rebuild, and developed procedures for a field assessment of the size of the maintenance job. AMC's maintenance program, originally approved at $474 million for Fiscal Year 1968, increased to $576 million in the fifth month of the year, was reduced by $9 million in February 1968, and finally reached $603 million by the end of the year. At this level, the program covered all the critical requirements as verified by the information then available and being developed in the closed loop and worldwide depot maintenance systems. But the prospect was for another maintenance funding shortage in Fiscal Year 1969.

Even in RDTE, where the total program was down in the sixth year to $1.226 billion, more information was needed. An informal AMC review of programs at mid-year (Fiscal Year 1968) indicated that while the record was improving, schedules were in many cases not being met on important hardware milestones, such as in process reviews and type classifications. The review also estimated that two-thirds of the RDTE program, roughly that portion not directly and immediately concerned with hardware development, lacked performance indicators and was therefore not sufficiently visible. Despite the information problem, AMC output in the research, development, test, and evaluation area remained high with new equipment and new models of equipment appearing in every commodity area.

The need for information, for quicker and more certain response to demands on the system, and the need to document performance, even in those many areas where it was from good to excellent, called for new and more sophisticated data systems, for more and better automatic data processing equipment, and for more and better trained workers. To the end of improving data systems and equipment, General Besson directed the upgrading of NAPALM, and the formation of the Automated Logistics Management Systems Agency (ALMSA) to concentrate the NAPALM development effort. ALMSA became an AMC class II activity in January 1968, and NAPALM development accelerated. The NAPALM schedule developed by the end of Calendar Year 1968 showed equipment selection for the commodity commands and centers and NICPs completed. It also showed equipment selection for part of the TECOM and data banks (such as MIDA) requirements completed. Final equipment selection for depots, and for the second part of the TECOM and data banks requirements were to be completed early in Calendar Year 1969, and for the arsenals and laboratories to be completed late in Calendar Year 1970. The implementation of systems and programs was scheduled for early in 1969 to early in 1971. Follow-on work, that is debugging, reprograming, and realignment of systems according to use and operating experience, was to begin with the data banks in the middle of Calendar Year 1969 and continue in all areas for the foreseeable future through 1972. The NAPALM cross level integration system was therefore to be operating in all areas but arsenals and laboratories by the end of Calendar Year 1970 or early in 1971. By the beginning of Fiscal Year 1972, the entire system was to be operating and in the process of change according to changes in logistics systems. AMC manage-

ment was not, however, laboring under the misconception that the tides of change could be held back until NAPALM was complete. As from the beginning, AMC's problems had to be attacked as soon as possible with all the resources possible, and here was the rub. Manpower resources had become a major problem —a problem intertwined with that of fiscal resources in the OMA area and with additional mission and special project requirements like those of NAPALM.

Tighter and tighter controls had been imposed on manpower over Fiscal Years 1967 through 1968 and into Fiscal Year 1969 when total expected funding amounted to $17.211 billion. During this period, AMC had discontinued MOCOM and established three major subordinate commands, U.S. Army Aviation Materiel Command, U.S. Army Mobility Equipment Command, and U.S. Army Tank-Automotive Command, in its place. A fourth major subordinate command, U.S. Army Sentinel Logistics Command, was organized on a cadre basis. Each of these new commands represented expanding missions and programs and, therefore, expanding resources requirements. The NAPALM action agency, ALMSA, more than doubled in size in its first year and projected a tenfold growth, mostly in the scarce skill areas of computer technology, programing, and systems analysis. Furthermore, the demand for intensive management, by project/product managers (66 of them by the beginning of Calendar Year 1969), by procurement and production specialists, by commodity managers, and by specialists of numerous kinds, had increased, and intensive management requires managers. Reception to AMC pleas for manpower made it even more apparent that efforts to define and display workload must be intensified.

The mid-Fiscal Year 1968 review which had concluded that more RDTE visibility was required also concluded that PEMA workload would increase with a greater volume of customer orders and the need to refill stocks drawn down for Southeast Asia. It was consequently necessary to maintain a high level of PEMA deliveries in order to accommodate the new workload. PEMA deliveries also needed to be kept up to take advantage of reducing administrative leadtimes. In the secondary item area, the review concluded that an improved stock fund sales to obligations relationship was a must, as was the continuing stratification, purification, and leveling off of the Army Stock Fund inventory. Also, stock fund supply discipline and financial management needed upgrading. In the OMA area, principally the central supply (2200 funds) and maintenance (2300 funds) areas, new management indicators of planning, programing, budgeting, and performance analysis were required.

One step toward improvement in all areas was the reorganization of the AMC headquarters on 1 July 1968. In this reorganization, the Directorate for Major Items became the Directorate for Materiel Requirements, charged with all or substantial portions of requirements planning and programing for PEMA, Army Stock Fund, maintenance, and other logistics support. All engineering became the province of the redesignated Directorate of Research, Development and Engineering, and shortly thereafter the director acquired a second hat as Deputy for Laboratories, the position of the former Deputy for Research and Laboratories. The Directorate of Supply, shorn of its requirements functions, absorbed the Directorate of Transportation. A clearer functional alignment resulted, but the reorganization was only a first step in the formulation and adoption of methods to increase visibility. Probing into the present, past, and future continued.

As one probe into present and future, General Besson in 1967 had asked the Army Materiel Command Board to study the impact on AMC of Department of Defense and Department of the Army trends. Not surprisingly, the board found the principal DOD trend to be toward the centralized control of materiel management. Both OSD and DA were increasingly trending toward weapons system management as the method of that centralization. AMC, by the very nature of its foundation and by its use of project and commodity managers, had been aboard this bandwagon since it started. But AMC's weapons system management had been intensive management as an exception to the normal functional pattern. In order to make weapons system management the normal pattern, AMC would need to control even more of the materiel life cycle process, and that control in turn demanded broadening the concept of wholesale logistics to include supply and main-

tenance overseas or wherever else a direct relationship with customers could be established. It also meant a restructuring of program and budget along weapon system lines, and it meant that AMC must take more of a hand than originally anticipated in the formation of logistics systems.

DCSLOG studied the implications of broadened AMC management and concluded that AMC should extend overseas on a weapons system management basis to command and operate oversea supply and maintenance depots and to set up a stock control and supply management system for worldwide assets. The stock control and supply management system would operate from CONUS. General Besson was in favor of the proposal, but he pointed out to DCSLOG that AMC lacked the resources in men and automatic data processing to perform the functions. General Besson also directed the AMC Board to study AMC's role in the development of logistics systems. The board concluded that AMC had wide responsibility for the development and recommendation of concepts, doctrine, systems, and procedures for wholesale logistics operations, subject to the doctrine, policy, guidance, and design control of DCSLOG and higher authority. In other words, the road to the future was open and AMC was on it. While some of the features of the road were becoming clearer, the destination was still shrouded in fog and distance.

Trends in Logistics Management

Some of the features of AMC's road to the future had been mapped early in the command's career. The need for a command information system employing a highly sophisticated data complex had been understood from the start. Efforts to control, improve, and integrate the research and development, procurement and production, and supply systems had met with considerable success. Containerization, largely designed, put into effect, and controlled by AMC, had proved to be an important trend in logistics management. But there were other areas where trends, older in some cases than the command, had not been assessed and evaluated until the command was in its sixth and seventh years. An examination of some of these trends, such as worldwide depot maintenance, Project OASIS, and fast deployment logistics ships, gives insight into both the past and the future.

Worldwide Control of Depot Maintenance

Prior to the reorganization of the Army in 1962, there existed little opportunity for the Army to achieve a unified and viable materiel readiness condition. Each Technical Service had developed its own materiel management and reporting systems and as a result there were a multiplicity of overlapping functions and duplications of effort. With the formation of AMC, it was possible to begin structuring a wholesale supply and maintenance system for the Army aimed at the vast improvement of Army materiel readiness. At that time worldwide depot maintenance control was largely centered in DCSLOG where Technical Service and oversea command depot maintenance programs were reviewed, approved, and funded. SMC took over Technical Service maintenance workloading and scheduling, actually handled as before through the various NICPs and NMPs. SMC accordingly consolidated the CONUS program for DCSLOG approval, while the oversea commands continued to report directly to DCSLOG.

Efforts to improve the Army maintenance stature were made prior to the reorganization; but though a "do or die" emphasis was being placed upon correcting the poor state of Army materiel readiness brought to light during the buildup for the Berlin crisis, corrective maintenance programs were in their infancy and little accomplishment could be detected in August 1962 when SMC became operational. Two months earlier, AR 11–14, "Army Programs—Attainment of Materiel Readiness" had been published. This regulation included a far-reaching statement of Army maintenance requirements and implemented "Project ARM" (Army Ready Materiel) that reached into all levels of materiel maintenance from the top management level to the "man with the wrench." The goals of "Project ARM" spread into the areas of funding, manpower, maintenance management, and integrated equipment

records, guidelines for none of which could be clearly drawn from the overall area of materiel readiness. It was felt that funding and manpower in sufficient quantities were problems that would always plague the Army; however, it was also believed that improvements in management systems and depot maintenance operations could attain demonstrable results in materiel readiness.

The overhaul and restoration of unserviceable Army equipment had always been of primary concern to the Army and a problem of proven difficulty to manage. Planning depot operations depended upon accurate and timely equipment status records. Information was therefore the first requirement. When SMC undertook the management of the depot maintenance complex of the Army, The Army Equipment Records System (TAERS), an outgrowth of The Army Plan for Equipment Record Revision (TAPER), both the result of "Project ARM," was in an experimental and developmental stage. What was sought was a more meaningful and responsive equipment status record system. Over the next six years the refinement and promotion of TAERS for the improvement of Army maintenance would be of continuing interest. General Besson saw in TAERS a method for improving forecasting techniques in the depot overhaul program. Past experience concerning estimated "turn-ins" of reparable unserviceable equipment, as opposed to actual receipts, had indicated a wide variance in both directions. Inaccurate predictions causing shortages in repair parts had been a major cause for slippage in depot overhaul schedules.[3]

To correct the situation, one of the major early assignments of SMC under TAPER and later under TAERS was to develop practical and measurable criteria and methods for forecasting the precise readiness condition of equipment that could be accomplished by the operator or crew. The result was the Equipment Serviceability Criteria (ESC) program that employed the "traffic light" concept using the colors green, amber, and red to indicate conditions of readiness: a green rating meant that equipment would perform properly for ninety days or more; amber indicated the equipment wouldn't perform ninety days; red equipment was deadlined. In March 1963, a list of selected items for which scoring criteria would be needed was published in Army regulations that made AMC responsible for the preparation, review, and revision of equipment technical publications prescribing procedures for evaluating equipment serviceability. In turn, additional manuals for table of organization and equipment (TOE) were issued for the Combat Arms. This application of ESC to materiel in the field and the reports resulting therefrom represented the first attempt in Army history to look uniformly at the readiness of Army materiel and equipment through an established management system. "Materiel Readiness Equipment Serviceability Criteria" were subsequently formalized in system regulations published 15 August 1968. DA Form 240 (Equipment Inspection and Maintenance Worksheet) was to be used to record readiness results.[4]

The aim of TAERS was always the production of essential maintenance information for commanders at each level, beginning with the operator, through the maximum use of automated procedures. Using TAERS information, commanders were to evaluate materiel readiness and were, additionally, to formulate decisions on product improvement, and equipment dependability, maintainability and serviceability. Basically, the new system meant getting rid of numerous old Technical Services forms and devising a new standardized, streamlined, and simplified records system designed to apply to Army equipment worldwide. The mere reduction of the number of old forms helped, but the data being fed back through TAERS could not be expected to rejuvenate the depot overhaul program immediately and in fact represented only a single aspect of the entire AMC/SMC effort to improve the maintenance of Army equipment.

General Besson believed that centralized SMC control of all Army depot maintenance shops would increase flexibility and would effect economies by a broader use of the existing shop facilities without regard for the former

[3] SMC Historical Summary, FY 1963, p. 123.

[4] Submission, AMCMA-PA to AMCHO, 10 Dec 68, pp. 2–3. (2) AR 750–57, 15 Aug 68, subj: Materiel Readiness Equip-Serviceability Criteria.

Technical Service affiliation. To achieve these results, the AMC commander proposed to control his depot maintenance activities through a centralized depot maintenance control center which he visualized as a central clearinghouse to receive overhaul requirements from all the commands and to place the requirements on the best available overhaul source.[5]

In November 1963, the Third U.S. Army was authorized personnel and funds for automation of TAERS program. From the results of the test program and information gathered from other field activities during the next two years, it was decided to rework the computerized program. At a conference at AMC headquarters during 31 January–4 February 1966, revised procedures were worked out that would coincide with local requirements and would also standardize the total program. The new standards were implemented during the third quarter of Fiscal Year 1967. Under the new procedures, programs were either developed or improved in the areas of reporting materiel readiness, non-available equipment or maintenance and supply downtime, equipment shortage and overage consolidation, materiel density, average non-available days at support maintenance, repair parts usage at support and organizational maintenance, and component density.[6] More accurate and timely forecasts of depot requirements was one aim of the revised procedures.

While these efforts to improve the maintenance information system had been in progress, AMC-SMC efforts to improve maintenance workloading, scheduling, and programing were also being made. The burden of detailed consolidation of commodity command maintenance programs, largely prepared under inherited Technical Service procedures, early proved too great for the numerically inadequate staff in the SMC Maintenance Directorate. Depot maintenance workloads continued to be imbalanced. General Besson accordingly directed the establishment of a class II activity at Letterkenny Army Depot to provide the central control needed.

[5] Ltr, Lt Gen F. S. Besson, Jr. to CGs of all AMC Subordinate Comds, 1 Apr 63, subj: Depot Maintenance Programs.

[6] Submission, AMCMA-PA to AMCHO, 10 Dec 68, pp. 5–6.

On 1 July 1963, the Depot Maintenance Control Center (DMCC), was activated as a functional extension of the SMC Directorate of Maintenance with a primary mission of programing and scheduling that would permit tighter control of depot maintenance than had ever been possible in the past. DMCC establishment happily coincided with the completion of the depot closings and consolidations determination portion of TASAMS, an Army program aimed at, among other considerations, selection of the proper number and types of depots to support Army maintenance requirements. Early efforts were devoted to an integration of the total effort generally along commodity lines. The effort resulted in depot closures with a loss of the then existing maintenance facilities and capabilities the Army would be hard pressed to furnish following the buildup of forces in Vietnam and the resultant increase in depot overhaul and rebuild requirements.[7]

From its modest beginning of management of those ordnance type items that had been in the hands of the Major Item Supply Management Agency, DMCC control responsibility was gradually expanded to include other equipments that had initially remained under commodity command control. As time progressed, the system of field level work ordering and reporting procedures established by AMCR 11–15 permitted DMCC to begin more effective scheduling of balanced workloads on the CONUS depots. The system had flaws, but competition for work schedules at the depots was reduced and depot commanders began to look to DMCC for guidance in accomplishment of the CONUS depot workload.

However, before substantial improvements could be effected, the Secretary of the Army established a Special Board of Inquiry headed by Maj. Gen. William C. Baker, Jr., to investigate the readiness conditions of equipment in certain Army units for the purpose of determining why such equipment failed to meet prescribed readiness standards and recommending corrective actions. The General Accounting Office (GAO) had been reporting unsatisfactory readiness conditions since February of

[7] Submission, AMCMA-PA to AMCHO, 10 Dec 68, pp. 5–6.

1962. GAO reported that formal periodic reports from units to higher commands often "contained inaccurate, incomplete, and misleading information, portraying a much better serviceability and readiness condition than actually existed.[8] The Baker Board concluded in its report of 23 September 1964 that, among other things, the Army repair parts supply system was in need of major improvement from unit to national level. Further, maintenance management and performance had not reached desired standards as evidenced from deadlined equipment figures and frequent failure to institute prompt corrective actions. The Baker Board recommended that materiel readiness be improved by revising the criteria and procedures for reporting readiness so that more realistic determinations of actual readiness could be ascertained; establishing a single basic Army regulation regarding readiness; re-evaluating TAERS with the objective of simplifying its application at the unit level; and coordinating all new or revised readiness reporting procedures, equipment serviceability criteria, and equipment record systems with all interested agencies. The board recommendations gave added impetus to improvement of materiel readiness, already a matter of the highest priority. Commenting on efforts to achieve a high state of materiel readiness, Sen. John Stennis of Mississippi, Chairman of the Senate Armed Services Preparedness Investigating Subcommittee, indicated in May 1965 at the beginning of the Vietnam buildup that he "would look for some great improvement in another 18 months because of the great deal of emphasis being placed upon materiel readiness by the Army, particularly since about October 1963."[9]

Quite naturally, the buildup and all the implications of it made the problem of materiel readiness, and depot maintenance support, and the need for rapid solution all the more acute. Additional interest in further simplification of the equipment reporting system came to light in Vietnam early in 1966. At the time, two reporting systems were in use: the asset reporting system established by AR 711–5; and the equipment experience system established under TAERS. There was considerable support for the institution of one report for both equipment assests and conditions. U.S. Army, Vietnam (USARV), subscribed to this objective, but considered it imperative that any changes in the reporting procedures should be thoroughly tested at all levels outside the theater prior to implementation in Vietnam. The AMC/SMC position was that reporting under AR 711–5 which had already been implemented in Vietnam should be continued for this system. AMC believed that all reported data should emanate from the unit property book or stock record account, and that the loss data should be reported by way of the modified TAERS form (2408–7) with materiel readiness reported by use of DA Form 2406 (TM 38–750). Summaries of loss data were to be reported to the Logistics Data Center and the Major Items Data Agency on a periodic basis.[10] So that depot worldwide maintenance operations could be realistically planned, there was a need for a simplified system of reporting equipment assets, condition, combat loss, and availability. USARV proposed to continue using the system it had already established.[11]

During this same period, AMC efforts to match workloads with resources, funding, man-hours, and facilities continued as a responsibility of the Directorate of Maintenance. When SMC was merged with AMC in August 1966, the Depot Maintenance Control Center became a functional element of the transferred Maintenance Directorate. Though some intelligence from oversea commands concerning depot requirements was filtering into AMC, overall control of worldwide depot maintenance was still primarily centered in DCSLOG.

During 1966 and the early part of 1967, staff elements of DA began evaluating various means to improve the overall management of the worldwide depot maintenance system, through the most effective and efficient use of available resources. These efforts were directed toward the development of a long-range comprehensive improvement plan rather than con-

[8] *Hearing* before the Preparedness Investigating Subcommittee on Armed Services, U.S. Senate, 89th Cong, 1st sess, May-Jun 1965 pp. 42–43.

[9] *Ibid.*, p. 51.

[10] Msg, Gen F. S. Besson, Jr. to Maj Gen J. E. Engler, CofS, AMC, Working Files, 24 Jun 66.

[11] *Ibid.*, 1 Jul 66.

tinuing to rely on the immediate solutions of problems as they arose. The increasing demands on the depot maintenance program resulting from operations in Southeast Asia revealed many inadequacies of the existing system. Past experience and finite evaluation indicated that a reasonable centralization of management below DA level was necessary to accomplish the long range improvement. Early in June 1967 the decision was made to assign sole responsibility for the management of the depot maintenance program to AMC.

Late in June 1967, General Besson was directed to begin to assume responsibility for management of worldwide depot maintenance on 1 July. The Department of the Army also called for a time phased plan for assuming complete responsibility by 1 July 1968.[12] General Besson assigned responsibility for development of the plan to his Director of Maintenance, Brig. Gen. John P. Traylor.

Under guidance established by General Besson, General Traylor, and his staff prepared the time-phased plan with a proposed concept of operation which was approved and forwarded to DA on 17 August 1967. DA approved the plan and concept of operation in November 1967.[13]

Under the approved concept of operation, final approval of programs and allocations to finance depot maintenance would continue to be made by DA. Funding would be direct to AMC for programs to be executed in CONUS, and direct to the appropriate oversea command for programs to be executed overseas. The single exception was for AMC-owned stock fund items stored in oversea depots. In these cases, the applicable NICP would forward a funded requirement to DMCC; it in turn would forward a funded work authorization to the appropriate oversea command.

The Commanders in Chief, U.S. Army, Europe (USAREUR), and the U.S. Army, Pacific (USARPAC), would continue to develop their own requirements, and to plan, program, and budget for depot maintenance programs to be executed within their commands. They would retain responsibility for execution of the programs established by AMC, and approved by DA. They would continue to requisition repair parts, operate and control the depot maintenance facilities, and to administer the contracts through which they would execute the program.

The fundamental change was that the Commanding General, AMC, would be responsible for the verification of worldwide requirements and for programing, workloading, technical standards, repair parts, and other support of worldwide depot maintenance. He would also continue to be responsible for budgeting programs to be executed in CONUS; and the execution of these programs. He would continue to operate and control the CONUS program but would extend his information and coordination responsibilities to the collection and reporting of depot maintenance information from worldwide depot maintenance facilities.

A coordinating office with Lt. Col. Conrad Davis as chief was established in the Maintenance Directorate to develop implementing procedures for the concepts as outlined in the time phased plan, and to act as the focal point for coordination of efforts by elements of AMC, the oversea commands, and the Department of the Army. A liaison team drawn from staff and field activities of the Maintenance Directorate visited the oversea commands to discuss common problems and to develop policies and procedures for implementation of the system concept by 1 July 1968. The final implementing document, establishing basic operational policy with implementing instructions, received DA approval and was forwarded for use by USAREUR, USARPAC, AMC Headquarters, and AMC commodity commands on 2 July 1968.[14]

Subsequent to 1 July 1968, the control office for management of the worldwide depot maintenance program was transferred within AMC from the Director of Maintenance to the Director of Materiel Requirements. During the period 8 July–26 November 1968, DMCC oversea branch representatives visited USARPAC and USAREUR to assist those commands with problems in implementing the basic plan. Both theater commands had prepared the basic program input cards, but delayed their submissions to DMCC until after adjustments to Fis-

[12] Ltr, AGAM-P(M) (20 Jun 67) LOG/DM, 28 Jun 67, subj: Central Control of Depot Maintenance.

[13] Ltr, DA, LOG/MCD 7428, 9 Nov 67.

[14] Ltr, AMCMA-MC, 2 Jul 68, subj: AMC Central Mgmt of Depot Maintenance Worldwide.

cal Years 1969 and 1970 depot maintenance programs were completed at the Worldwide Depot Maintenance Coordinating Conference held 2–10 December 1968 at Letterkenny Army Depot. Delays had resulted not only from the need for adjustment information, but also, and more significantly, because of problems in the development of local implementing procedures, the writing of programs, and the acquisition of machine time; however, it was expected that most of these problems would be resolved with implementation of the concept which was to be fully operational after 1 January 1969.

The assumption of worldwide control of depot maintenance by AMC was necessarily predicated upon a revitalization of its maintenance posture and capabilities. Actions to improve the Army maintenance program were initially concentrated in the development of regulations and systems. Subsequently, and especially since the Vietnam buildup began, AMC concentrated its efforts on two broad maintenance management projects designed to refine and develop the operations of its depot maintenance complex. These projects were TRIMMS (total refinement and integration of maintenance management systems) and OPTIMUM (obtain increased productivity through improved modernization and updating of facilities).

TRIMMS was initiated in March 1965 as a part of the overall program to improve maintenance management. Initial concentration of effort was toward a depot maintenance management system, and, because there were many separate projects already involved in this area, TRIMMS was designated as the vertical control of all maintenance projects to insure continuity, compatability, and total integration. In-depth surveys were completed of DMCC, the AMC commodity commands, and its Directorate of Maintenance, and at the request of Maj. Gen. Joseph M. Heiser, Assistant Deputy Chief of Staff for Logistics (Supply and Maintenance) the Maintenance Division of DCSLOG. Refinements to current systems were instituted where possible, as well as work on designs for the systems to be installed under NAPALM. Eventually, this project was to review and analyze all maintenance management systems within AMC; provide a totally integrated maintenance management system, with maximum automation consistent with good management; determine management information requirements at all levels; and provide a maintenance data bank that would provide meaningful, mechanically analyzed, and timely information. Active participation in the development of automated systems for maintenance being developed under NAPALM, both at the commodity command and depot levels was being monitored by the TRIMMS.

OPTIMUM was initiated in Fiscal Year 1967 as a long-range, comprehensive effort to modernize and standardize equipment, methods and facilities used in depot overhaul of all categories of materiel. "Modernization" was not restricted to acquisition or utilization of exotic *new* tools, machines and facilities. It was also applied to the updating of *existing* tools, machines, and facilities, and more so to the updating of methods. "Standardization" of machines and facilities was desirable because it provided a better means of control, and offered the economic advantage of procuring from a standard set of specifications. The Logistic Systems Support Center (LSSC) at Letterkenny Army Depot was assigned the task of developing and monitoring the implementation of the plan. Each installation with a maintenance mission established a "Modernization and Standardization Committee" to work with the LSSC people on the project. The project was planned to run through Fiscal Year 1970 and was divided into three phases: one phase was to survey what existed, beginning in the aircraft and automotive areas; the second phase was to develop a model shop that would be easily adaptable to processing various types of commodity items; and the third phase was to achieve the ultimate objective of creating a highly modernized plant.[15]

The trend toward the centralized control of worldwide depot maintenance through such programs as TAERS, TRIMMS, and OPTIMUM was part of a much larger DOD-wide trend toward centralized management at higher levels in accordance with the exact intent of the National Defense Act of 1947. Since 1962, when AMC was organized, these intensively and aggressively pursued programs have reflected DA and DOD thinking as formulated

[15] Submission, AMCMA-PA to AMCHO, 10 Dec 68, pp. 15–17.

by the study "Responsive Automated Materiel Management System—1968." The trend toward a more centralized and responsive worldwide depot maintenance system coincided with the buildup in Vietnam that required significant increases in depot maintenance efforts. Depot maintenance expenditures increased from $184 million in Fiscal Year 1963 to $500 million in Fiscal Year 1968. A program of approximately $900 million was envisioned for Fiscal Year 1969. The lion's share of the program was for aircraft maintenance. What was troubling General Besson regarding the depot maintenance program was forecasting requirements. As he pointed out to a group of materiel specialists attending the USAREUR and 7th Army Logistics Seminar at Wiesbaden, Germany, in July 1968, CONUS depot maintenance for Fiscal Year 1968 was forecast at $304 million in 1966, while actual performance was $673 million. What AMC was pursuing was a method for forecasting the requirements for depot maintenance and for perfecting the centralized control of maintenance as required on a worldwide scale.[16]

The difficulty of the problem could be seen in the situation regarding asset control over the engine for the M60 and M48A tanks. At the end of Calendar Year 1968, it was estimated that there should have been about 2,600 spare engines in the logistics system. Of these, AMC owned about half and the other half were below the worldwide depot level. AMC had only fragmentary information pertaining to those below depot level. Of the approximately 1,300 owned by AMC, 800 were in CONUS depots and the remaining 500 were carried on AMC accounts in oversea depots. AMC had accurate control over these engines; however, the remaining tank engines were always moving from spares to installed unserviceable and back to serviceable stock, and AMC was never able to reconcile the statistics received concerning them. This situation placed AMC and the Army Staff in a very vulnerable position when the command attempted to influence the budgeteers to give AMC the money needed to run the supply and maintenance program.[17]

AMC believed that it was on the road toward improving the depot maintenance operations. TAERS was proving helpful in solving the forecasting problems. TRIMMS was making inroads toward more efficient depot management and OPTIMUM was upgrading the depot facilities. The Southeast Asia operations were heavily involved in the programs and the retrograde of serviceable materiel through the Closed Loop Support system and the Worldwide Depot Coordinating Conferences were helping to resolve the depot maintenance problems. Envisioned as a long-range program, the requirement for AMC control of depot maintenance on a worldwide basis was accelerated by operations in Vietnam and the high deadline rates of equipment there and in other theaters.[18] General Besson was very concerned about the persistence of the deadline equipment problem that plagued the Army at the close of 1968. Commenting on this on 12 December, the AMC commander said "we must get a handle on the retrograde of unserviceable assets. AMC representatives in the oversea commands must intensify their efforts to improve retrograde movement of unserviceables, particularly those in the OASIS program." At this time, of some $200 million worth of OASIS assets in oversea depots, almost two-thirds were unserviceable. The funding of the program also presented problems that had not been resolved as yet.[19]

Project OASIS*

Coming at a time—August 1967—when, in the words of General Besson, AMC was "beset with a plethora of urgent requirements," the approval of the concept for AMC ownership and accountability of super-high dollar value

[16] (1) AMCB-2-67, Aberdeen Proving Ground, Md., 24–25 Oct 67, pp. vii-ix. (2) Speech, Gen F. S. Besson, Jr. to USAREUR and 7th Army Logistics Seminar, Wiesbaden, Germany, 20 Jul 68.

[17] Speech, Gen. F. S. Besson, Jr. to Army Commander's Conf, 3 Dec 68.

[18] Presentation, Brig Gen John P. Traylor, AMC, Dir/Maintenance before the Secy of the Army's Prog for the Comd Supervision of Readiness, Comd Presentation by AMC, 21 May 68, pp. 29–30, 32.

[19] (1) Minutes, AMCB Meeting, 11–12 Dec 68, Aberdeen Proving Ground, Md., p. 7. (2) Speech, Gen F. S. Besson, Jr. to Army Commander's Conf, 3 Dec 68.

*AMC Ownership and Accountability of Selected Secondary Items Stocked in Oversea Theater Depots.

secondary items in oversea depots was one more revoluntionary step toward the goal of greater visibility and centralized control over assets on a worldwide basis similar to the depot maintenance program launched two months previously.[20] The pressure on the Army to gain wider visibility over high dollar assets had been strong. For AMC had no visibility over assets below the depot level. Through the years the GAO and OSD had repeatedly pointed out programing and control problems, and finally on 18 February 1967, Deputy Secretary of Defense Cyrus Vance, directed the Army to develop centralized procedures for the mangement of requirements and assets of high dollar value secondary items, mostly spare parts, subject to AMC inventory controls on a worldwide basis. Originally, it was proposed that AMC would control some 25,000 items and extend responsibility down to user level rather than depot level. General Besson, in consideration of the job's magnitude, managed to reduce the lists to less than 1,000 prime items or to a total of about 1,800 including substitutes.

The implementation of Project OASIS, as the program came to be known, was a complete change in DA logistics procedures. Previously, all assets located in an oversea command were owned and controlled by the oversea theater commander. The change in procedures was made possible with the advent of high speed electronics communications and data processing techniques into Army logistics. So that the Army could manage its tremendous volume of assets and more precisely predict its future requirements, the change seemed logical, desirable, and necessary. In General Besson's view, the change from the then prevailing Army doctrine and tradition challenged the "professional logistical management 'know how' of AMC."[21]

In his memorandum of 18 February 1968, Mr. Vance issued a policy directive on the determination of secondary item requirements and budgeting. He acknowledged that the Army had achieved significant progress in the area of secondary item management for both stock fund and appropriation financed (PEMA) items. He pointed out, however, that additional areas required continued attention and improvement in the management of secondary items and in budgeting for them. He acknowledged that OSD had not been able to reach a common position with the military departments on basic requirements which, in turn, had led to budget decisions which reduced the amounts requested for stated requirements. He therefore issued basic guidance which had as its goal the improvement and standardization of secondary items requirements, computations and detailed data contributing to the preparation of budget estimates. Specifically, he directed that requirements and assets for high value reparable and other high cost items would be included on a worldwide basis, subject to the control of the cognizant inventory control point.

Based upon the policy change in June 1967, the Chief of Staff of the Army directed the establishment of a DA task group to develop the required techniques and procedures for instituting the necessary procedural changes.[22] The task group was charged with developing improved management techniques based upon the concept of AMC ownership and accountability of selected secondary items stocked in oversea theater depots, now referred to as Project OASIS.

The implementation date for Project OASIS was established originally as 1 January 1968 for USAREUR and USARPAC, less Vietnam, with extension to Vietnam effective on 1 April 1968. Since the oversea commands were unable to meet these dates, actual implementation occurred on 1 May 1968 for all commands except USARV. The OASIS program was scheduled to be evaluated by DA during February and March 1969, at which time a decision would have been made concerning the value of and possible expansion of the concept.

Under the former system, when the oversea theater commanders controlled the theater as-

[20] Ltr, Gen F. S. Besson, Jr. to his commodity comdrs, 1 Sep 67, subj: AMC Ownership and Accountability of Super-High Dollar Value Secondary Items In Oversea Theater Depots.

[21] (1) *Ibid.* (2) Speech, Gen F. S. Besson, Jr. to USAREUR and 7th Army Logistics Seminar, Wiesbaden, Germany, 20 Jul 68. (3) Speech, Gen F. S. Besson, Jr. to Army Commanders' Conf, 3 Dec 68. (4) AMCSU Historical Summary, FY 1968, p. viii-4. (5) CSM 67-257, 19 Jun 67.

[22] *Ibid.*

sets, AMC's visibility of these assets was only as accurate and timely as the asset reports submitted by oversea commands. Furthermore, once stocks passed through the CONUS port of embarkation, accountability for them in effect was lost until receipt at the oversea depot. Thus, the amount of inventory in the pipeline was never really known to any degree of accuracy.

Since OASIS asset data at the oversea theater depots had been maintained at the appropriate NICP, the item manager at the NICP had been able to function on a worldwide basis, with the flexibility of meeting shortages in one command from any other command. Additionally, the concept included procedures for maintaining intransit accountability of OASIS items. The item manager now had available much more timely, accurate, and extensive data upon which to base his management decisions, compute requirements, and justify his budgetary submissions. The new system did not change significantly the oversea theaters' supply procedures except for the requirement to transmit transaction data to the appropriate CONUS NICP daily. Also, the oversea commands no longer submitted replenishment demands when a reorder point was reached. The NICP would automatically "push" supplies to the oversea depots. Depot stock levels and reorder points were computed each month by the NICPs. Oversea theater commanders were informed of the revised levels and were allowed to suggest changes resulting from local experience.

The greater control and knowledge of worldwide stocks at AMC allowed the customer's requirement to be met from any storage location anywhere in the world. Stocks could also be redistributed and surpluses avoided. Procurement was to be based on total global requirements rather than piecemeal requirements. Through OASIS procedures, accountability for materiel in transit could be maintained and the "push" procedure was thought to be conducive to greater utilization of the containerization program. In the main, it was thought that OASIS, through a greater visability over assets, would foster the filling of requisitions and result in the reduction of equipment deadlines.

Within two months, in September 1967, after the OASIS concept was announced, the Worldwide Logistics Management Office (WWLMO) was established as a separate office under the AMC Director of Supply. Effective with the AMC reorganization of 1 July 1968, timed to coincide with the implementation of OASIS and the assumption by AMC of maintenance program responsibility for Army equipment on a worldwide basis, WWLMO was put under the Directorate of Materiel Requirements, a combination of the former Major Items and Supply Directorates. The mission of the WWLMO was to direct the operations of all AMC activities involved in the new mission of ownership and accountability of secondary items in oversea theater depots.

Shortly after the Worldwide Logistics Management Office was established, it became obvious that detailed implementing instructions in many areas had to be provided to all AMC elements involved in Project OASIS. Basic policy and implementing instructions were provided by Department of the Army to AMC, USAREUR, and USARPAC on 5 January 1968.[23]

In addition, guidance was necessary in such related areas as administration, transportation and containerization, reports, international logistics, and the like. To assure that such diverse guidance was properly controlled and coordinated, and that all of it would reach the designated OASIS personnel in every command and activity, WWLMO directed that an Administrative Plan be prepared, incorporating into one document all the guidance provided to AMC elements. Based upon the concept and general guidance from DA, the various staff elements within AMC Headquarters were asked to develop some of the detailed procedures involved. However, the bulk of the plan was developed by the WWLMO. The AMC Administrative Plan on OASIS implementation was published on 1 February 1968. The plan was distributed to all AMC elements involved in Project OASIS, including NICPs, CONUS depots, the Army Logistics Management Office, Logistics Control Offices, and Headquarters, AMC, elements. Copies were provided to DA and the supported oversea commands. The Administrative Plan contained background infor-

[23] Ltr, AGAM-P(M) LOG/SP-PPB, 5 Jan 68, subj: AMC Ownership and Accountability of Super-High Dollar Value Items in Oversea Theater Depots.

mation concerning the conception and implementation of Project OASIS. The concept for phased implementation of the program, command relationships involved, and other general and miscellaneous information were included. The detailed operating procedures, data and guidance were contained in 14 annexes:

Administration
Supply Management
Stock Control
Storage
Logistic Support
Maintenance
Financial Management
Systems & Procedures
AMC Ownership Items
Transportation & Containerization
Management & Evaluation Techniques
International Logistics
Intelligence Gathering
War Plans

The document was essentially a "Logistics Primer," containing in one volume practically all the guidance, information, and procedures required by the action agencies involved.

It was recognized early in the formative stages of Project OASIS that close and timely coordination would be essential between the oversea commands, AMC, and AMC's subordinate commodity commands. To provide for this coordination, it was decided that AMC would establish an Army Logistics Management Office (ALMO) in close proximity to the supported oversea command Stock Control Activity. Accordingly, ALMOs were established in Germany, Hawaii, Japan, Korea, and Okinawa, effective 1 October 1967. Each ALMO was commanded by a field grade officer and staffed by DA civilians from the commodity commands.[24]

The ALMOs supported the oversea command for OASIS items and coordinated and interpreted AMC policy regarding the receipt, issue, maintenance storage and distribution of OASIS items. They provided the interface between AMC NICPs and oversea commands in routine supply matters such as computing requisitioning objectives, determining distribution patterns, scheduling maintenance, and obtaining logistics intelligence data for use in supply control studies and depot maintenance programs.

In addition to their assigned missions, some of the ALMOs materially assisted the oversea Stock Control Activities in the initial stages of implementation of the program. Because of difficulties experienced with computer programs and in other areas, manual processing of OASIS transactions was required. The ALMOs provided personnel to assist in this manual effort.

Procedures were developed by the Directorate of Materiel Requirements, AMC Headquarters, which were later supplemented by the Department of the Army for establishing a going-in position. Such information proved essential to providing a base point against which to measure the success of AMC in supporting oversea commands under the OASIS concept. Data were obtained from both the ALMOs and the NICPs which were based upon documentation furnished by oversea Stock Control Activities at the time of the transfer of accountability.

The initial conference of key NICP OASIS personnel was held at the South Gate Motor Hotel, Arlington, Virginia, on 26–27 October 1967. Each NICP made a presentation concerning progress toward implementing the OASIS concept, and the problems it had encountered or anticipated. Additioned detailed guidance was provided by AMC Headquarters with respect to concept, techniques and new management tools associated with the project. A second conference of NICP representatives, held to review progress of the NICPs and to refine the procedures which were by then fairly well developed, was conducted in St. Louis, Missouri, in January 1968.

On 1 March 1968 the Missile Command and USACOMZEUR (U.S. Army Communication Zone, Europe) Supply and Maintenance Agency implemented Project OASIS with respect to MICOM-owned OASIS items. The purpose of initiating the project on this limited basis, two months prior to the required implementation date, was to test the concept and procedures and to make any necessary adjustments prior to worldwide implementation. The exercise proved profitable and on 18 April 1968, MICOM hosted a conference of NICPs to brief each on the results of implementing

[24] (1) Ltr, AGSD-C-(M) 20 Oct 67, ACSFOR, 26 Oct 67, subj: Establishment of U.S. Army Logistics Mgmt Ofcs. (2) AMC GO 97, 29 Oct 67.

OASIS and the first month of operation. This limited operation was useful for the identification of problem areas regarding concepts and techniques. Consequently, corrections and modifications were made prior to full scale implementation of OASIS.

On 1 May 1968 Project OASIS was implemented on a worldwide basis for the purpose of allowing the program to be extensively tested. The actual transfer of accountability of OASIS assets from oversea commands to NICPs took place at AMC Headquarters on 6 May 1968. Transfer documents were hand carried by couriers from USAREUR and USARPAC and turned over to the accountable property officers from the NICPs. Following some eight weeks of operations under OASIS, a conference workshop was conducted at AMC Headquarters between 24–27 June 1968. On the first day, General Besson was briefed by the commanding generals of the participating commodity commands. Each commander spoke concerning the general supply posture of his OASIS items, and of the management actions taken or to be taken to correct supply deficiencies.

The major problem encountered upon implementation of Project OASIS was the inability of the oversea commands to incorporate the system within their existing automatic data processing supply systems. In USAREUR, the decision was made to process OASIS transactions manually, whereas in USARPAC, programing difficulties resulted in manual processing for the first two months. AMC NICPs consequently received passing orders for the first two months, but received no other transactions, that is, demand data, materiel release orders, materiel release denials, and receipt transactions. These were all necessary to maintain accountability and to effect automatic replenishment actions. Inconsistent data upon the transfer of accountability documentation presented another problem. This was compounded further in that, for some line items, it was discovered that on-hand balances were significantly different from those reported on transfer documents. A sample inventory had to be made to determine what further action would be required.

An analysis of the going-in position following transfer of accountability disclosed a less than desirable overall supply posture. Of the 994 prime items selected for project OASIS, over a third were in a zero balance (out of stock) position, and more than another 25 percent were in short supply.[25]

In summary, the implementation of Project OASIS was a major innovation in Army logistics. Although the number of items designated for the test were less than one half of one percent of the Army's active inventory of secondary items in the stock fund area, they accounted for over 35 percent of secondary item annual procurement dollars (over $400 million in Fiscal Year 1969). Including the PEMA program, OASIS covered 46 percent of the annual program for secondary items. The criteria upon which items were selected for the test were annual dollar demand, criticality, and operational significance.[26]

For the period of the test, at least, AMC's management of these items on a worldwide basis would be under continuous critical review, including close monitorship by OSD and Congress. Though AMC inherited the problems of any new system or concept; along with the problems was the challenge and desire to improve significantly the supply support to oversea commands. AMC was confident that additional benefits of intransit accounting, improved requirements determination, more efficient inventory management, and more precise budgetary data would be realized through Project OASIS.

It was recognized throughout the formative stages of OASIS that a test of the concept and procedures under combat conditions was highly desirable, if not essential. The inability of USARV to support the program led to an indefinite postponement of the original implementation dates. However, in October 1968, DA determined that plans would be made to implement OASIS in Vietnam on 31 December 1968. A DA task group was appointed to develop the procedures and time phasing to meet this date. On 22 November 1968, the implementation of OASIS in USARV was announced, effective 31 December 1968, but for aviation items only. Basic policy and implementing in-

[25] AMCSU Historical Summary, FY 1968, pp. viii–4.

[26] (1) Submission, AMCMR to AMCHO, 3 Jan 69. (2) Speech, Gen F. S. Besson, Jr. to Army Commanders' Conf, 3 Dec 68, SLIDES 24, 27.

structions accompanied the announcement. However, USARV and USARPAC submitted a reclama stating that implementation of OASIS on 31 December would seriously impair the support to combat units. A postponement was sought until an upgrading of automatic data processing capability would permit complete mechanization of the OASIS program.

Some indication of the success of the program after six months surfaced on 19 December when the results of a study conducted at the U.S. Army Logistics Management Center were released to the Worldwide Logistics Management Office recommending that the number of OASIS items be increased; and the program be expanded to include the U.S. Army, Alaska, and the U.S. Army, Southern Command. The next day, the Research Analysis Corporation and the American Power Jet Corporation proposed that additional studies be undertaken to determine the extent to which OASIS should be expanded.[27]

Early in the program, General Besson had insisted that AMC be given ownership of the OASIS items. He reasoned that AMC ownership would provide the easiest and clearest method for establishing the required control over the OASIS assets. Unless AMC owned the stocks, there would necessarily be two accountability records which the AMC commander likened to the husband and wife who used two different check books on the same bank account. AMC was seeking greater control by eliminating the requirement for one of the accountability records. Also early in the program, the AMC commander directed that the OASIS items were to be intensively managed. Consequently, in December 1968, 277 managers were managing the 1,806 OASIS items leaving the remaining managers with a little over 400 line items each. General Besson said there didn't seem to be anything wrong with 23 percent of the managers handling 46 percent of the dollars, even if for only four-tenths of one percent of the lines. The establishment of credibility of requirements for these items representing such a large dollar amount was of vital concern. Increased and more efficient troop support through wider visibility over assets was the goal. General Besson viewed the OASIS program, coupled with the Worldwide Depot Maintenance Program and the Worldwide Depot Maintenance Conferences as important steps toward achieving that goal.[28] AMC was enthusiastic regarding the potential of both the OASIS and Worldwide Depot Maintenance programs.

[27] Submission, AMCMR to AMCHO, 3 Jan 69.

Fast Deployment Logistics Ships

During the years since World War II, on several occasions, the military forces have been required to intervene at strategic locations around the world to enforce U.S. foreign policy. To bridge the gap between its capabilities to rapidly deploy troops and its capabilities to logistically support them, the United States increased its airlift and sealift capabilities and have made arrangements with some friendly nations to pre-position supplies. With the advent of AMC, another plan was put forth calling for the pre-positioning of materiel aboard floating depots that could be strategically located so that forces deployed to the world's troubled spots could be immediately supported. The ultimate concept was that of the Fast Deployment Logistics (FDL) ship. The FDL concept had its origin in the Floating Forward Depot (FFD)—a method for pre-positioning military supplies and equipment at strategic points around the world.

The FFD concept had first been approved in July 1962, and during 1963 three World War II victory ships were modified, stocked with supplies and equipment for an infantry brigade, and stationed at Subic Bay in the Philippines. In June 1964, the soundness of the FFD concept was tested during Operation Quick Release, and the Army Chief of Staff approved a recommendation for a fleet of such ships to support specific task forces at various trouble points in the world.

Reestablishment of the FFD fleet was deferred by the Deputy Secretary of Defense in April 1966. One reason was the current shortage of some essential items of equipment; another was the need to consider whether the reconstituted FFDs could be readied in time to justify the expenditures, for they were now seen as an interim device.[29] A more sophisti-

[28] Speeches, Gen F. S. Besson, Jr. to USAEUR and 7th Army Logistics Seminar, Wiesbaden, Germany, 20 Jul 68; and to the Army Commanders' Conf, 3 Dec 68.

[29] Proj Ofc, FFD Historical Summary, FY 1967, pp. 1–2.

cated concept for pre-positioned supply support, known as the Fast Deployment Logistic ship, had come into being. It envisioned the development of a high-speed ship especially designed for over-the-beach supply support.[30]

The program for FFD ships continued under active consideration, however, and within AMC a special project officer was appointed in August 1966 to expedite the acquisition and dissemination of information concerning U.S. Army materiel and supplies that would be needed if either the FFD or FDL fleets were approved.[31] During Fiscal Year 1967, lists of the TOE designations of Army units assigned to each of the ships were furnished to AMC, and AMC developed lists of supplies and equipment for these units.

In May 1965, the Secretary of the Army had supported the replacement of World War II victory ships with newly constructed FDL ships as they became available. In October of that year the Secretary of Defense approved a force objective of such ships, and in August 1966 he increased this to a fleet in size accordance with future needs. The Army Chief of Staff and the Chief of Naval Operations had already agreed, in April 1966, on the operational concepts for FDL ships, and a few months later the contract definition phase of this developmental project was initiated. Three corporations participated. At the time, it was hoped that a total package (development/production) contract would be readied for award by May 1967.[32]

Within the Department of Defense, it was widely agreed that the use of FDL ships, combined with the new huge C–5A transport planes, was the most efficient method for the fast deployment of men and equipment during emergencies in support of national policy. The Joint Chiefs of Staff and OSD estimated a need for FDL ship support at eight strategic areas around the globe including Southeast Asia, Korea, India-Near East, Western Europe, Mediterrean-Middle East-North Africa, Central and Southern Africa, the Caribbean, and South America. These ships would store military vehicles and equipment for extended periods of time, ready to be deployed and unloaded rapidly either at ports or over beaches. However, not everyone agreed that a special purpose fleet was needed. For instance, Adm. Arleigh Burke (retired), a former Chief of Naval Operations, said he considered floating warehouses as "floating rust buckets." "We certainly need merchant ships," he said, "but they should be able to pay their own way."[33] There were misgivings concerning the types of supply and materiel that could be pre-positioned because of problems concerning preservation and accessibility.

In considering the Defense program for Fiscal Year 1968, the House Armed Services Committee decided to deny funds for the FDLs program. Concern lest such ships encourage the Chief Executive to undertake foreign adventures, along with other factors such as fiscal restraint and opposition by the maritime industry, figured in this decision. There were also diplomatic and international law considerations. This did not mean that the Secretary of Defense had given up on the building of these ships; the program was resubmitted to the Congress for Fiscal Year 1969 and again for 1970. In his budget for Fiscal Year 1970, the President included $187 million for three FDLs, a start toward a projected fifteen, but the likelihood of this program being approved had not brightened. From all indications, the mood of the Congress continued to be cautious less the United States become more and more the "policeman of the world."[34] Thus, at the close of Calendar Year 1968, efforts to match logistics deployment capability with that for troops, seemed to be floundering in a sea of neo-isolationism in the U.S. Congress.

[30] Leaflet, "The Fast Deployment Logistic Ship Sys," incl to ltr, AMCPO-FDL to Dir/Supply *et al.*, 19 Oct 66, subj: Fast Deployment Logistic Ships.

[31] (1) AMC Cir 1–24, 8 Aug 66, subj: Proj Ofcr for FFD. (2) AMC Cir 1–18, 8 Aug 66, subj: Proj Ofcr for FDL Ships.

[32] (1) Proj Ofc, FFD Historical Summary, FY 1967, p. 3. (2) Ltr, AMCPO-FFD to ICPs *et al.*, 10 May 67, subj: FFD Data Guidance. (3) Ltr, same to same, 8 Jun 67, subj: "Push"—"Pull" Supply of FFD Ships. (4) Proj Ofc, FDL Ships Historical Summary, FY 1967, pp. 1, 3.

[33] "Is an FDL Capability Essential in Supporting U.S. Commitment?" *Armed Forces Mgmt*, Sep 1968, pp. 66–69.

[34] (1) *Ibid.* (2) The *Washington Post*, January 16, 1969, p. A12.

General Besson, his staff, his commanders, and thousands of AMC employees, both military and civilian, can look back over the command's first seven years to see a series of tremendous accomplishments in the logistics support of the Army. They can also see that AMC has done, or has begun to do, or is in the middle of doing that which it had been set up to do—consolidate, standardize, and improve the Army's logistics system. They can see lessons learned and can see the application of new techniques and methods, such as the systematization of intensive management and the computerization of many supply procedures. They can also see and remember problems, frustrations, and uncertainties. Some of them can remember battling in World War II, in the Korean period, and in the Southeast Asia crisis with the same problems of repair parts, indefinite materiel requirements, inadequate equipment condition and usage data, and erratic funding and programing. These same people can look forward to a view which is as clouded and uncertain as it was in 1945 and 1955, but it is not the same view.

In 1945, and even in 1955, the tendency was to abandon wartime controls and methods of management in the face of retrenchment. Retrenchment will probably come again, and with it the abandonment of some Southeast Asia period controls and methods of management, but the prospect appeared to be different in AMC's seventh year. The difference is that Department of Defense centralization seems to be the pattern of at least the near future, and AMC, a representative of that centralization, was created as a peacetime organization which continued its integration of systems while performing a wartime mission.

There appears to be an evolving pattern of AMC management discernable, perhaps by hindsight, since the beginning of the command. The core of this pattern is intensive management. Intensive management was first focused by the project managers, but it came almost simultaneously to be employed in functional management, as in procurement, in research and development, and in supply. Commodity management was soon adapted to intensive management techniques with the restructuring of commodity centers and commodity management offices. With the Southeast Asia workload, intensive management was employed in many areas with respect to both materiel and functions. The Brown Board recommended a combination of functional management and a form of intensive management, systems management, for the commodity commands. Subsequently, intensive management was employed for the OASIS test and for worldwide depot maintenance management.

As AMC had made project management its own, so did it mold other forms of intensive management to its own purposes. During Fiscal Year 1969, the Aviation Materiel Command converted to an AMC form of weapons system management. Then redesignated the U.S. Army Aviation Systems Command (AVSCOM), this major subordinate command integrated its functional management and a large part of aviation materiel project management into its new systems concept, and this organization, after testing, was to become the AMC commodity management pattern. If, as anticipated, the AVSCOM type of systems management provides for better control of the commodity life cycle process and gives better visibility to major secondary item requirements and supply, it will serve as a basis for the restructuring of the commodity commands. Such restructuring will in turn permit budget and program formulation on a systems basis in accordance with OSD practice. The problems of workload and financial accounting should therefore be considerably eased. No form of management, of course, offers a panacea, and other forms of management must continue to be practiced separately or in conjunction, but systems management seems to offer the best integration for current trends.

A corollary of systems management or any other form of management practiced is a system of management information. NAPALM, after a history of vicissitudes, promises to develop into an information system which will feed management decisions and will make it possible to manage intensively in almost any area of executive choice. The incorporation of maintenance systems and supply systems into NAPALM should give the asset data necessary

to verify and purify worldwide stockages and requirements, thereby justifying programs and expenditures and hopefully smoothing the whole process of program, fund, and workload allocation.

Systems management and information management could of course work within the concept of AMC as a CONUS organization, but the indications are that they will work better, more effectively, and more economically if AMC extends to a worldwide operation. Oversea commanders would then be relieved of the necessity for forecasting and controlling supply and maintenance except, possibly, in forward units. As General Besson has said with respect to OASIS, the idea is not that AMC can do the supply job better than the oversea commanders, but that one ownership and one accountability will simplify the system, give increased visibility to all factors bearing upon life cycle management, and will thus give increased credibility to the Army's estimates of its capabilities and requirements. Barring a drastic change in attitudes or failure in present tests, it would appear that AMC will be required to assert a fuller control of the materiel life cycle—extending operations worldwide if necessary.

The view that AMC should and will assume a worldwide logistics operating role is supported by the present and forecasted development of materiel and services. Containerization, largely an AMC development, has revolutionized transportation and could revolutionize supply. Containers permit the rapid handling of materiel, and the association of repair parts with major items and forces supported. Containers can move from supplier to using unit with only one set of documentation and without intermediate handling of the contents. They remove many of the problems of packing and packaging, offer ready-made shelter for materiel, and can be adapted for air, land, and sea transport. The roll-on/roll-off ship is an extension of the containerization principle, and these ships allow for rapid handling of supply. The fast deployment logistics ship is a further extension which makes supply response to crisis as flexible and automatic as Flat-Top made maintenance flexible and automatic.

Red Ball, Flat-Top, DeLong piers, generator ships, cargo aircraft, transport containers, modular and lightweight equipment and weapons, all terrain and swimming vehicles, prepackaged and airtransportable hospitals, and many other developments are no longer rarities and exceptions; they are becoming the normal means of logistics response. They could represent the best current vision of Army readiness.

APPENDIX

AMC KEY SUPERVISORS AND EXECUTIVES

Headquarters, AMC

Commanding General	
Gen. Frank S. Besson, Jr.	Aug 1962–Mar 1969
Deputy Commanding General	
Lt. Gen. William B. Bunker	Apr 1964–
Lt. Gen. Jean E. Engler (Support)	May 1965–Jan 1966
Maj. Gen. Jean E. Engler	Oct 1963–Apr 1964
Maj. Gen. Frank H. Britton	Jul 1963–Sep 1963
Maj. Gen. William J. Ely	Aug 1962–Jul 1963
Maj. Gen. William W. Lapsley (Mobility)	Jan 1965–Jan 1967
Maj. Gen. Alden K. Sibley (Mobility)	Jun 1964–Dec 1964
Brig. Gen. Raymond C. Conroy (Western Opns)	Apr 1964–Sep 1965
Chief of Staff	
Maj. Gen. Clarence J. Lang	Jun 1967–
Maj. Gen. Kenneth H. Bayer	Apr 1967–Jul 1967
Maj. Gen. Selwyn D. Smith, Jr.	Jul 1963–Mar 1967
Col. Paul A. Feyereisen	Mar 1963–Jul 1963
Brig. Gen. Fred P. Campbell	Aug 1962–Mar 1963
Deputy Chief of Staff	
Col. Stanley P. Hidalgo	Sep 1968–
Col. John B. Clark	Mar 1967–Aug 1968
Col. William E. Campbell, Jr.	May 1966–Mar 1967
Col. Charles L. Redman, Jr.	Dec 1963–May 1966
Col. Paul A. Feyereisen	Aug 1962–Dec 1963
Secretary of the General Staff	
Col. Stanley P. Hidalgo	Sep 1968–
Col. Howard H. Braunstein	Nov 1966–Jul 1968
Lt. Col. Edward P. Genger	May 1966–Nov 1966
Col. William E. Campbell, Jr.	Mar 1964–May 1966
Lt. Col. Edward E. Moran	Dec 1963–Mar 1964
Col. Charles L. Redman, Jr.	Jun 1963–Dec 1963
Col. George P. Warner	Aug 1962–May 1963
Col. John M. Christensen	Aug 1962–Aug 1962
Joint Activities Coordinator	
Col. John A. Thomas	Dec 1966–
Technical Relations Advisor	
Mr. Henry Handler	Aug 1962–
Sergeant Major	
SMaj. Raymond M. Garrity	Sep 1968–
SMaj. Harry H. Hess	May 1966–Jul 1968
SMaj. James F. Graziano	Aug 1962–Dec 1965

Lawson presented to gen, 5/27/64

Special Assistants:

to the Deputy Commanding General

Col. Elbridge L. Snapp	Jul 1966–

Chief Engineer

Mr. Lehmann M. Taylor	Jul 1967–
Mr. Charles H. Zimmerman	Oct 1963–Jul 1967

Chief Scientist

Dr. Craig M. Crenshaw	Jan 1963–

Deputy Employment Policy Officer

Mr. Sam S. Shwartz	May 1968–
Dr. Ralph G. H. Siu	Aug 1962–May 1968

Congressional Affairs

Mr. Paul Cyr	May 1965–
Col. James H. Batte	Nov 1962–Aug 1964

Industrial Fair Employment

Mr. David A. Sawyer	Aug 1962–Jul 1966

Contractor Labor Relations

Mr. Alexander Corey	Jan 1963–

Management Surveys of Industries, External Audits and Internal Review

Mr. Olin O. Taylor	Dec 1963–

Nuclear, Chemical, and Biological Affairs

Mr. John L. Chamberlin	Jan 1963–

Post Hostilities Logistic Operations

Brig. Gen. Theodore Antonelli	Jan 1969–

Project Management

Col. Clarence H. Ellis	Jul 1968–
Mrs. Sarah W. Clements	Sep 1967–Jul 1968
Col. James H. Schofield, Jr.	Oct 1966–Dec 1967
Col. James L. Lewis	Aug 1963–Dec 1966
Col. John M. Christensen, Jr.	Aug 1962–Aug 1963

Field Support Operations

Mr. John Shada	Jul 1966–Nov 1968

Special Projects

Mr. Charles W. Flaherty	Nov 1967–

Administrative Office

Col. William A. Gregory	Apr 1968–
Col. Stanley J. Sawicki	Dec 1964–Apr 1968
Col. Richard O. Davidson	Jan 1963–Sep 1964
Col. Horace E. Alphin	Aug 1962–Jan 1963

Aviation Office

Col. Harry L. Jones	Jan 1968–Sep 1968
Col. William B. Dyer	Aug 1964–Jun 1967

Chaplain

Col. Lee A. Cousin	Jan 1968–
Col. Richard W. Jungfer, Jr.	Feb 1963–Jan 1968
Col. Kenneth M. Sowers	Aug 1962–Mar 1963

Combat Surveillance and Target Acquisition Systems Office

Col. Earl J. Cobey	Nov 1967–
Mr. Robert F. Brady	Oct 1966–Nov 1967
Col. Lloyd L. Leech, Jr.	Mar 1966–Sep 1966
Col. Thomas M. Rienzi	Jan 1965–Mar 1966

Comptroller and Director of Programs

Mr. William O. Harris	Sep 1968–
Brig. Gen. Victor L. Cary	Oct 1967–Sep 1968
Brig. Gen. Olinto M. Barsanti	Oct 1966–Jun 1967
Brig. Gen. Eads G. Hardaway	Apr 1964–Jun 1966
Maj. Gen. William B. Bunker	Jun 1962–Mar 1964

Deputy

Col. Leonard D. Mitchell	Sep 1968–
Mr. William O. Harris	May 1966–
Mr. John P. O'Hehir	Dec 1964–Mar 1966
Mr. Edgar W. Lancaster	Mar 1964–Jul 1964
Brig. Gen. Eads G. Hardaway	Feb 1963–Dec 1963
Brig. Gen. Thomas H. Beck	Aug 1962–Sep 1962

Director of Research, Development, and Engineering

Maj. Gen. Richard H. Free	Apr 1967–
Maj. Gen. Kenneth H. Bayer	Apr 1966–Jul 1967
Brig. Gen. William C. Gribble, Jr.	Sep 1964–Mar 1966
Brig. Gen. Wheeler G. Merriam	Oct 1963–Sep 1964
Maj. Gen. Frank H. Britton	Aug 1962–Oct 1963

Deputy Director for Operations

Brig. Gen. John R. Guthrie	Nov 1968–
Brig. Gen. George R. Sammet, Jr.	Sep 1967–Jan 1968
Maj. Gen. Richard H. Free	May 1966–Jul 1967
Brig. Gen. Kenneth H. Bayer	Oct 1964–Apr 1966

Deputy Director for Plans

Dr. J. V. Richard Kaufman	Oct 1968–
Dr. Ralph G. H. Siu	Apr 1968–Oct 1968
Brig. Gen. Tobias R. Philbin, Jr.	Oct 1964–Feb 1966

Deputy Director

Brig. Gen. William C. Gribble, Jr.	May 1964–Sep 1964
Brig. Gen. John G. Zierdt	Aug 1962–Sep 1963

Director of Distribution and Transportation

Maj. Gen. Howard F. Schiltz	Jul 1968–
Maj. Gen. John J. Hayes (Supply)	Dec 1967–Jul 1968
Mr. John Shada (Supply)	Jun 1967–Jul 1967
Brig. Gen. Thomas H. Scott, Jr. (Supply)	Jul 1966–Jun 1967
Brig. Gen. Donald G. Grothaus (Supply-SMC)	Jun 1964–May 1965
Brig. Gen. Bruce E. Kendall (Supply-SMC)	Jun 1962–May 1964

Deputy Director (Dist & Trans)

Col. George J. Holly	July 1968–

Deputy Director (Supply)

Col. George J. Holly	Feb 1968–Jun 1968
Col. Donald W. MacFeeters	Aug 1966–Jan 1968
Col. Walter J. Woolwine	May 1966–Aug 1966
Col. Edward L. Burchell	Jun 1964–May 1966
Col. James D. Peterson	Aug 1962–May 1964

Director of Transportation

Col. Reuben E. Wheelis	Aug 1966–Jun 1968
Col. Emmett G. Scott	Jul 1966–Aug 1966
Brig. Gen. John D. Crowley	Sep 1963–Feb 1965
Brig. Gen. Melvin D. Losey	Aug 1962–Jul 1963

Deputy Director (Trans)

Mr. Walter W. Duke	Aug 1966–Jun 1968
Col. John P. Traylor (SMC)	Aug 1962–Aug 1964

General Counsel

Mr. Kendall M. Barnes	Aug 1962–

Historical Office

Dr. Dale Birdsell	Jan 1967–
Mr. Raymond J. Snodgrass	May 1966–Jan 1967
Dr. Erna Risch	Jul 1963–May 1966

Information Officer

Col. Joseph E. Melanson, Jr.	Nov 1967–
Col. Harry D. Kight	Aug 1966–Oct 1967
Col. Robert J. Coakley	Aug 1962–Jan 1966

Associate Information Officer

Mr. Don Craig	Oct 1962–

Inspector General

Col. Clifford H. Ruffner, Jr.	Sep 1968–
Col. Cleo S. Freed	Nov 1966–Sep 1968
Col. Thomas B. Jones	Apr 1963–Oct 1966
Col. Clinton F. Matthews	Aug 1962–Apr 1963

Director of Installations and Services

Col. Robert Fritz	Jan 1969–
Col. Hollis Dakin	Jan 1968–Jan 1969
Col. Alfred J. D'Arezzo	Apr 1963–Dec 1967
Brig. Gen. Thomas H. Beck	Sep 1962–Apr 1963
Col. Clarence C. Haug	Aug 1962–Sep 1962

Deputy Director

Col. Bevelle T. Brown	Jul 1968–Jan 1969 (Apr 1967–Jun 1967)
Col. William C. Carter	May 1968–Jul 1968 (Jun 1967–Sep 1967)
Col. Hollis Dakin	Sep 1967–Jan 1968
Col. Edwin G. Moran	Nov 1966–Apr 1967
Col. George W. Adair	Oct 1966–Nov 1966

Col. James C. Hogle	Mar 1964–Oct 1966
Col. Cecil H. Fuller	Feb 1963–Mar 1964
Lt. Col. William F. Cumming	Dec 1962–Feb 1963
Col. John E. Bowman	Aug 1962–Dec 1962

Director of International Logistics

Maj. Gen. Robert C. Forbes	Sep 1968–
Maj. Gen. Thomas A. Lipscomb	Sep 1967–Jul 1968
Col. George A. Barten	Jun 1967–Sep 1967
Maj. Gen. John M. Finn	Jul 1966–Jun 1967

Mutual Security Office

Brig. Gen. Clarence C. Haug	Sep 1962–Jun 1965
Col. Chase R. Teaboldt	Aug 1962–Sep 1962

Deputy Director

Mr. Melvin O. Amoth	Nov 1962–

Judge Advocate

Lt. Col. Carol E. Minis	May 1968–
Lt. Col. James E. Macklin, Jr.	Jul 1966–May 1968
Col. Hal H. Bookout	Jul 1965–Jul 1966
Col. Harry J. Salisbury, Jr.	May 1963–Jun 1965
Maj. Lawrence Caruthers	Mar 1963–May 1963
Col. Herbert K. Greer	Aug 1962–Mar 1963

Logistics Data Management Office

Technical Data Office

Col. Reuben T. Morgan	Dec 1968–
Col. Peter P. Yaskin	Jul 1968–Sep 1968
Col. Charles T. Campbell	Apr 1964–May 1967

Deputy Chief

Mr. Fenner M. Grimes	May 1964–Sep 1968

Director of Management Systems and Data Automation

Brig. Gen. Vincent L. Cary	Sep 1968–
Col. James R. Howton	Mar 1968–Sep 1968
Brig. Gen. Jack E. Babcock	Jul 1966–Feb 1968

Data Systems Office

Col. Richard Hansen	Mar 1963–Jun 1966
Col. Paul D. Hickman	Aug 1962–Feb 1963

Management Science Office

Col. Merrill G. Hatch	Jan 1963–Dec 1965

Deputy Director

Mr. John A. Arnston	Nov 1968–
Lt. Col. Donald L. Sprowls	Mar 1968–Sep 1968
Col. James R. Howton	Mar 1967–Mar 1968
Col. Richard A. Hansen	Jan 1967–Mar 1967
Col. Edward H. Lautz	Sep 1966–Jan 1967
Col. Gerald P. Lerner	Jul 1966–Aug 1966

Director of Maintenance

Col. George C. Benjamin		Sep 1968–
Brig. Gen. John P. Traylor		May 1966–Sep 1968
Brig. Gen. Durward E. Breakfield	(SMC)	May 1964–Nov 1965
Brig. Gen. John M. Cone	(SMC)	Jun 1962–May 1964

Deputy Director

Col. Karl H. Zornig	Dec 1968–
Col. George C. Benjamin	Feb 1967–Sep 1968
Col. Robert E. Vanderberg	Jul 1965–Mar 1967
Col. Desloge Brown	Jun 1962–Jun 1965

Director of Materiel Requirements

Brig. Gen. William W. Stone, Jr.	Oct 1968–
Maj. Gen. John J. Hayes	Jul 1968–Oct 1968

Major Items

Maj. Gen. Howard F. Schiltz	Jul 1967–Jun 1968
Brig. Gen. John G. Schermerhorn	Oct 1964–Jun 1967

Materiel Readiness

Brig. Gen. Henry K. Benson, Jr.	May 1963–Oct 1964
Col. William H. Connerat	Oct 1962–May 1963
Col. Claude J. Merrill	Aug 1962–Oct 1962

Deputy Director

Mr. Maurice D. Finn	Jan 1964–
Mr. George A. Passela	Apr 1963–May 1963

Operational Readiness Office

Col. Frank J. Petrilli	Dec 1968–
Col. Victor E. Matteson	Oct 1967–Nov 1968
Col. Donald L. Sallee	Jan 1967–Sep 1967
Brig. Gen. John L. Klingenhagen	Jun 1966–Jan 1967
Maj. Gen. Frank S. Osmanski	Nov 1965–Feb 1966
Brig. Gen. Durward E. Breakfield	Jun 1965–Oct 1965
Maj. Gen. Robert C. Kyser	May 1965–Jun 1965

Director of Personnel and Training

Col. Claude M. McQuarrie, Jr.	Oct 1968–
Brig. Gen. Edward A. Bailey	Jul 1967–Jul 1968
Col. Jack E. Babcock	Jul 1965–Jun 1966
Brig. Gen. William H. Harris	Aug 1962–Apr 1965

Deputy Director

Mr. William S. Charin	Jan 1963–

Director of Procurement and Production

Maj. Gen. Walter J. Woolwine	Jan 1967–
Brig. Gen. John J. Hayes	Dec 1966–Jan 1967
Maj. Gen. Henry A. Miley, Jr.	Nov 1964–Aug 1966
Maj. Gen. Elmer J. Gibson	Aug 1962–Oct 1964

Deputy Director

Mr. Paul E. Atwood	Apr 1967–
Brig. Gen. Walter J. Woolwine	Aug 1966–Jan 1967
Brig. Gen. Henry A. Miley, Jr.	Mar 1964–Nov 1964
Brig. Gen. John A. Goshorn	Aug 1962–Nov 1963

Director of Quality Assurance

Mr. Seymour J. Lorber	Jul 1965–
Maj. Gen. John M. Cone	May 1964–Jul 1965
(SA for Quality Control)	May 1964–Jul 1964

SA for Quality Control

Col. Kenneth E. Jurgens	Aug 1962–Jul 1964

Deputy Director

Mr. Norman C. Krause	Dec 1967–
Mr. Seymour J. Lorber	May 1964–Jul 1965
Mr. Silas Williams, Jr.	Aug 1962–Jul 1964

Deputy for Research and Laboratories

Maj. Gen. Richard H. Free (Labs)	Dec 1968–
Dr. Jay Tol Thomas (Rsch & Labs)	Jan 1966–Sep 1968

Safety Office

Mr. George L. Feazell	Dec 1967–
Mr. S. Julian Pulley, Jr.	Sep 1967–Dec 1967
Mr. Frederick M. Bishoff	Nov 1962–Sep 1967

Security Office

Col. William J. Merlo	Nov 1966–
Col. John P. Gillis	Jul 1964–Sep 1966

Major Subordinate Commands AMC

*U.S. Army Aviation Systems Command** (St. Louis, Mo.)

Maj. Gen. John Norton	Jun 1967–
Brig. Gen. Howard F. Schiltz	Apr 1964–Jun 1967
Brig. Gen. David B. Parker	Jan 1963–Apr 1964
(U.S. Army Transportation Materiel Command)	
(U.S. Army Aviation and Surface Command)	
Brig. Gen. William B. Bunker	Oct 1955–Dec 1962
(U.S. Army Transportation Supply & Maintenance Command)	
(U.S. Army Transportation Materiel Command)	

U.S. Army Electronics Command (Fort Monmouth, N.J.)

Maj. Gen. William B. Latta	Oct 1965–
Maj. Gen. Frank W. Moorman	Aug 1963–Sep 1965
Brig. Gen. Walter E. Lotz	Jul 1963–Aug 1963
Maj. Gen. Stuart S. Hoff	Aug 1962–Jul 1963

U.S. Army Missile Command (Redstone Arsenal, Ala.)

Maj. Gen. Charles W. Eifler	Jul 1967–
Maj. Gen. John G. Zierdt	Sep 1963–Jun 1967
Brig. Gen. Howard P. Persons	Aug 1963–Sep 1963
Maj. Gen. Francis J. McMorrow	Aug 1962–Aug 1963

*Formerly U.S. Army Aviation Materiel Command, Dec 1968.

U.S. Army Mobility Command (Detroit, Mich.)

Maj. Gen. William W. Lapsley	Jan 1965–Jan 1967
Maj. Gen. Alden K. Sibley	Aug 1962–Jan 1965

U.S. Army Mobility Equipment Command (St. Louis, Mo.)

Maj. Gen. Charles C. Case	Feb 1968–
Brig. Gen. Edwin I. Donley	Jan 1967–Jan 1968

U.S. Army Munitions Command (Dover, N.J.)

Maj. Gen. Frank G. White	Jun 1967–
Maj. Gen. Floyd A. Hansen	Nov 1962–May 1967
Maj. Gen. William K. Ghormley	Aug 1962–Oct 1962

U.S. Army Sentinel Logistics Command (Huntsville, Ala.)

Brig. Gen. Mahlon E. Gates	Apr 1968–

U.S. Army Supply and Maintenance Command (Washington, D.C.)

Lt. Gen. Jean E. Engler	Apr 1964–Jan 1966
Lt. Gen. August Schomburg	Aug 1962–Mar 1964

U.S. Army Tank-Automotive Command (Warren, Mich.)

Maj. Gen. Shelton E. Lollis	Oct 1967–
Maj. Gen. William W. Lapsley	Feb 1967–Sep 1967

U.S. Army Test and Evaluation Command (Aberdeen Proving Ground, Md.)

Maj. Gen. Frank M. Izenour	Jul 1968–
Maj. Gen. Leland G. Cagwin	May 1966–May 1968
Maj. Gen. Benjamin H. Pochyla	Dec 1965–May 1966
Maj. Gen. James W. Sutherland, Jr.	Aug 1963–Dec 1965
Brig. Gen. William F. Ryan	Aug 1962–Jul 1963

U.S. Army Weapons Command (Rock Island, Ill.)

Maj. Gen. Oren E. Hurlbut	Sep 1968–
Brig. Gen. William J. Durrenberger	Oct 1966–Sep 1968
Brig. Gen. Roland G. Anderson	Feb 1964–Sep 1966
Maj. Gen. Nelsen M. Lynde, Jr.	Aug 1962–Feb 1964