Management Of Research And Development In Electronics-Communications Equipment Needs Improvement

B-165008

Department of the Army

UNITED STATES
GENERAL ACCOUNTING OFFICE

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

DEFENSE DIVISION

B-165008

Dear Mr. Secretary:

This is our report on the need for improvement in the management of Army research and development in electronics-communications equipment.

The findings in this report deal with requirements documents, management reviews, and concurrent development and production. The reply from the Assistant Secretary of the Army (Research and Development) to our draft report indicated concurrence in our proposals and stated that corrective actions either had been taken or were in the process of being taken. Included in the report is our evaluation of his reply. If the actions cited by the Assistant Secretary are properly implemented, improved management, with accompanying savings, should result.

Copies of this report are being sent to the Director, Office of Management and Budget; and the Secretary of the Army.

Sincerely yours,

for Director, Defense Division

The Honorable
The Secretary of Defense

GENERAL ACCOUNTING OFFICE
REPORT TO THE
SECRETARY OF DEFENSE

MANAGEMENT OF RESEARCH AND DEVELOPMENT IN ELECTRONICS-COMMUNICATIONS EQUIPMENT NEEDS IMPROVEMENT
Department of the Army B-165008

D I G E S T

WHY THE REVIEW WAS MADE

During fiscal 1970 the Army awarded contracts valued at about $758 million for the production of electronics-communications equipment. The Army Electronics Command is responsible for the management of research and development of that equipment. The General Accounting Office (GAO) reviewed selected aspects of the Electronics Command's management, because of the amount of funds involved and because of the importance to the planned combat effectiveness of the Army.

FINDINGS AND CONCLUSIONS

A need for improvement was found in:

--Management practice during development. Procedures were not implemented properly to ensure that exploratory development work was justified by approved objectives, thus avoiding unnecessary development expenditures. (See p. 7.) There were excessive delays in approving the statements of the required characteristics of the materiel. These statements are important, since they specify the goals to be achieved by the development work. (See p. 9.) In addition, substantial expenditures were made for (1) development of an item for which no user had been identified (see p. 12) and (2) testing under development requirements that were no longer valid. (See p. 14.)

--Conduct of management reviews. Required management reviews were not always held (see p. 16) and personnel participating did not always have necessary authority. (See p. 18.) The result was that the reviews did not fulfill their intended purposes, which included providing a decision-making point in the development process.

--Concurrent development and production of materiel. A majority of the items placed in production during the review period had not been put through the complete development process. This high-risk procedure is authorized only in exceptional circumstances. (See p. 20.) The Blue Ribbon Defense Panel, in its July 1970 report to the President and the Secretary of Defense, recommended that a new policy prohibit concurrent development and production and defer the production decision until development prototypes have been successfully demonstrated. (See p. 24.)

Tear Sheet

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RECOMMENDATIONS OR SUGGESTIONS

GAO proposed to the Secretary of Defense that:

--Projects be developed and justified in accordance with approved Army objectives and requirements. (See p. 8.)

--Organizations involved in reviewing and approving original requirements documents act more promptly. (See p. 10.)

--Procedures be established so that necessary changes in requirements documents would be made on a timely basis. This would require that the changes be coordinated promptly among the various using, developing, and testing agencies. (See p. 15.)

--Army regulations governing management reviews be followed to ensure that required reviews are held and that personnel attending are given the proper authority to make decisions. (See p. 19.)

--The number of items to be produced before completion of development be kept under close control; the regulatory criteria for allowing this procedure be followed; and all items so treated be reviewed periodically, as required by regulations. (See p. 21.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

The Assistant Secretary of the Army (Research and Development) said action had been taken to

--ensure that all projects have documentation and authorization and are developed in accordance with Army objectives and requirements (see p. 8.)

--ensure that review and approval of requirements documents are prompter (see p. 10.)

--change Army procedures to ensure that changes in requirements documents are made in a more prompt manner (see p. 15.)

--clarify the applicable Army regulation so that the purpose of the management reviews is fulfilled (see p. 19), and

--rewrite the applicable Army regulations to strengthen the management of items to be developed and produced concurrently. (See p. 21.)

If the actions cited by the Assistant Secretary are successful, improved management, with accompanying savings should result. GAO will examine the area again to determine the degree of success.

Tear Sheet

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ABBREVIATIONS

ECOM U.S. Army Electronics Command

GAO General Accounting Office

GENERAL ACCOUNTING OFFICE
REPORT TO THE
SECRETARY OF DEFENSE

MANAGEMENT OF RESEARCH AND DEVELOPMENT IN ELECTRONICS-COMMUNICATIONS EQUIPMENT NEEDS IMPROVEMENT

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CHAPTER 1

INTRODUCTION

The General Accounting Office has examined into the effectiveness of the management of research and development of electronics-communications materiel in the Army. This management responsibility is assigned to the U.S. Army Electronics Command (ECOM), Fort Monmouth, New Jersey. The overall mission of ECOM, a subordinate command of the U.S. Army Materiel Command, is to manage assigned electronic equipments and systems throughout the Army, including research and development, procurement, production, and control of this materiel.

Research and development projects at ECOM are under the direct supervision of laboratory directors who report to the Commanding General, ECOM. The work is performed by six operating laboratories: Atmospheric Sciences; Combat Surveillance, Night Vision and Target Acquisition; Communications-Automatic Data Processing; Electronic Warfare; Avionics; and Electronic Components. The ECOM Directorate of Research and Development performs staff functions and provides certain common support services for the operating laboratories.

In addition, the Institute for Exploratory Research is responsible for basic research in the fields of the physical sciences relating to the broad areas of communications and surveillance. ECOM work is identified through varying stages of research and development by categories of effort, among which are basic research, exploratory development, advanced development, engineering development, and operational systems development.

The Department of Defense proposed budget for fiscal year 1970 included $8.2 billion--of which $1.8 billion was for the Department of the Army--for research, development, test, and evaluation. The portion actually allotted to ECOM's research, development, test, and evaluation program for that fiscal year amounted to $157 million. ECOM received also about $40 million for research and development work for other Army and Government organizations. During the same period, the Army awarded contracts valued at about $758 million for the production of electronic equipment whose design was based largely upon the work of ECOM.

The Commanding General, Combat Developments Command, submits recommendations to Headquarters, Department of the Army, for establishing development objectives and for specific materiel requirements on the basis of these objectives.

The Assistant Chief of Staff for Force Development has responsibility for overall staff supervision and for coordination of Army combat developments and related policy with research and development functions assigned to the Office of the Chief of Research and Development. The Deputy Chief of Staff for Logistics has responsibility for the Army procurement and materiel maintenance support policy in conjunction with the research and development effort.

The Army Materiel Command performs its research and development mission under the functional supervision of the Chief of Research and Development, who has staff responsibility for planning, programming, coordinating, and supervising all Army research, development, test, and evaluation functions, including funding and setting of priorities.

The Army regulations pertaining to materiel development objectives and procedures state, in pertinent parts, that:

> "*** The ultimate objective of the Army research and development *** is to develop weapons, equipment and techniques *** qualitatively superior to those of any potential enemy, in any environment, and under all conditions of war."
>
> * * * * *
>
> "Research and development activities are primarily directed toward achieving *** qualitative materiel development objectives (QMDO's) and developing materiel which satisfies *** qualitative materiel requirements (QMR's) and small development requirements (SDR's)."

With regard to the practical execution of materiel development and production, the applicable guidelines state that:

"*** The most important and relatively inexpensive phase of the materiel life cycle is research and development ***. Research and development is most efficiently conducted sequentially because problems at one stage are not fully apparent until the test data is available from the previous stage ***."

We examined seven active projects in varying stages of the development process as of March 1968. The seven were randomly selected from a list of 145 items in four of the six operating laboratories at ECOM.

Because of security restrictions, this report does not include a complete identification or description of the items selected for our review; however, we have furnished Army officials with complete information regarding the items that we reviewed.

The Assistant Secretary of the Army (Research and Development), in a letter dated February 10, 1970, commented on our draft report. This letter is included as appendix I.

CHAPTER 2

MANAGEMENT PROCEDURES DURING DEVELOPMENT REQUIRE IMPROVEMENT

Effective management controls over research and development require that all projects be conducted in accordance with approved Army objectives and requirements. Our review showed that there was a need to implement or improve management procedures in order to manage more effectively development effort at ECOM and higher Army levels.

We found that procedures neither were implemented properly nor were sufficient (1) to ensure that exploratory development work be performed only to meet approved objectives and (2) to eliminate delays in approving Qualitative Materiel Requirements. We found also that ECOM was developing an item (1) for which there was no user and (2) which was tested against development requirements which were no longer valid. We attribute this to the fact that the approved development requirements documents were not updated to incorporate changes agreed upon, as required by regulations.

EXPLORATORY DEVELOPMENT WORK NOT JUSTIFIED BY APPROVED OBJECTIVES

The Army policy for research and development provides that exploratory development projects support the objectives stated in the Combat Development Objectives Guide. The objectives guide is an Army compilation of approved objectives which need to be met to fulfill the Army's mission. These objectives must be quoted in the qualitative materiel development objectives document authorizing the exploratory development work. A qualitative materiel development objective is an Army-approved statement of a military need for the development of new materiel, the feasibility of which cannot be determined sufficiently to permit the establishment of a qualitative materiel requirement. These objectives provide guidance for combat development activities and the research and development program. Army procedures require that documents supporting proposed development work

cite the Combat Development Objectives Guide as reference for the objective to be met.

As of April 1968 our analysis of 506 active exploratory development projects showed that there had been no supporting documents or objectives guide references for initiation of 148 of these projects. This same finding was previously reported by ECOM's Research and Development Directorate in a January 1966 report entitled "Instructive Analysis of the RDT&E [note 1] Program." Our review disclosed that no action had been taken to correct the recognized deficiency.

The necessary procedures evidently were not being followed by ECOM and Headquarters, Army Materiel Command, to ensure that items under development were directed to objectives guide references. We believe that this unsupported development work could result in the expenditure of research and development funds on projects that might not be of sufficient value to the Government to justify the expenditure.

Agency comments and GAO evaluation

In our October 1969 draft report, we proposed that all development projects be supported in accordance with approved Army objectives and requirements.

In reply to our proposal, the Assistant Secretary of the Army stated that the Army concurred with the proposal and that action had been taken to accomplish this objective. He stated that all subtasks now had the proper documentation and Combat Development Objectives Guide reference. (See p. 36.)

The Assistant Secretary stated also that the findings that 148 exploratory development subtasks lacked recorded supporting documents or Combat Development Objectives Guide references was correct at the time of the review, but that the problem was merely one of a recordkeeping nature, since all of the 148 subtasks were authorized and had valid objectives guide references. He said that ECOM regulations

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[1]Research, Development, Test, and Evaluation

required an objectives guide reference for any proposed subtask before its activation could be approved and that a recent review disclosed that all mission subtasks in this category had valid references. (See p. 33.)

The failure to record agreed changes in the authorizing documents can result in inappropriate expenditures. Thus, it is important that adequate recordkeeping be maintained to avoid the possibility that unauthorized expenditures will be made. Our followup review showed that action had been taken to correct the situation and that valid references now were required for exploratory development projects.

DELAYS IN APPROVING QUALITATIVE MATERIEL REQUIREMENTS

According to Army regulations, qualitative materiel requirements are to be stated as soon as a need is recognized, the technical approach is approved, and the probable feasibility of development has been determined. An internal study made by ECOM in January 1966 reported that the difficulty in securing requirement documents was caused by the long waiting period between the submission of a proposed requirement and approval by higher headquarters. It stated also that the long waiting period presented a problem for ECOM laboratory and fiscal planners and programmers who must decide whether resources should be set aside to cover future jobs which might materialize. The 1966 study pointed out that the average waiting period at that time was about 18 months; however, reductions were anticipated in the future.

Our examination of five of the seven projects included in our review showed that the length of time required to approve a qualitative materiel requirement for two projects was almost 2 years, a small development requirement for another project took about 15 months, and the requirements documents for two projects were still pending.

We were informed by Combat Developments Command officials that it should take about 1 year between the submission of a proposed requirement and its approval by the Assistant Chief of Staff for Force Development. Our discussions with ECOM officials revealed, however, that the average waiting period was still about 18 months.

In our opinion more timely action is required on the part of all organizations involved in reviewing and approving requirements documents so that the developing agencies can better plan, program, and conduct their work. In this respect, there is a need to improve procedures to assure that such timely action is taken.

Agency comments and GAO evaluation

The Assistant Secretary has stated, in his reply to our draft report, that the times to approve the requirements document cited by GAO are not unreasonable if the time count begins with the initial distribution of the draft proposed requirements and ends with Department of the Army approval.

He has noted that a qualitative materiel requirement represents major Army equipment and large expenditure of funds and requires considerable effort and time by all concerned to complete the required studies and to determine cost effectiveness. He has stated that it is far better to take this time to have a valid requirement than to push the process and have an invalid requirement. He did say, however, that, if later events prove that the requirement was not or is no longer valid, a rapid means of making a change would be required. (See p. 33.)

It is, of course, necessary to take the time required to validate a requirement. If the length of time required, however, is greater than that expected by lower level planners and thereby creates problems (see p. 9), we believe that action should be taken to either shorten the length of time taken to process qualitative materiel requirements or to stabilize the length of time necessary so that lower level planners will know the time frame in which they are operating. The Army evidently favors the former since the Army reply notes procedural changes that should lead to a more orderly and timely establishment of requirements documents. (See p. 35.)

In our draft report of October 1969, we proposed that more timely action should be taken by all organizations involved in reviewing and approving qualitative materiel requirements and small development requirements to ensure that the developing agencies could better plan, program,

and conduct their work. The Assistant Secretary of the Army (Research and Development), by letter dated February 10, 1970, stated that he concurred with our proposal and that the Army is implementing this policy. (See p. 36.)

DEVELOPMENT OF AN ITEM FOR WHICH AN ARMY USER WAS NOT IDENTIFIED

Requirements for new equipment, or for major changes or improvements in materiel originating from new concepts, are normally expressed in a qualitative materiel requirement or a small development requirement. A qualitative materiel requirement is an Army-approved statement of a specific military need for a new item, a system, or assemblage the development of which is believed feasible on the basis of prior experimental work. A small development requirement states an Army need for the development of equipment of proven feasibility which can be developed in a relatively short time and which does not warrant the major effort required in satisfying a qualitative materiel requirement.

Army regulations state that any changes to these documents after they have been approved will be reviewed by the Combat Developments Command with the developing agency--and when appropriate with using field agencies--and forwarded by the Developments Command to Headquarters, Department of the Army, for approval.

The approved qualitative materiel requirement, dated December 1965, for the development of a mobile weather radar set included a requirement for three sets to be used by the Army at each field Army[1] level, i.e., one to each corps.[2] On January 29, 1968, the Developments Command advised the Assistant Chief of Staff for Force Development that, since corps levels would not be significant users of the data furnished by the radar, it would not be appropriate for them to operate it and that they had conducted an extensive

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[1] A field Army is an administrative and tactical organization composed of a headquarters, certain organic Army troops, service support troops, and a variable number of corps and divisions.

[2] A corps is a tactical unit larger than a division and smaller than a field army. A corps consists of two or more divisions together with auxiliary arms and services.

survey to find other legitimate Army users but had been unsuccessful. The Command stated also that it could not justify the personnel spaces and training program that would be required to operate the radar.

In February 1968 the Command informed the same Assistant Chief of Staff that questions had been raised concerning the organizational level at which the radar should be used. They said that the Air Force Air Weather Service was contemplating use of the radar at the division[1] level of the Army since it was furnishing weather support to the field Army level.

In April 1968 the Assistant Chief of Staff for Force Development advised the Developments Command by letter that, since the Army was responsible for the procurement, maintenance, and operation of the mobile weather radar sets and since the Command had recommended employment of this radar at the division level, it was considered appropriate that the approved Qualitative Materiel Requirement be changed to reflect the different level of use.

We were informed by Developments Command officials that they had never recommended use of the set at the division level and that use at such level would increase the number required at least three times. They stated also that it had been their position that the radar set should be used by the Air Force, although the Air Force had not made any firm commitment on its use of the item, and that the Army should not be considered as a user.

Developments Command officials informed us that they did not intend to establish any military spaces to train personnel to operate and maintain this equipment. As of April 30, 1969, however, ECOM was still continuing development work on the item and had incurred total development costs of over $1 million, even though a valid Army user had not been identified and there was no assurance that the Air force would use the radar.

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[1] A division is a tactical unit smaller than a corps which combines in itself the necessary arms and services required for sustained combat.

The Army had projected total costs of approximately $1.8 million for this radar as of September 30, 1969, and was planning to type classify it as Standard A[1] in fiscal year 1972, even though a user had not yet been decided upon.

An official from the office of Assistant Chief of Staff for Force Development informed us in September 1970 that the Army is going to use the mobile weather radar. He stated, however, that the Army had not decided at which level--corps or division--the sets would be used. The decision will be made after the completion of engineering test and service tests. These tests are to be completed by July 1971.

Agency comments and GAO evaluation

The Assistant Secretary of the Army (Research and Development), by letter dated February 10, 1970, listed several regulations which provide guidance to the user and developer for preparation of objectives and requirements and for development of hardware. He stated that procedures outlined in these documents are monitored by the Army staff to prevent development of items for which a need is not identified. (See p. 32.)

In our opinion, the problems noted in the development of this item, selected at random, illustrate the need to ensure that these procedures are actually followed.

TESTING AGAINST OBSOLETE REQUIREMENTS

The small development requirement specifies the performance, physical, and maintenance requirements for the

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[1]In the normal method of conducting development and production, wherein these operations are performed sequentially, an item is type classified as Standard A upon satisfactory completion of development and prior to production. The action indicates that the item is suitable for Army use and is approved for full production.

item. The small development requirement states a need for a new item for which development is of proven feasibility and is relatively inexpensive. These requirements are known as either essential or desired characteristics and serve as the testing criteria used by the Army Test and Evaluation Command in determining whether the new item is suitable for Army use.

Our review of the development of a quick-erect antenna mast showed that the Combat Developments Command, in September 1966, agreed to a change in the small development requirement to increase the allowable repair time from 1 hour to 3 hours. This change finally was approved by the Chief of Research and Development in July 1967. The document itself, however, was not revised to reflect this change. Subsequently, the mast was tested by the Army Test and Evaluation Command in September 1967 against the original requirement of 1 hour and was found unsuitable for Army use.

We discussed this with an ECOM official who stated that the failure to record the changed requirement at the Combat Developments Command had occurred before with other items.

The mast actually required 5 hours repair time and thus did not meet the revised requirement. It is conceivable, however, that equipment which does meet current requirements could be found unsuitable for Army use because of the failure to revise the requirements document. The comment that this is not an isolated case shows that this should be of concern to the Army.

Agency comments and GAO evaluation

In our draft report, we proposed that procedures be established to effect any necessary revisions to approved qualitative materiel requirements and small development requirements. This would require that the changes be coordinated promptly among the various using, developing, and testing agencies.

The Assistant Secretary of the Army stated that the Army concurred with our proposal, and that appropriate Army procedures are being changed to correct these problems. (See p. 36.)

CHAPTER 3

NEED FOR COMPLIANCE WITH AND CLARIFICATION OF REQUIRED MANAGEMENT REVIEWS

To provide for periodic evaluation of progress in the development of materiel, the Army has established in-process reviews at specified decision-making points in the research and development cycle. These reviews are designated as either formal or informal and are required to be held for the purpose of obtaining from each responsible Army organization its opinion and recommendations concerning the future development course of the items. The in-process reviews are, according to Army regulations, decision-making review points in the development of new Army materiel.

We found that required management reviews were not always held. We found also that, when these reviews were held, organizations required to attend were not always represented and that personnel participating did not always have the necessary authority to state their organization's position concerning the future development course of the item under consideration.

LACK OF MANAGEMENT REVIEWS

In our report to the Congress entitled "Need to Improve Management Controls over Ammunition Development" (B-157535, September 27, 1968), we stated that certain organizations responsible for the development of ammunition were not complying with Army regulations dealing with in-process reviews. As stated in our report, the Army, in a letter dated April 9, 1968, advised that corrective action had been taken, including the issuance of an Army Materiel Command Regulation 11-19, dated July 26, 1967, applicable to all elements of that command and for all types of materiel.

We examined into the extent of overall participation in these research and development management reviews for the seven ECOM items selected for review. These items were in various stages of development and as many as from three to five in-process reviews should have been held for each

item. In total, 29 of these reviews should have been held, but we found that only 15 actually had been held.

We were informed in discussions with ECOM and Army Materiel Command officials that some of the reviews were not held, because the items did not have an approved qualitative materiel requirement or small development requirement. We noted, however, that ECOM Regulation 70-5, dated August 4, 1965, required that the initial in-process review be held after the preparation of the technical characteristics but prior to the initiation of development, even though a requirements document had not been approved. We noted that the initial in-process reviews had been held for only two of the seven items we reviewed.

In addition, our review showed that ECOM had received copies of instructions cited by the Army as providing the necessary corrective actions taken in response to our previously mentioned report. One of these instructions was a letter, dated September 14, 1967, from the U.S. Army Munitions Command, which stated that in-process reviews should be held for each item in the engineering development phase of the research and development cycle, even though a requirements document had not been approved.

Agency comments and GAO evaluation

We proposed that Army regulations governing management reviews be complied with to ensure that the required reviews were held. The Assistant Secretary of the Army in his reply, dated February 10, 1970, to our draft report stated that, while the GAO had found the number of in-process reviews actually held were less than those then required by regulations, some reviews were not held because it had proven impractical to hold each review separately and that some combined reviews were held on individual items. He stated that, on November 25, 1968, Army Materiel Command recognized the practicality of this viewpoint by issuing a revised Army Materiel Command regulation which considerably relaxed the requirements for in-process reviews. (See p. 34.)

When counting the number of in-process reviews that actually were held, we took into consideration the combination of some reviews to arrive at our finding that 29 reviews should have been held. Thus, it was evident that further action was needed to assure that in-process reviews were held when required. We plan to evaluate the effectiveness of these actions in a future review of the command's operations.

LACK OF AUTHORITY AT MANAGEMENT REVIEWS

Army Regulation 11-25 states that in-process reviews will be decision reviews rather than learning and information reviews. In this respect, Army Regulation 705-5 states that the developing agency should publish an agenda for each in-process review. This agenda should identify each area for which a decision is required and should contain enough background data to permit each participant to establish a valid position for his command or agency. In addition, Army Regulation 705-5 states also that representatives of each participating command and agency at formal in-process reviews should be prepared to state the official position of his agency or command on matters cited in the agenda.

We have been informed by ECOM officials that one of the major problems in conducting the in-process reviews is the lack of decision-making authority by representatives who participated in these reviews. They have stated that the reviews are usually learning sessions and no decisions are made due to this lack of decision-making authority.

Our discussions with Army Materiel Command and Combat Developments Command officials revealed, however, that there was a difference of opinion as to whether in-process reviews were decision-making points or not. We believe that Army regulations needed to reemphasize that the reviews are intended to be decision-making. We believe also that it is important that participants in the in-process reviews are aware of their organization's position concerning the item under review and have sufficient authority to make a decision concerning the future course of the program.

Agency comments and GAO evaluation

In our October 1969 draft report, we proposed that Army regulations be complied with to assure that required management reviews are held and that regulations be clarified to assure that agency representatives at management reviews are given the authority to make firm decisions for their agencies.

The Assistant Secretary of the Army (Research and Development) in his reply stated that the Army concurred in this proposal. He said that the applicable Army regulations had been or would be revised to (1) indicate which reviews are mandatory and specify the content and format of the minutes recording the reviews and (2) assure that in-process review attendees have the authority to make firm decisions for their agencies. (See p. 36.)

These changes, if properly implemented, should enable the in-process review to become the important link in the management of developmental materiel it was intended to be.

CHAPTER 4

EXTENSIVE CONCURRENT DEVELOPMENT AND PRODUCTION

In the Army, concurrent development and production of an item is authorized by classifying it "limited production." A limited production item is described in Army regulations as:

> "*** an item under development *** for which an urgent operational requirement exists and for which no other existing item is adequate *** and [is] promising enough operationally to warrant initiating *** production for troop issue prior to completion of development and/or test ***."

Items authorized for limited production are developed and produced on a concurrent basis. This basis involves expedited development under high-risk conditions and requires extremely careful planning. It usually entails the expenditure of additional funds and often results in major retrofit programs. For these reasons, it is essential that only those projects with a genuine need for the earliest delivery be considered for concurrent development and production. Army policy, officially, states that the use of the limited production classification will be restricted to exceptional cases to meet urgent operational requirements.

EXTENSIVE USE OF LIMITED PRODUCTION TYPE CLASSIFICATION

Of the 77 items classified either as Standard A[1] or as limited production by ECOM in a 2-year period from April 1966 to April 1968, 56 items, or 73 percent, were classified as limited production. It appears that, while this classification is high risk in nature, its usage was becoming the rule rather than the exception, and, as a result, considerable amounts of money were being spent on items which had not completed development. An example of this is in the section on the quick-erect antenna mast on page 22.

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[1] See page 14.

Agency comments and GAO evaluation

In our October 1969 draft report, we proposed that the number of items being classified as limited production be kept under close control, since it appeared that this classification was the rule rather than the exception; that the regulatory criteria for assigning this classification to an item be followed; and that all limited production items be reviewed on a periodic basis as required by regulations.

The Assistant Secretary of the Army (Research and Development), in his reply to our draft report, stated that some nontactical communications systems procurement was based on performance specifications and therefore must be obtained under limited production authorization. He said that, if the use of limited production procedures was further restricted, the Army would lose the ability to acquire needed nontactical communications systems on the basis of required operational performance.

The Assistant Secretary stated also that numerous additional controls had been instituted within Army Materiel Command and Department of the Army to limit limited production action to essential items of reasonable risk and to more closely monitor such programs. (See p. 36.)

He noted that a provision for the control of the number of items being classified as limited production was included in a new regulation that replaced the one that formerly had governed this area. (See p. 37.)

We have examined the new Army Regulation 71-6 and it appears that, with effective implementation, the limited production classification will be more closely monitored in the future. The additional controls instituted to limit limited production actions include the issuance by the Army staff and the Army Materiel Command of new directives to define conditions for renewals and the requirement that proposals have the signature of a general officer.

QUICK-ERECT ANTENNA MAST

A quick-erect antenna mast, one of the seven items we reviewed, was among the 56 items classified as limited production. (See p. 20.) The Army initiated limited production of the mast prior to completing development, even though there was a question as to whether the mast could be successfully developed.

The mast was initially authorized for development to satisfy a small development requirement approved in April 1964, and a contract for its development was awarded in April 1965. While the mast was undergoing development, ECOM received a crash directive to expeditiously develop a radio terminal set for Vietnam users. It was subsequently decided to use the mast with the set, even though it had not been tested to determine its reliability.

During early testing of the mast, the ECOM Commodity Management Office directed procurement for a limited production of 300 masts for use with the radio terminal set, and a contract was awarded in April 1967. In October 1967 the mast was found to be unsuitable for Army use after being tested as an individual development item. The mast was found also to be deficient when tested with the radio terminal set. During the same month, the laboratory considered 10 existing standard Army masts for use with the radio terminal set and a decision was made to use one of the 10 standard masts under consideration and not the mast undergoing development.

Our discussions with an ECOM representative indicated that, at the time of the procurement, both the ECOM laboratory personnel and the contractor believed that production of the developmental mast at that time would be premature and advised against its procurement. The Commodity Management Office initiated the procurement, however, apparently because of the urgent need for the radio terminal set on which the mast was to be used.

The Army had programmed approximately $179,000 for the research and development of this mast as of September 1969 and had procured 300 masts for about $817,000.

We do not believe that procurement of the mast was justified since the criteria for the use of the limited production classification had not been satisfied. The mast undergoing development had not been shown to be promising enough operationally to warrant initiating limited production or production for troop issue prior to completion of development and/or test.

Agency comments and GAO evaluation

The Assistant Secretary's reply stated that the facts pertaining to the antenna mast were correct, to the best of his knowledge, but it did not necessarily follow that they represent excessive concurrent development and procurement under a wartime environment. He stated that they reflected the inordinate demands placed on the Army in that time frame by the increased need to furnish equipment to the troops in Southeast Asia, but that the current situation was different and new controls had already been established to insure that limited production status was judiciously used. He noted that no item in any subordinate command could now be type-classified as limited production without Headquarters, Army Materiel Command group, approval. He stated that these improvements in Army Materiel Command controls should assure compliance with the applicable regulations. (See p. 34.)

It is encouraging that new controls have been established over the use of the limited production classification. Effective implementation of these controls should result in better management of this area. Even during wartime, however, it would seem prudent to get some indication of an item's ability to fulfill a requirement before ordering its production.

The Assistant Secretary stated also that, with regard to limited production items, corrective action had been undertaken by Army Materiel Command. He stated that the quick-erect mast was cited as an example in the discussion; however, it was not considered a prime example of improper management of limited production. According to him, the quick-erect mast represented low risk and expenditure and had the potential of providing a much improved capability for the highly mobile terminal. A standard mast was used as a fallback item only after the quick-erect mast failed the

Test and Evaluation Command test. He stated that limited production of the mast was approved as a part of the radio terminal facility and that the overall objective of providing this new terminal capability was met through this action. (See p. 35.)

In this case, we believe that a proper course of action for the Army would have been to procure the existing mast for the urgent requirement and continue development of the new mast. Perhaps a less pressured development approach would have resulted in a mast that met all the requirements of the Army.

The Blue Ribbon Defense Panel, in its report to the President and the Secretary of Defense dated July 1, 1970, recommended that a new development policy for weapon systems and other hardware be formulated and promulgated. The new policy should provide for a general rule against concurrent development and production and should defer the production decision until successful demonstration of developmental prototypes. We believe that this general rule would be proper policy, although it may be necessary, in exceptional circumstances, to allow concurrent development and production. The new Army controls imply such a rule while providing for the exception in the limited production type classification.

CHAPTER 5

INTERNAL AUDITS

The U.S. Army Audit Agency has completed two audits at ECOM relating to its research and development mission. A third audit also was performed as part of an audit of the management of the Army Materiel Command's research and development program.

The first report, NE 66-15, dated April 26, 1966, was issued for the purpose of evaluating the effectiveness and efficiency with which ECOM utilized resources in accomplishing its research and development mission. Some of the more important areas in need of improvement were found to be in the research and development management of funds, estimating, engineering surveillance of contractor progress, cost analysis, and determination of requirements. ECOM generally concurred with the deficiencies and agreed to initiate corrective action.

The second report, NE 69-6, dated November 1, 1968, was issued for the purpose of evaluating the effectiveness and efficiency with which the Avionics Laboratory utilized resources in accomplishing its mission. The deficiencies cited were concerned primarily with operating procedures.

Subsequent to the completion of our fieldwork, a third report, NE 70-23, dated February 13, 1970, was issued for the purpose of evaluating the management of the Army Materiel Command's research and development program. The audit was performed at 19 commands and activities, including ECOM, and involved a review of transactions representative of procedures and controls in effect during the first quarter of fiscal year 1970.

Deficiencies similar to those found in our review were noted in the areas of type classification of materiel and performance characteristics of developmental items.

With regard to type classification of materiel, it was found that limited production procurements were made although (1) existing items were available to meet the urgent

operational requirement, (2) urgent operational requirements were not substantiated, (3) quantities procured were far in excess of the quantity needed, and (4) tests disclosed that there was more than a moderate risk that adequate performance would not be achieved. With regard to performance characteristics the Army Audit Agency found that (1) agreement on performance characteristics could not be reached for long periods of time and (2) performance characteristics were not adequately defined. In addition, other deficiencies were found in the area of development under the family concept, the in-house laboratory independent research program, and research and development test models. The internal audit effort, applied to date in the areas covered by our review, appears to be comprehensive.

CHAPTER 6

SCOPE OF REVIEW

Our examination was made at ECOM, Fort Monmouth, New Jersey; Headquarters, Army Materiel Command, Washington, D.C.; the Combat Developments Command, Fort Belvoir, Virginia; and the Office of the Assistant Chief of Staff for Force Development, Washington, D.C. We directed our examination primarily toward the policies and procedures established for the management of development phases of programs and toward an evaluation of the actual practices followed in carrying out such policies and procedures.

We reviewed regulations and directives issued by the Department of the Army, Army Materiel Command, and ECOM regarding the management to be exercised over the research and development of electronics-communications materiel.

We examined seven active projects in varying stages of the development process as of March 1968. The seven were randomly selected from a list of 145 items in four of the six operating laboratories at ECOM.

The Assistant Secretary of the Army (Research and Development), in reply to our draft report, commented that:

> "Although the Army does not feel that the scope of the report (7 projects randomly selected from 145 items at only ECOM) is broad enough to make the Army-wide recommendations contained in the GAO report, the Army concurs in general with the findings, conclusions, and recommendations at the time of the audit ***." (See p. 32.)

In addition to the fact that serious problem areas were disclosed in our random selection, the similar findings in the internal audits previously discussed indicated the Army-wide recommendations were warranted.

APPENDIXES

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

10 FEB 1970

Mr Charles M. Bailey
Director, United States
General Accounting Office
Washington, D. C. 20548

Dear Mr Bailey:

This is in reply to your letter of 10 November 1969 concerning the review of Research and Development Management of Electronics/ Communications Materiel (OSD Case #3034).

The inclosed statement provides the Department of the Army position on your report. This reply is made on behalf of the Secretary of Defense.

Sincerely yours,

R. L. Johnson
Assistant Secretary of the Army
(Research and Development)

1 Incl
Department of the Army
Position

DEPARTMENT OF THE ARMY POSITION
ON

GAO Draft Report GAO RD-33, dated October 1969, Subject: Review of Research and Development Management of Electronics/Communications Materiel. Department of the Army (Code 67018).

I. Position Summaries

A. GAO Position Summary

GAO found need for improvement in management of research and development of electronics/communications materiel. Areas needing improvement included determining development requirements, procedures used during development, compliance with and clarification of existing management reviews, concurrent development and production of equipment,
[See GAO note on p. 37] The report covers the time period 1 March 68 through 22 November 68.

B. Army Position Summary

Although the Army does not feel that the scope of the report (7 projects randomly selected from 145 items at only ECOM) is broad enough to make the Army-wide recommendations contained in the GAO report, the Army concurs in general with the findings, conclusions, and recommendations at the time of the audit (CY 1968). The GAO report is not current in all areas, however, the corrective effort planned and/or executed is described below. In addition, reasons for specific nonconcurrence in some of the details of the report are also provided.

II. Background for Army Position

Many of the problem areas touched by the GAO are not new to the Army. Some have been the subject of considerable inquiry and study within the Army for extended periods of time. The dynamic nature of research and development is a constant source of difficulty in management planning of research effort at the subordinate level. Special expediting actions associated with developments for use in Southeast Asia are a typical case. No one can question their need, but they still disrupt planning. Frequent problems arise when the subordinate command finds itself the victim of circumstances.

Sometimes a too-literal interpretation of higher level directives restricts the flexibility which laboratory directors should rightly have in fulfilling their responsibilities.

III. Army Position on GAO Findings

A. Chapter [2]

AR 705-5, AR 71-1, AR 11-25, Annex C, CDOG and DA Pam 11-25 provide guidance to the user and developer for preparation of objectives and requirements and for development of hardware. Procedures outlined in these documents are

monitored by the Army staff to prevent development of items for which a need is not identified.

B. Chapter [2]*

(1) The findings that 148 exploratory development subtasks lacked recorded supporting documents or CDOG references was correct at the time of the review. However, the problem was merely one of a record-keeping nature, since all of the 148 subtasks were authorized, had valid CDOG references, etc. ECOM has corrected this problem, and a recent review disclosed that all 455 mission subtasks in this category had valid CDOG references. ECOM Regulation 11-9 requires a CDOG reference for any proposed subtask before its activation can be approved.

(2) The times to approve the QMRs and SDRs cited by GAO are not unreasonable if the time count begins with the initial distribution of the draft proposed requirements and ends with DA approval. CDC, after receiving Army-wide comments and recommendations, including those of AMC, staffs the comments on the draft proposed requirements internally, (a process which takes 60-90 days). After obtaining CDC approval, the proposed document is then staffed at HQ DA for about 120 days before DA action.

(3) A QMR represents major Army equipment and large expenditure of RDTE and PEMA funds. To complete the studies required and to determine cost effectiveness requires considerable effort and time by all concerned. It is far better to take this time and have a valid requirement than to rush the process and have an invalid requirement. When later events prove that the requirement was not or is no longer valid, a rapid means of making a change is required.

[See GAO note on p. 37.]

C. Chapter [3]

[See GAO note on p. 37.]

[See GAO note on p. 37.]

(2) While the GAO has properly found the number of IPRs actually held were less than those then required by regulations, some IPRs were not held because it had proven impractical to hold each IPR separately, and some combined IPRs were held on individual items. On 25 Nov 68, AMC recognized the practicality of this viewpoint by issuing a revised AMC Regulation 70-5 which relaxed the requirements for IPRs considerably. Smaller, non-project managed items below certain dollar thresholds now can be covered by one formal IPR.

[See GAO note on p. 37.]

(4) AR 705-5 is being rewritten to correct shortcomings.

D. Chapter [4]

(1) The facts pertaining to the antenna mast are correct, to the best of our knowledge. However, it does not necessarily follow that they represent excessive concurrent development and procurement under a wartime environment. They reflect the inordinate demands placed on the Army in that time frame by the increased need to furnish equipment to the troops in Southeast Asia. The current situation is different and new controls have already been established to insure that LP status is judiciously used. For instance, no item in any subordinate command can now be type classified LP without AMC HQ command group approval. These improvements in AMC controls should assure compliance with the applicable regulations.

[See GAO note on p. 37.]

[See GAO note on p. 37.]

IV. Army Position on GAO Conclusions.

The conclusions are considered generally valid. The following comments on each conclusion on Page [S 1 and 2] of the report are also important.

[See GAO note on p. 37.]

B. It is true that some exploratory development efforts in the past were not documented as being valid CDOG references or QMDOs. This has been recognized for some time and major organizational and procedural changes have been implemented to correct the situation. These include total concept formulation as prescribed in the DA Disciplined Management Model. Organizations established to insure early requirements generation are the CDC Institute for Land Combat, AMC's Advanced Materiel Concepts Agency, and ACSI's Threat Analysis Group. The necessity for accelerating approval of QMRs and SDRs also has been recognized and the procedure mentioned above should lead to a more orderly and timely establishment of QMRs and SDRs.

C. In regard to LP items, corrective action has been undertaken by AMC. The quick erect mast cited as an example in the discussion, however, is not considered a prime example of improper management of LP. The quick erect mast represented low risk and expenditure. It had the potential of providing a much improved capability for the highly mobile terminal than any standard available mast. A standard mast was used as a fall back item, only after the quick erect mast failed TECOM test. LP of the mast was approved as a part of the radio terminal facility and the overall objective of providing this new terminal capability was met through the LP action.

[See GAO note on p. 37.]

[See GAO note on p. 37.]

V. Army Position on GAO Recommendations. The Army generally concurs with the recommendations. The following comments apply to each of the recommendations on pages 2 and 3 of the report:

A. The Army concurs with the recommendation that procedures be established to effect, in a timely manner, any necessary revisions to approved QMRs and SDRs. Appropriate Army procedures are being changed to correct these problems.

B. The Army concurs with the recommendation that the use of SDRs be confined to materiel already proven feasible. This policy is now required by Army regulations.

C. The Army concurs with the recommendation that all projects be developed and supported in accordance with approved Army objectives and requirements. Action has been taken to accomplish this objective and all subtasks now have the proper documentation and CDOG reference.

D. Concur that more timely action should be taken in reviewing and approving QMRs and SDRs. The Army is implementing this policy.

E. The Army concurs in this recommendation. AR 705-5, Army Research and Development, is currently being revised and should be published during 4th Quarter, FY 70. The revision will indicate which reviews are mandatory and specify the content and format of minutes recording the reviews. In view of the fact that AR 11-25 states In-Process Reviews (IPR) will be decision reviews rather than information reviews, IPR attendees should have the authority to make firm decisions for their agencies. This shortcoming will be corrected in the revision of AR 705-5.

F. (1) Numerous additional controls already have been instituted within AMC and DA to limit LP action to essential items of reasonable risk and to more closely monitor such programs.

(2) Some non-tactical communications system procurement is based on performance specifications and therefore must be obtained under LP authorization since the hardware specifications can not be defined prior

to competitive systems procurement. This procedure is used to make maximum use of existing commercial communications equipment. If the use of LP procedures is further restricted, the Army would lose the ability to acquire needed non-tactical communications systems on the basis of required operational performance. This ability is essential. The draft report does not address non-tactical communications materiel.

(3) AR 71-6, replacement for AR 700-20, has been approved and released to TAGO for publication. A provision for the control of the number of items being classified as LP is included in this regulation.

[See GAO note below.]

2 Incls
as

GAO note: Deleted comments relate to matters discussed in the draft report but which have not been discussed in this final report.