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ARMY TEST AND EVALUATION REVISITED: AN APPRAISAL OF THE PRESENT SYSTEM

Sammy J. Cannon, et al

Army War College
Carlisle Barracks, Pennsylvania

10 June 1974

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Significant changes were made to the Army structure during 1972-1973 with the formation of TRADOC, FORSCOM, and OTEA. At the same time the Army instituted new basic policies for material acquisition. The impact of these changes on the test and evaluation process was examined to determine if the new organization improved the way the Army did its testing. Additionally, the current test system and organization was examined to identify areas where improvements could be made. FDTE was found to be very weak in struc-

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ARMY TEST AND EVALUATION REVISITED: AN APPRAISAL OF THE PRESENT SYSTEM

A GROUP RESEARCH PROJECT

by

Colonel Sammy J. Cannon, SigC
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US Army War College
Carlisle Barracks, Pennsylvania
10 June 1974

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Significant changes were made to the Army structure during 1972-1973 with the formation of TRADOC, FORSCOM, and OTEA. At the same time the Army instituted new basic policies for material acquisition. The impact of these changes on the test and evaluation process was examined to determine if the new organization improved the way the Army did its testing. Additionally, the current test system and organization was examined to identify areas where improvements could be made. FDTE was found to be very weak in structure and accomplishment. Further, the resources available for this type of testing were fragmented and not effectively utilized. Although OTEA was assigned the overall responsibility for operational testing, it was found that most nonmajor systems would be tested by TRADOC or some other command. Moreover, as a result of the 1974 Army Staff reorganization operational testing received no DA staff supervision. To resolve these major problems it is recommended that a Force Development Test and Evaluation Agency be formed at TRADOC with MASSTER and CDEC as subordinate elements; that the AMC test boards be assigned to OTEA to do all operational testing; and that on the Army Staff the DCSRDA be given staff responsibility for both development and operational testing and the DCSOPS be given responsibility for force development testing.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the contributions of the many people whose assistance has been of real benefit to this study. In addition to the obvious policy aid rendered by such individuals as GEN DePuy, LTG Starbird, LTG Deane, MG Ochs, MG Brown, and MG McChrystal, sound ideas and data were provided by Mr. Tyler and LTC Gillispe, OCRD; Mr. Henson and COL Standley, MASSTER; Mr. Somody and LTC Solberg, TECOM: and LTC Brownlee, OTEA. At the War College, the research was guided by COL Thompson, SSI, whose advice and council was of significant importance. Two students of this class, COL Galloway and COL Blum, also gave generously of their time and were most helpful.

Any success the study may enjoy is shared with them all, any failure belongs solely to the authors.

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EXECUTIVE SUMMARY

The format of the summary is as follows:

- Facing pages are related.
- Graphic portrayal appears on the right.
- Verbal explanation is shown on the left.

For a cursory summary of this study, read the blocked portion on the left page and relate it to the entire right page.

For extended summary, also read the discussion appearing on the left page.

The study purpose is to provide a critical appraisal of the Army's test and evaluation system and to recommend change where appropriate.

Testing is big business in the Army. Some 300 million dollars and 18,000 people are directly chargeable to test and evaluation, excluding troop support.

The subject has received extensive attention over the past few years. Considerable change has occurred in the system. In view of the reorganization of the DA staff, the formation of the Operational Test Agency, and the creation of the Forces Command and the Training and Doctrine Command, an appraisal is necessary to validate the system or to recommend changes. Through an analysis of present problems, an improved system will be developed if necessary, including definitions, procedures, organization and responsibilities.

The Army tests for two basic reasons: First, as an integral part of the material acquisition process, and, second, as a critical way to assess innovative ideas in organizations, tactics, and doctrine. A test is a process by which data are accumulated to assist in determining that a system meets, exceeds or fails to meet the characteristics ascribed to it.

PURPOSE

TO EXAMINE THE ARMY TEST AND EVALUATION SYSTEM.

- DETERMINE PROBLEMS.
- DEVELOP A 'BEST' SYSTEM.
- DETERMINE ASSIGNMENT OF RESPONSIBILITIES.

The group followed three paths: reviewed previous studies and regulations, interviewed key individuals, analyzed test reports, and drew on their own experience.

To accomplish the purpose of the study, the three-man group reviewed all major studies of test and evaluation, the most significant ones being the reports of the President's Blue Ribbon Panel, the Priority Project Four Group, and the Army Materiel Acquisition Review Committee. All regulations were analyzed in-depth, the most significant being DOD Directive 5000.3, the DA LOI that implemented material acquisition guidelines; and AR 10-4.

Discussions were held with all key personnel involved in testing, including LTG Starbird, (Ret.), DDRE; GEN DePuy, TRADOC; LTG Deane, DCSRDA; MG McChrystal, MASSTER; MG Brown, TECOM; and MG Ochs, OTEA. All shared their philosophy of testing with the study group and injected views on the strengths and weaknesses of the present system.

The study is limited to the Army system, although some of the report contents may be of use to the other Services. It excludes the testing activities of special elements such as the Surgeon General, the Chief of Engineers and the Army Security Agency.

METHODOLOGY

- REVIEW OF PREVIOUS STUDIES AND REGULATIONS.
- DISCUSSIONS WITH KEY PERSONNEL.
- REVIEW OF TEST REPORTS.

Current Army Test and Evaluation policies stem from DOD guidance, DA regulations, letters of instructions, and directives.

Since 1971, DOD has emphasized the necessity of improving operational testing in the Services. In January 1973, DOD Directive 5000.3 was published as guidance on Test and Evaluation. The major thrust of the directive was to require each Service to have a separate agency responsible for operational testing which would report its results directly to the Chief of Service.

The Army implemented the DOD philosophy by publishing a Letter of Instructions (LOI) incorporating new basic policies for materiel acquisition. Included in these policies was the requirement that testing be divided into the categories of Development, Operational, and Force Development Tests.

Since publication of the basic policy, the Army has been very slow in providing further guidance on testing. In January 1974, DA issued AR 10-4 which provided the mission, functions, and command relationships of the Army's separate test agency, the Operational Test and Evaluation Agency. The remaining regulations have been under revision since 1972 and with the last DA staff reorganization, even the latest drafts are nullified.

CURRENT TEST POLICY

DOD GUIDANCE.
DIRECTIVE 5000.3

ARMY GUIDANCE.
AR 1000-1
LOI, 23 AUGUST 1972

ARMY TEST REGULATIONS.
AR 10-4
AR 70-10 (DRAFT)
AR 71-3 (DRAFT)
AR 71-8

The current family of Army tests are DT, OT and FDTE.

As part of its guidance, the LOI established the three types of tests:

Development Testing is planned, conducted and evaluated by the developer and started as early in the development cycle as possible. It should first test components, then subsystems and finally prototypes or preproduction models of the whole system. The characteristics of DT are as shown on the right.

Operational Testing is planned, conducted and evaluated by either the designated user or an independent test agency. It is accomplished in as realistic an operational environment as possible. Characteristics of OT are shown on the right.

Force Development Test and Experimentation consists of tests that are performed to support the force development process by examining the impact, potential and effectiveness of selected concepts, doctrine, tactics, organization and materiel. They support the materiel acquisition process by:

- assisting in the development of ROCs
- assisting in understanding the total performance of a materiel system
- assisting in the development of counter-countermeasures for a deployed system.

TEST CHARACTERISTICS

DEVELOPMENT TESTING (DT)

ASSESS TECHNICAL RISKS.

DEMONSTRATE THAT ENGINEERING DESIGN IS COMPLETE AND ACCEPTABLE.

DETERMINE IF DESIGN RISKS ELIMINATED.

OPERATIONAL TESTING (OT)

DETERMINE MILITARY POTENTIAL, UTILITY, OPERATIONAL EFFECTIVENESS, AND OPERATIONAL SUITABILITY.

DETERMINE FROM USER VIEW IF NEW SYSTEM IS BETTER THAN EXISTING (BENEFITS VS BURDENS).

DETERMINE NEED FOR MODIFICATION.

DETERMINE ADEQUACY OF ORGANIZATION, DOCTRINE, OPERATIONAL TECHNIQUES AND TACTICS FOR SYSTEM EMPLOYMENT AND MAINTENANCE SUPPORT.

FORCE DEVELOPMENT TEST AND EXPERIMENTATION (FDTE)

ASSESSES INTERDEPENDENCE AMONG DOCTRINE, TACTICS, ORGANIZATION AND MATERIEL.

SUPPORTS MATERIEL ACQUISITION PROCESS.

The Army has incorporated high-level decisionmaking in its materiel acquisition policies.

As a part of its new materiel acquisition procedures, adopted in 1972, the Army established an Army Systems Acquisition Review Committee (ASARC) in parallel with the Defense Systems Acquisition Review Committee. This group of senior officials is the approving authority for all major systems undergoing development. Major systems include all materiel developments that exceed the dollar thresholds shown on the right.

Approval authority for all other systems is by means of In-Process Review (IPR), normally chaired by the materiel developer. The Army staff has designated certain systems, classified as selected non-major systems, to be approved by Headquarters, DA. The criteria for these systems is not well defined, but includes those development projects that have congressional interest, are of particular importance to the Army, or are of sufficient magnitude to warrant special attention. All other developmental projects are merely classified as other non-major systems.

Each materiel development passes through four milestones during its acquisition cycle. The decision for a system to pass from one milestone to another is made by the appropriate approval authority, either the ASARC or IPR. DT and OT are scheduled to coincide with these decision meetings. Since there are three ASARCs (I, II, III) required for each major system development, regulations also provide for the same number of DTs and OTs.

LEVELS OF DECISION

TYPE ACQ. (APPROVAL LEVEL)	DECISION BODY	DOLLAR THRESHOLD (MILLION)	REMARKS
MAJOR SYSTEM (SECDEF)	DSARC ASARC	RDTE (50+) PEMA (200+)	SEC. ARMY CAN DIRECT ASARC TO APPROVE OTHER SYS.
SELECTED NON-MAJOR SYSTEMS (CRD)	IPR	RDTE (0-50) PEMA (0-200)	SELECTED BY ACSFOR OR CRD
OTHER NON-MAJOR SYSTEMS (MATERIEL DEVELOPER)	IPR	RDTE (0-50) PEMA (0-200)	NO DA PARTICI-PATION

Developmental Tests for the Army are conducted by the Test and Evaluation Command of the Army Materiel Command.

The Deputy Director of Defense Research and Engineering (Test and Evaluation) monitors closely all major acquisition programs of the Department of Defense.

The Department of the Army staff representative for DT is the Office of the Deputy Chief of Staff, Research, Development and Acquisition (DCSRDA)--formally OCRD. Here a 10-man Test and Evaluation Branch manages the DT program.

The Test and Evaluation Command (TECOM) is one of nine subordinate elements of the Army Materiel Command (AMC). TECOM provides independent test and evaluation for AMC, its commodity commands, private industry and other Government agencies.

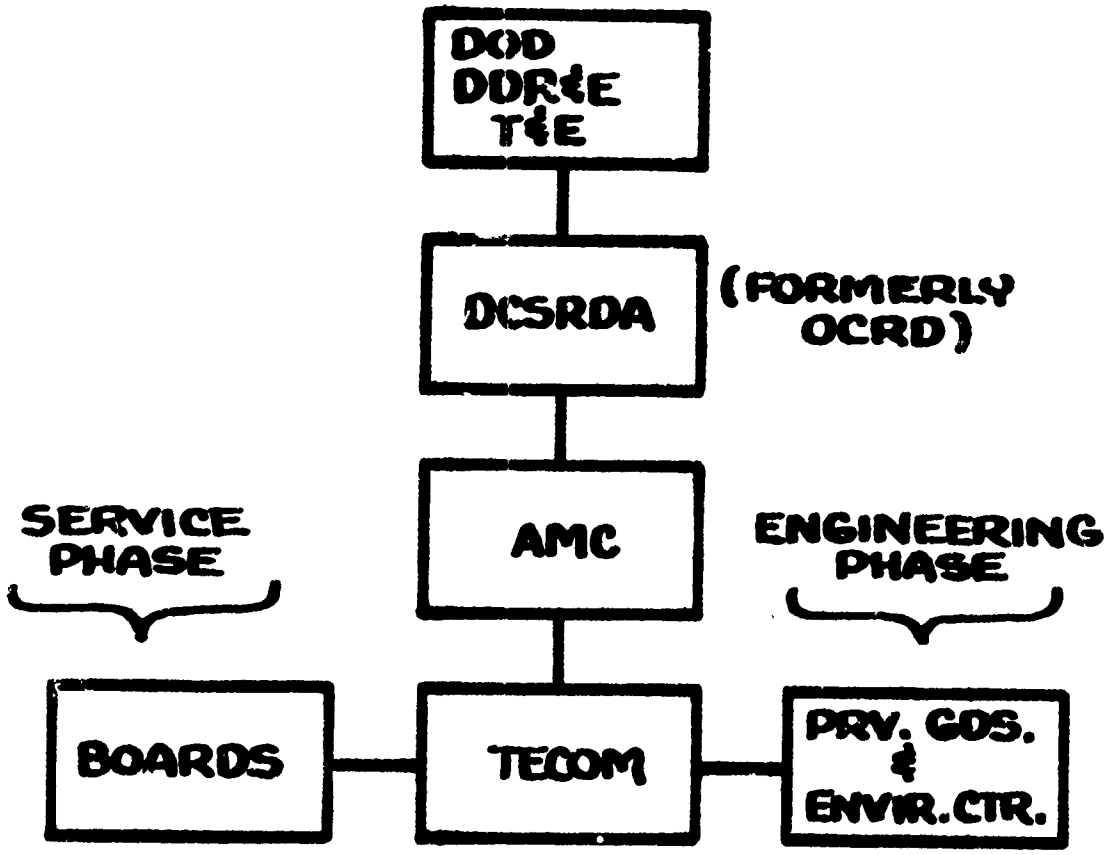
The 14 installations of TECOM perform the Developmental Tests of new material. The Engineering Test portion of DT is usually conducted at one of the six Proving Grounds and the two Environmental Test Centers.

The Service Test portion of DT is usually conducted at the six Branch Boards which are co-located with the appropriate schools.

Consisting of some 14,000 personnel, TECOM contains the bulk of the dedicated Army test and evaluation force.

DEVELOPMENTAL TESTING

(LINES OF COMMUNICATION)



INFANTRY		ABERDEEN
FIELD ARTY.		DESERET
ARM & ENGR.		JEFFERSON
AIR DEFENSE		ELECTRONICS
ABN. COM. ELEC	TROPIC	WHITE SANDS
AVIATION	ARCTIC	YUMA

Operational Tests for the Army are managed by OTEA and TRADOC.

The Deputy Director Defense Research and Engineering (Test and Evaluation) provides policy guidance and establishes procedures for Operational Testing. As a result of the criticism directed at OT by the Blue Ribbon Defense Panel in 1970, the Department of Defense has been extremely active in this field.

Each Service has been directed to establish an independent test agency to plan, direct and evaluate OT, with the results being reported directly to the service chief.

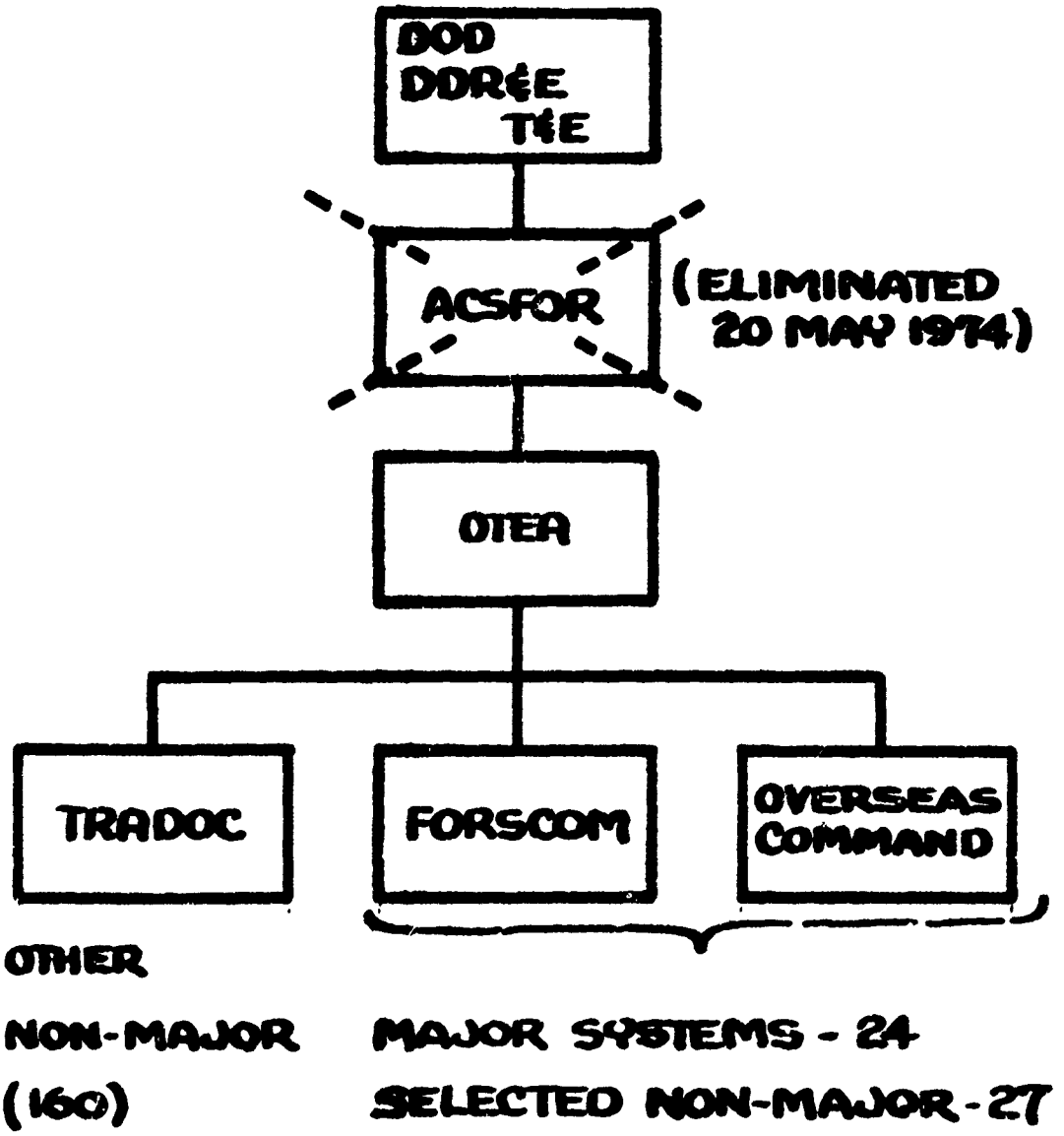
The Assistant Chief of Staff for Force Development (ACSFOR) managed OT, through OTEA, prior to the recent reorganization of the DA staff. With the elimination of ACSFOR, OTEA was placed directly under control of the Army Chief of Staff.

Major and selected non-major operational testing is actually executed by troop units within Forces Command or an overseas command under the direction of OTEA. There are currently some 51 critical systems (major and selected non-major) in the process of test planning, direction or evaluation by OTEA.

All OT other than that selected for intensive OTEA management is conducted by TRADOC. There are currently 160 such systems.

OPERATIONAL TESTING

(LINES OF COMMUNICATION)



Force Development test and experimentation for the Army is primarily conducted by MASSTER and CDEC.

ACSFOR provided DA staff management of FDTE until the majority of the function was passed to OTEA, its field agency. Although the Deputy Chief of Staff for Military Operations (DCSOPS) assumed many ACSFOR functions during the DA staff reorganization, its participation in FDTE is currently being debated.

There are presently two test agencies concentrating on FDTE--the Modern Army Selected System Test, Evaluation, and Review (MASSTER) at Fort Hood, under FORSCOM, and the Combat Developments Experimentation Command (CDEC) at Fort Ord, under TRADOC.

Broadly speaking, MASSTER conducts large-unit subjective FDTE utilizing the two FORSCOM armored divisions which report to the MASSTER/III Corps Commander. Extensive instrumentation now being procured will substantially enhance MASSTER's capability.

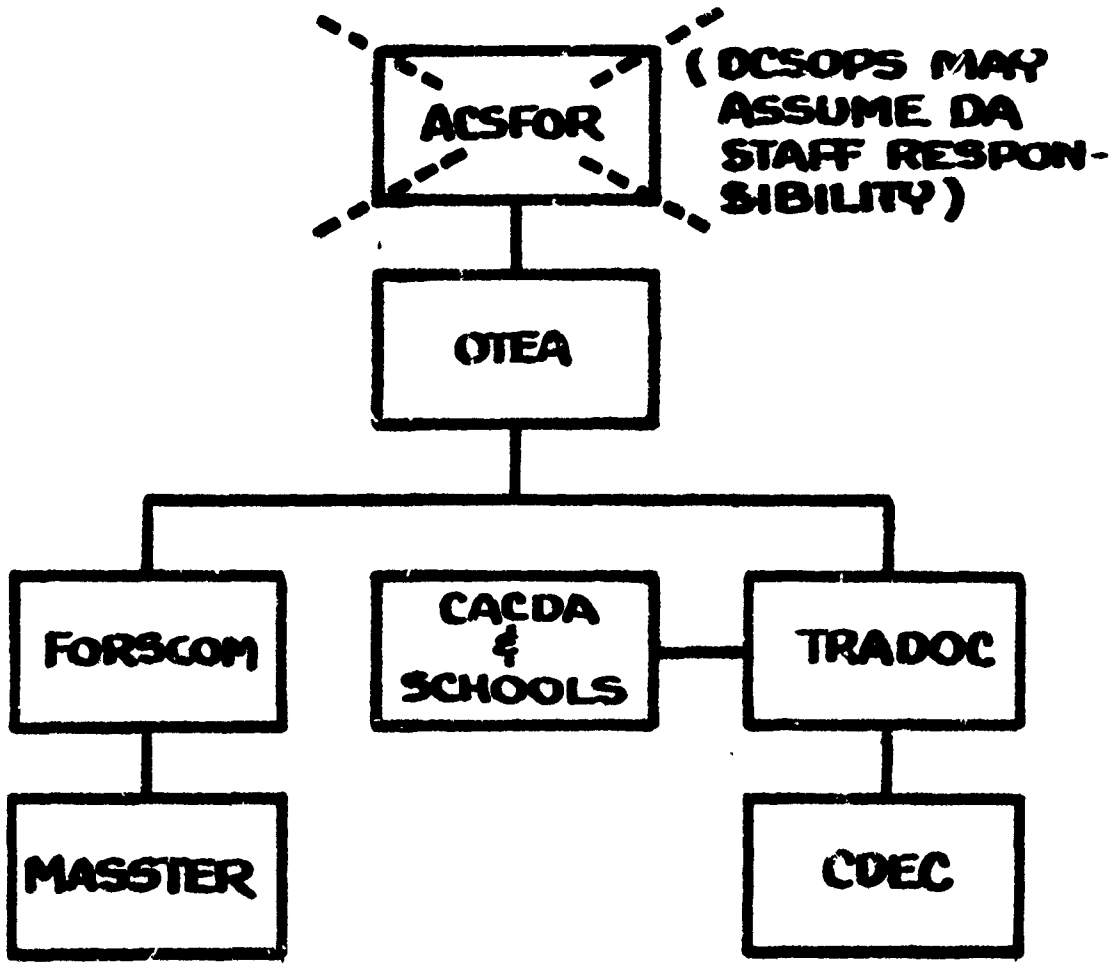
CDEC conducts small-unit objective tests (experiments) utilizing organic troops of its 1900-man Experimentation Group. CDEC is supported by a contract scientific support laboratory of approximately 100.

FDTE requests are normally generated by the schools and functional centers, then forwarded to TRADOC for assignment through OTEA to either CDEC or MASSTER, as appropriate.

Although DOD could become active in directing the Army's Force Development Test and Experimentation (FDTE) program, it has not been so to date.

FORCE DEVELOPMENT TEST AND EXPERIMENTATION

(LINES OF COMMUNICATION)



The total Army testing requirement is immense.

Though predicting the foreseeable Army test requirements is difficult, it is possible nevertheless to estimate an average yearly test load from historical evidence and current planning documents.

Considering the "user" test side of the coin first, over the next five years there are scheduled operational tests for 24 major systems (such as tanks, helicopters, and air defense weapons) and 27 selected non-major systems (such as mortars, drones and radars). Though small in number, these include all the major material the Army plans to acquire. Moreover, 160 "other" systems require operational testing also. To assist the combat development process, nearly 70 tests of tactics, doctrine and organization are scheduled. Some 300 pending ROC's may prove grist for this test mill, as well.

On the development side of the coin, by far the bulk of Army testing is done for the material developer, AMC. Test requirements ranging from customer assistance to DT's of major systems run the AMC load to an estimated 1200 yearly.

A reasonable estimate of the yearly Army test requirement is 125 "user" and 1200 AMC tests.

MAGNITUDE OF ARMY TESTING

CURRENTLY-PROGRAMMED TESTS FOR 1974-1978.

MAJOR	24 (FYTP)
SELECTED NON-MAJOR	27 (FYTP)
OTHER NON-MAJOR	160
FORCE DEVELOPMENT TEST AND EXPER.	68 (FYTP)

ESTIMATED ANNUAL TEST LOAD.

TECOM TESTS	1200
USER TESTS	125

FINDING AND RECOMMENDATION

Test goals are often mixed with test methods, one being defined in terms of the other. This leads to confusion and misunderstanding and is due, in part, to unclear regulations and, in part, to lack of understanding of the philosophy of testing. AR 71-8 should be rewritten to include separate and distinct 'goals' and 'methods' sections as spelled out in Chapter VII.

It became apparent during the study that confusion existed concerning test goals and test methods. Existing AR's lump the two together saying, for example, "... Force Development Tests are tests ranging from small ... highly instrumented experiments to broad ... highly subjective field tests that are performed to support the force development process...." The definitions are too broad to be useful to the planner and they do not clarify the complex philosophical nature of testing.

Fundamental goals of Army testing are as shown on the right. There is a continuum of test methods that may be used to satisfy the goals. The method selected will ultimately depend on a number of factors including information needs and resource constraints.

Across the method continuum are two extremes: the field experiment (highly objective) and the field evaluation (highly subjective). In the middle ground is a method that combines aspects of each, the field trial. Eight defining characteristics for each test method have been developed in Chapter VII and illustrate the point more completely. Although effort should always be made to strive for complete objectivity in any test, some questions may only be addressed through subjective field evaluation.

TEST GOALS ARE MIXED WITH TEST METHODS CAUSING CONFUSION.

- GOALS

  MATERIEL PERFORMANCE (DT)

  MATERIEL-SOLDIER-MISSION PERFORMANCE (OT)

  MATERIEL CONCEPT VALIDITY (FT-M)

  ORGANIZATION-TACTICS-DOCTRINE VALIDITY (FT-S)

- METHODS

INCLUDE SEPARATE GOALS AND METHODS SECTIONS IN APPROPRIATE REGULATIONS

FINDING AND RECOMMENDATION

FDTE is not receiving sufficient emphasis due to vague regulations and loose definitions. By separating Force testing into two types of tests, FT-M and FT-S, the FT system will be more responsive. New definitions are proposed in Chapter VII and the recommended system appears on the right.

History provides ample proof of the value of force testing. Previously, such testing was done under a variety of terms such as Troop Test, Field Test, Field Evaluation and Field Experiment. More recently, the term FDTE has been developed to cover all of this type of testing. The present definition, however, is too vague to be of much utility. It is our view that force tests should be separated into two categories:

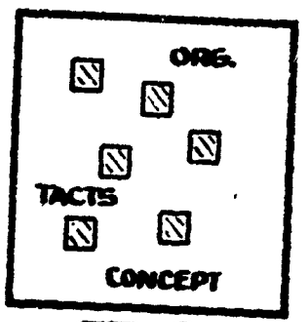
> Force Test--Material (FT-M) aids the material acquisition process by providing information toward the establishment or validation of a ROC.
>
> Force Test--Structure (FT-S) examines the validity of proposed tactics, doctrine and organization.

The top figure on the right illustrates the proposed system. The outer blocks represent the entire test while the inner blocks represent the relative importance of the material to the test. The relationship of the four tests to one another, with possible test outcomes, is illustrated by the figure on the bottom.

It is not our intent that every ROC proposal or every question involving organization, tactics and doctrine be subject to this system--only those ideas that are amenable to the test process.

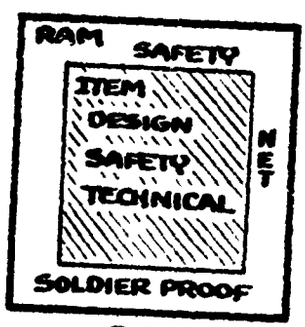
THE TEST SYSTEM

TYPES OF TESTS

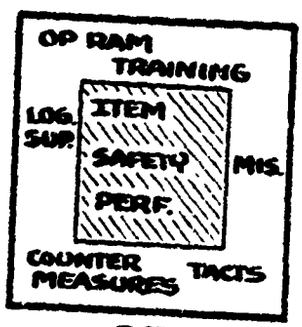


FT-S

FT-M

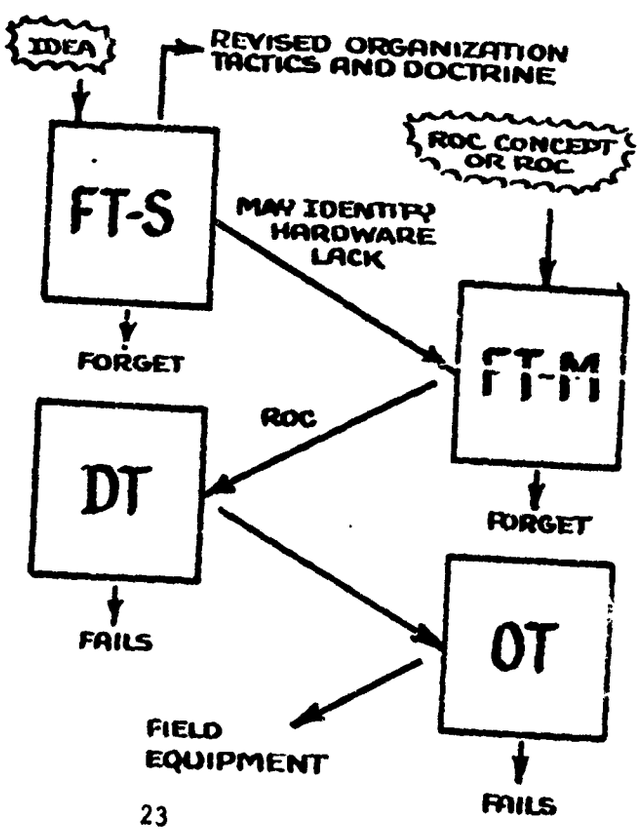


DT



OT

TEST RELATION-SHIP



FINDING AND RECOMMENDATION

In implementing DOD policy, the Army has not maintained a flexible attitude toward testing and has overstructured its OT procedures and overemphasized organizational placement of the operational tester. To resolve these problems, two actions are required. First, publish AR 70-10 immediately and in it specify that there not be a rigid requirement for all phases of OT. Secondly, give further study to the organizational placement of OTEA.

It has been two years since the Army changed its testing procedures, and 18 months since DOD published its guidance on testing; however, implementing regulations (AR 70-10 and AR 71-3) are still in draft form. The latest draft of AR 70-10 appears to be vague and controdictory. Even though the various developmental systems are categorized as major, selected non-major, and other non-major no such differentiation is made for testing. In fact, the vagueness of the draft is such that all phases of both OT and DT could be expected for all developments, regardless of their relative importance.

Although DOD guidance directs that both development and operational test results will be reported to the Military Service Chief, it is not evident that this would require the testers to be located at that echelon. It is our opinion that the intent of the DOD directive is that neither the development tester nor the operational tester need be placed directly under the Office of the Chief of Staff.

RIGID INTERPRETATION OF DOD POLICY

- REGULATIONS VAGUE.
- RIGIDITY OF REQUIREMENTS FOR THREE PHASES OF TESTS.
- REPORTING DIRECTLY TO CHIEF OF STAFF.

RELAX RIGID REQUIREMENT FOR ALL PHASES OF DT-OT

FURTHER EXAMINE THE OTEA ORGANIZATIONAL LOCATION

FINDING AND RECOMMENDATION

The Coordinated Test Program is not being properly coordinated in order to insure that (1) the right issues are tested and (2) there is no duplication of testing between DT and OT. To accomplish this, the DCSRDA should have the overall responsibility for the management of the CTP.

The draft regulations governing the CTP are clear as to intent of coordination and specify that the operational tester will concur in the plan. The CTP has the making of a fine management tool; however, its preparation, coordination, distribution and updating are the responsibility of the materiel developer who has no control over the input from the operational tester. Although there are detailed requirements for each involved agency to coordinate with all others, there is no mechanism for deciding which critical issues will be addressed, or which tester (DT or OT) will conduct what test. There is a definite requirement for an "honest broker" to insure that critical test resources are most effectively utilized.

CTP NOT COORDINATED

- REGULATIONS GOOD

- MATERIEL DEVELOPER RESPONSIBLE

- NO DIRECTED COORDINATION

DCSRDA RESPONSIBLE FOR CTP MANAGEMENT

FINDING AND RECOMMENDATION

The division of DA staff test responsibility is inefficient. DCSRDA should be responsible for OT and DT while DCSOPS should represent FDTE.

Through the years, OCRD (now DCSRA) has been the proponent for Developmental Testing on the DA staff. ACSFOR had a similar responsibility for User Testing (OT and FDTE) until the recent reorganization of the Army staff.

In reality, ACSFOR has passed most of its User test management responsibility to its field operating agency, OTEA. OTEA is primarily involved in OT execution, and not located within the Pentagon; therefore, the staff coordination role is inappropriately assigned.

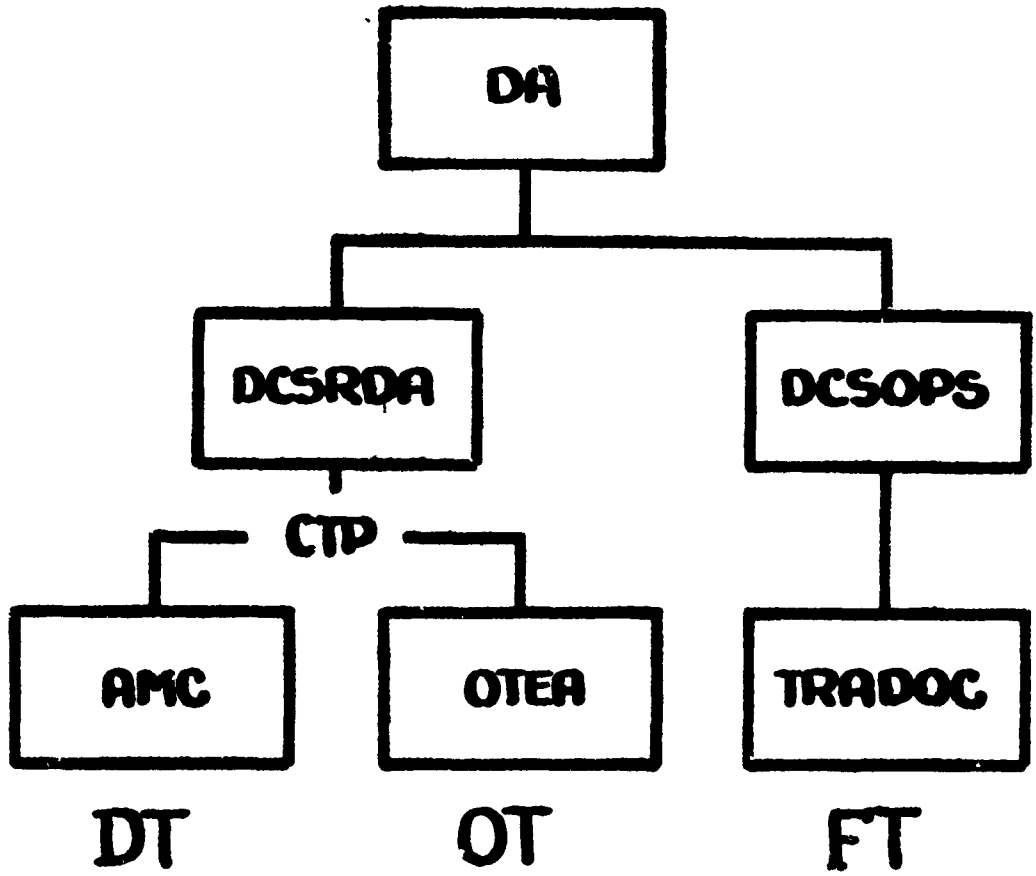
Testing responsibility on the DA staff is now divided along lines of Developmental Testing and User Testing rather than in accordance with the division of Materiel Acquisition Testing and Force Development Testing.

A spirit of confrontation appears to exist between the developmental and operational testers; therefore, disputes over division of functions are difficult to resolve.

DCSRDA, now responsible for both R&D and acquisition, should assume responsibility for both DT and OT, which are parts of the acquisition process, thus facilitating coordination and centralizing authority. DCSOPS, since it is now responsible for force development, should assume staff responsibility for force tests.

Both DCSOPS and DCSRDA should chair test schedule and review committees for their types of tests.

DA STAFF TEST RESPONSIBILITY IS IMPROPERLY DIVIDED



ASSIGN DCSRDA STAFF RESPONSIBILITY FOR DT AND OT; ASSIGN DCSOPS RESPONSIBILITY FOR FORCE TESTING.

FINDING AND RECOMMENDATION

Operational Test responsibility is currently divided between OTEA and TRADOC. The TECOM Boards should be assigned to OTEA and TRADOC should be relieved of its OT responsibility.

OTEA plans, directs and evaluates all major and selected non-major OT. TRADOC conducts other non-major OT.

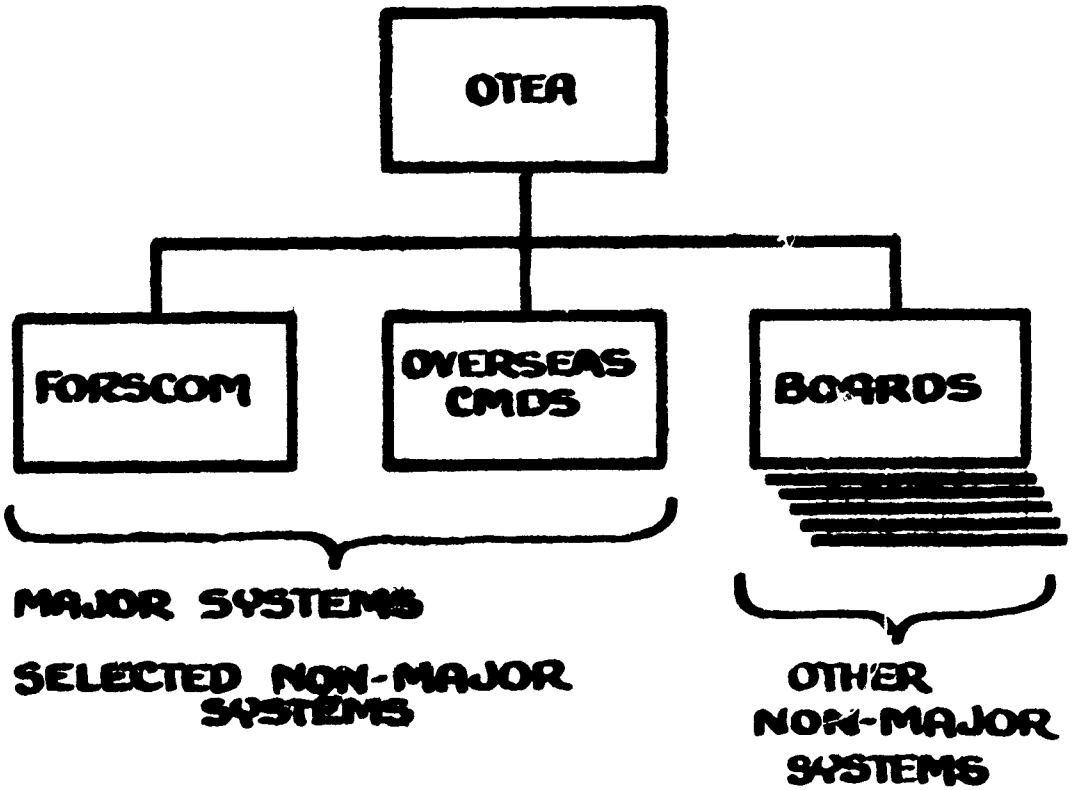
By this division of responsibility, OTEA is able to direct its attention to the few acquisition systems of primary importance. This management system, however, allows for varying policy and direction. In addition, difficulty may arise if systems are elevated in priority. This would, perhaps, necessitate a test agency change.

The TECOM Boards currently conduct the service-use phase, a form of operational testing, which encroaches into the OT field.

By assigning the Boards to OTEA, the argument concerning limits of the service phase of DT and the OT would be defused and OTEA would have its own capability to conduct other non-major OT.

TRADOC could then direct its full attention to Force Testing, an often-neglected area of appropriate and critical interest to that command.

OT TEST RESPONSIBILITY DIVIDED



CONSOLIDATE OT RESPONSIBILITY AT OTEA AND ASSIGN SERVICE BOARDS TO THAT AGENCY.

FINDING AND RECOMMENDATION

> **There is much confusion concerning the amount of troop involvement in development testing. AMC, upon losing its test boards, should retain a limited capability to do soldier-materiel compatibility testing as part of DT. To avoid confusion as to the meaning of this term, the definition contained in Chapter VII should be adopted.**

The service phase of DT, as presently conducted by TECOM, is in large measure duplicative in nature to OT. Although TECOM views the service phase as answering questions about the materiel while OT is to answer questions which are raised because new materiel is being introduced, this definition does not agree with the DOD guidance. In fact, the DOD requirement to accomplish OT with representative user troops in a realistic environment is similar to the specified criteria for the service phase. At the same time, there is a definite requirement for the developer to have some user troops assist him during the development of the materiel particularly in trouble-shooting the equipment.

Many of the answers required by the developer, as his materiel proceeds through the evolution of development and testing, can only be provided in an environment more rigidly controlled than that of an operational test. For this reason, AMC must have a limited number of user troops available, giving them a capability to conduct soldier-materiel compatibility testing as part of normal development testing.

CONFUSION AS TO TROOP INVOLVEMENT IN DT

SERVICE PHASE OF DT AND OT ARE DUPLICATIVE.

DEFINITIONS UNCLEAR.

REQUIREMENT FOR "USER" PERSONNEL IN DEVELOPMENT PROCESS.

DEFINITION OF "SOLDIER-MATERIEL-COMPATIBILITY"

TECOM RETAIN LIMITED "SOLDIER-MATERIEL-COMPATIBILITY" TESTING CABABILITY

FINDING AND RECOMMENDATION

Force Development Testing is currently fragmented. A Force Test and Evaluation Agency should be formed under TRADOC.

Force Development Testing is currently conducted by two potentially duplicative agencies, CDEC and MASSTER. Neither of these organizations is optimally controlled or directed by higher command.

MASSTER conducts an active test program, however, it has occasionally been criticized for conducting tests not in consonance with Army needs. It reports to FORSCOM to facilitate troop support, yet receives all its tasking from other sources--a violation of proven managerial procedure.

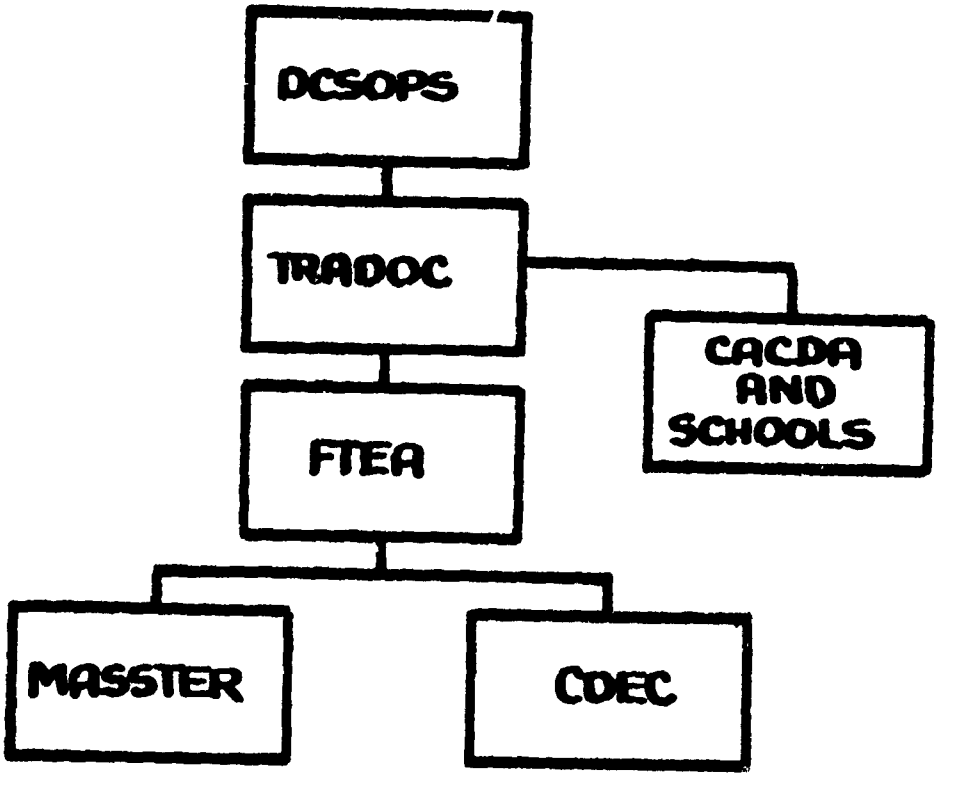
CDEC, a highly instrumented field laboratory, requires extensive time for test planning and execution. This has resulted in limited output. It considers itself a totally impartial test agency which does not initiate or actively solicit tests.

OTEA has been given responsibility for force test management; however, its extensive involvement in the critical operational tests has precluded active management of force testing.

Since TRADOC would be the principal user of force test data, it would appear appropriate for that headquarters to command both CDEC and MASSTER.

In order to provide direction to and coordinate the FT activity within TRADOC, a Force Test and Evaluation Agency (FTEA) should be formed. The agency would task and command both CDEC and MASSTER.

FORCE DEVELOPMENT TESTING IS VITAL; HOWEVER, CURRENTLY FRAGMENTED AND LACKING STRONG DIRECTION

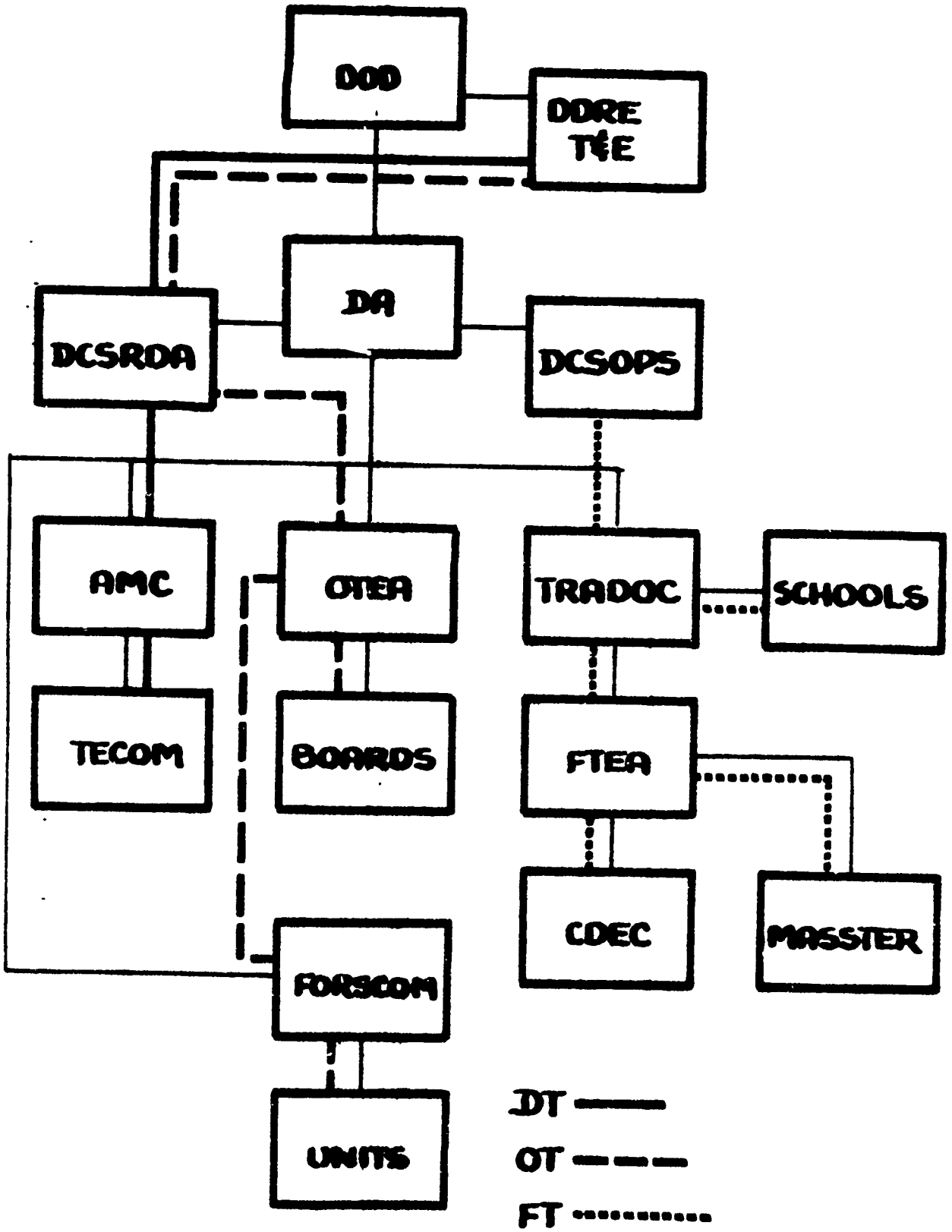


FORM A FORCE TEST AND EVALUATION AGENCY WITH CDEC AND MASSTER AS SUBORDINATE UNITS.

SUMMARY OF RECOMMENDATIONS

Implementation of study recommendations will provide an improved system for Army Test and Evaluation.

- Give DCSRDA staff responsibility for all acquisition testing (DT and OT).
- Strengthen the CTP by giving DCSRDA responsibility for coordination.
- Consolidate responsibility for all OT at OTEA.
- Assign the TECOM boards to OTEA to assist in the conduct of OT.
- Have TECOM continue a limited form of the service-use phase of DT.
- Give DCSOPS staff responsibility for all Force Testing.
- Give TRADOC field responsibility for all Force Testing and place more emphasis in this area.
- Form from MASSTER and CDEC resources a Force Test and Evaluation Agency under TRADOC.
- Assign both CDEC and MASSTER to the Force Test and Evaluation Agency.
- Separate Force Testing into two types: one for testing materiel concepts, the other for testing structure concepts.
- Clarify the difference between <u>goals</u> of tests and <u>methods</u> of conducting tests.


DOD
DDRE T&E
DA
DCSRDA
DCSOPS
AMC
OTEA
TRADOC
SCHOOLS
TECOM
BOARDS
FTEA
CDEC
MASSTER
FORSCOM
UNITS
DT
OT
FT

CHAPTER I

INTRODUCTION

" . . . from testing-knowledge . . . from knowledge--the power of decision . . ."

Goal

The goal of this study is to appraise the Army's test and evaluation organizations and procedures as they pertain to the combat forces development process. Three major objectives are considered to achieve this goal:

--Determine problems with the current test and evaluation system and organization for testing.

--Develop a "best" generalized system for test and evaluation.

--Determine the most effective definitions, procedures, and assignment of responsibilities.

Why Study?

Testing is big business in the Army. It has been estimated that some $300 million dollars and roughly 18,000 people are directly chargeable annually to the test and evaluation sector--excluding troop support.

At the same time, as will be shown in Chapter II, the subject has received considerable high-level attention, particularly over the past few years. As a result of this attention, a number of significant changes have been instituted which have kept the system in

turmoil. One school of thought suggests a moratorium on further change until the present system achieves a steady-state before additional study is made. The test and evaluation system of the Army, however, is merely a small part of the whole and there have been recent broad changes to the whole system that affect--or will affect--the testing system dramatically. Discussed in detail elsewhere, these changes include the creation of two major commands, Forces Command (FORSCOM) and Training and Doctrine Command (TRADOC), the reorganization of the Department of Army staff, and a maturing Operational Test and Evaluation Agency (OTEA) to mention a few. For these reasons alone, it is timely to reappraise the present system to determine if additional changes are warranted.

Why Test?

Almost since the beginning of military organizations, tests of some kind have been run. It is said that Xerxes, the mighty King of Persia, once built a structure large enough to hold 10,000 men wherein he "tested" to be sure his massive levys were met, thus obviating the need for a soldier-by-soldier count. A fundamental step taken in the development of organizations, tactics, and doctrine, is a "test." War games, field trails, and hardware proofing have long been part of military procedure.

Today the Army tests for two basic purposes: First, as an integral part of the material acquisition processes, and, second, as a critical means of assessing innovative ideas in organizations, tactics, and doctrine.

The first category includes tests of material under acquisition consideration. Loosely grouped under terms such as "Developmental" and "User," they include tests to check technical capabilities of an item, the meeting of technical specifications, logistical impact, hardware utility in a tactical context, quality assurance, and a host of others.

Under the second category are included such tests as those conducted either in response to the introduction of new hardware or those resulting from the formulation of new tactical and organizational concepts. In short, one tests to gain knowledge about hardware and about ideas.

What is a Test?

Having briefly discussed why the Army tests, exactly what is a test? Webster says:

> Test: Means of trial; to subject the conditions that show the real character of thing in a certain particular.

A test forms a basis for evaluation. An evaluation determines or fixes the value of a thing or an idea through an examination and judgment of test results. Testing is one of the more complicated tasks in the cycle of military research. Testing in the broadest sense includes experimentation but, in many instances, Army testing is not scientific experimentation in the classic sense; it is, rather, an art. It is an art where scientific methods are employed whenever appropriate, where all judgments are supported by as wide a range of data as possible, but where the art will usually be more evident than the science.

The Army Dictionary, Ar 310-25, answers the question "What is a test?" as follows:

> A test is 'a process by which data are accumulated to serve as a basis for assessing the degree that a system meets, exceeds, or fails to meet the technical or operational properties ascribed to the system.'
>
> Development testing focuses on testing 'those characteristics of equipment which pertain primarily to the engineering principles involved in producing equipment prosessing desired military characteristics . . .'
>
> Operational testing focuses on testing 'the specific military qualities of performance and capability required of an item of equipment to enable it to meet an agreed operational need.'

Study Group Approach

The three-man group undertook research that followed three avenues:

--Reviewed all major previous studies and all appropriate regulations.

--visited major activities and conducted face-to-face discussions with key personnel in the Army and Department of Defense (DOD). Visits were made to the Test and Evaluation Command (TECOM) at Aberdeen Proving Grounds; the Modern Army Selected Systems Test, Evaluation and Review (MASSTER) Headquarters, Fort Hood, Texas; and the Combined Arms Combat Development Activity (CACDA), Fort Leavenworth, Kansas. Key discussions were held with LTG Starbird, Deputy Director, Defense Research and Engineering (DDRE); LTG Deane, Chief of Research and Development (CRD); GEN Depuy, (TRADOC); MG McChrystal, (MASSTER); MG Ochs, (TEA); and MG Brown, (TECOM).

--Reviewed--on a limited basis--some 18 test reports. These represented a sample output from OTEA, MASSTER, TECOM, and the Combat Developments Experimentation Command (CDEC).

The group also drew heavily from their own cumulative 17 years' experience in the test and evaluation field.

Scope

The study is limited to the Army. Further, it excludes the testing activities of such special organization as the Army Security Agency, the Surgeon General, Chief of Engineers, and others outside the mainstream.

The contents should be viewed as a general portrait of the system rather than a detailed analysis. Elements of the system--especially organizational relationships--are so dynamic that some will undoubtedly have changed prior to completion of this effort. Nevertheless, the underlying problems identified will undoubtedly persist.

Report Organization

In order to provide a proper framework, it is important to know how the Army arrived at today's testing system. Chapter II treats this by discussing the evolution of testing in the Army from a historical perspective, drawing heavily from the many previous studies conducted in the area.

Chapter III sets forth the current policy in terms of regulations, definitions, responsibilities, and procedures. The actual resources dedicated to and available for testing are the subject of Chapter IV.

The next chapter provides indications of the future requirements for testing, for it is to meet these known requirements that the Army must be efficiently and logically organized. Two very recent events impact upon this research effort to a considerable degree. Chapter VI deals with these events, the major reorganization of the Army staff and the recommendations of a recently completed study made for the Secretary of the Army. Chapter VII, entitled Evaluation, is the heart of the report, wherein the analysis of the present system is made and the study findings and recommendations are contained.

CHAPTER II

THE EVOLUTION OF ARMY TEST AND EVALUATION

Background

The Army throughout its history has been involved in the testing of new materiel and ideas; however, interest in the field of test and evaluation has increased markedly in thypast quarter century. A change in the Army's attitude from one of almost total rejection of any new idea to one of active encouragement of research and development has had a substantial effect on the test and evaluation process.

Although limited in scope, we find an excellent example of a material acquisition test being conducted over one hundred fifty years ago. A gentleman by the name of John Hall, conceived the idea of a breech-loading rifle. He developed and demonstrated working models of the weapon and entered into a contract with the Army for construction of several test prototypes. In 1820, Hall delivered these weapons to the Army for testing. As it turned out, tests indicated that the weapon was not satisfactory for use in combat andd, therefore, no procurement was initiated.

To further illustrate testing within the Army, let us advance the date to 1911 when it was concluded that the Army should undertake some "experimentation" which would help develop a motor truck "to replace the field wagon to the greatest possible extent." The quartermaster department at that time began a developmental and

testing program to produce a suitable truck. A test of two Army trucks and a privately-owned truck which was run from Washington, DC to Ft Benjamin Harrison covered 1,524 miles in forty-eight days. The conclusion was reached that although the results were not entirely satisfactory, trucks did show some promise.

Lieutenant General Lesley J. McNair directed in 1937 one of the most extensive organizational tests ever conducted by the Army. As a result of these evaluations, the Triangular Infantry Division used throughout World War II was devised. Beginning with the fundamental study of an Infantry rifle squad, an entire divisional organization was put together piece by piece. Matters on which alternative ideas were tested included: frontages and fire power per man and per unit; ammunition allowances; motor columns; the requirement for artillery in proportion to infantry; the time elapsed in transmission of orders; and the amount of service support to be incorporated in the division. Findings on these organizational, tactical and doctrinal questions were embodied in an extensive report submitted by General McNair in 1938.

These tests, along with those of Colonel Billy Mitchell in 1921 demonstrating the effectiveness of airpower against ships, provide illustrations of the type of tests and rather primitive procedures which existed prior to World War II. Although testing was conducted by the Army as these examples indicate, it was not until the late 1950's that the Army developed a sophisticated organization for test and evaluation.

The remainder of this chapter will deal with the most recent 15 years of testing and will review the evolution of testing using as a medium the various studies of this subject made during that period.

Previous Studies

In the discussion which follows, we will review only those major studies of the test and evaluation system conducted since 1960. It would, perhaps be helpful to review the Army's organization for testing at the beginning of the period. With this preliminary information, one can better evaluate the recommendations of the various study groups and visualize the development of the current system.

Test Organization in 1960

A Department of the Army publication entitled "US Army Organization and Procedures for Research and Development," dated September 1960 stated that basically there were three categories of tests: engineering tests, service tests, and troop tests. The publication also outlined Army organization for conduct of these tests.

At that time there existed the seven separate technical services--their chiefs being heads of both the Army technical staff and the technical services. The Technical Service Chiefs included the Chief Chemical Officer, the Chief of Engineers, the Chief of Engineers, the Chief of Ordnance, the Quartermaster General, the Chief Signal Officer, the Surgeon General, and the Chief of Transportation. It was the responsibility of each Chief of service to develop, provide, and service the material items under his purview. His program of material

development was to include engineering tests for new items of equipment. These tests evaluated the engineering characteristics to see that the technical specifications were met.

The Continental Army Commander (CONARC) had both a Deputy Chief of Staff (DCS) for Materiel Developments and a DCS for Combat Developments. The DCS for Materiel Developments was responsible for coordinating and evaluating service tests conducted by the seven CONARC boards which came under his supervision. The service test evaluated an item of materiel under simulated or actual operational conditions to determine the degree to which the item met the stipulated military characteristics and its suitability for military use. The CONARC Test Boards included the Artillery, Armor, Infantry, Air Defense, Airborne and Electronics, Aviation, and Arctic Test Boards. Although primarily concerned with service testing, these boards also participated to some degree in troop tests.

The DCS for Combat Developments had responsibility for combat development field experiments and troop tests. He also supervised the Combat Developments Experimentation Center, a new field laboratory located at Ft Ord, California, which was designed to prepare, conduct and evaluate with maximum objectivity and scientific control, tests and experiments of concepts, organizations, doctrine, and procedures for future combat. An experiment, although not a specific category of test, was designed to be highly scientific. The troop test was conducted in the field by units for the purpose of evaluating operational or organizational concepts, doctrine, techniques, procedures, or to gain further information on materiel.

The Chief of Research and Development had primary general staff responsibility for the Army's engineering and service test program, while the Deputy Chief of Staff for Operations (DCSOPS) had the same responsibility for the troop test and experimentation program.

Project 80 (1961)

The Project 80 study addressed testing as one aspect of the materiel acquisition and combat developments system. It cited the need for better coordination of Army testing and recommended that developmental and service testing be consolidated into one test agency. As has been pointed out, engineering tests were at that time conducted by the technical services while service tests were carried out by the CONARC boards. This recommended test agency would be independent of the developer and at the same time improve efficiency by consolidating the engineering and service tests.

The study also recommended the establishment of a combat developments agency to focus on the future. CDEC would be assigned to this agency as a concept test activity.

Project 80 stated that the combat developments activity of the DA staff (a function including "research, development, and early integration into the Army of new doctrine, new organization and new materiel to obtain the greatest combat effectiveness") should be separated from both the DCSOPS and the OCRD. This proposal was the genesis of a new Army staff agency for force development.

Reorganization of the Army (1962)

The 1962 reorganization of the Army incorporated many of the recommendations of Project 80. The key features included the establishment of an Army Material Command (AMC) with its own test and evaluation command and formation of the Combat Developments Command (CDC) where future concepts would be developed under a single authority.

The Test and Evaluation Command provided independent engineering and service tests for the commodity commands (the new name for the technical services now subordinate to AMC). This centralized test command assumed control of the CONARC test boards and all test agencies of the technical services. It was designed to reduce requirements for lateral coordination and to shorten lead time. TECOM also assumed responsibility for supervising the troop tests conducted by CONARC.

The Combat Developments Experimentation Center was assigned to CDC and given the mission of concept testing and field experimentation.

In summary, test responsibility under this new organization was as follows: AMC - engineering and service testing; CONARC - troop testing (supervised by AMC/TECOM); and CDC - concept tests and field experiments.

Sate (1966)

The study of Army Test and Evaluation (SATE) was initiated by a memorandum from the Army Chief of Staff in October 1965. The objective was to determine how the Army could best organize, administer and control the test and evaluation process to support the timely acquisition

of equipment. Interestingly enough, the study criticized the 1962 assignment of engineering and service testing to AMC/TECOM, stating that the "developer," AMC, was now responsible for the total evaluation of its own product. It is noteworthy that the 1962 reorganization had looked upon the technical services as the "developers" and had attempted to eliminate the technical services evaluation of their own products by the formation of TECOM as an independent test agency.

SATE cited the need for improved operational testing within the Army and recommended the assignment of TECOM to CDC where all material testing would be conducted. This was an attempt to separate operational testing from the material developer and provide the decisionmaker with an independent user evaluation. It failed, however, to recognize the developer's need to accomplish engineering tests. The report also pointed out the need to minimize the number of activities and installations involved in testing and the requirement to simplify the cumbersome regulations governing testing.

Among the other "improvement actions" were recommendations for advanced instrumentation, scientific support and statistical analysis in service tests; greater participation by service schools in test planning so as to include doctrine in the combat development process; and the assignment of DA staff responsibility for the "life span of materiel" to the Assistant Chief of Staff for Force Development (ACSFOR).

The Brown Board (1967)

A "Board of Inquiry on the Army Logistics System" was established in September of 1965 with Lieutenant General Frederic J. Brown as

Chairman. Its purpose was to analyze the entire Army logistics system to determine what changes and modifications were needed. Only a single section of this six-volume report dealt with test and evaluation.

The principal thrust of the report was that the "systems" approach to testing was being neglected in favor of a "hardware" approach. By this the report meant that too much emphasis was being given to the functioning of the materiel and not enough to its relationship with the enemy threat, future doctrine, environment, organization, training, and logistic support requirements. In short, the report seems to indict the testers for their isolation from the field army and their narrow view of testing.

The Board pointed out that testing had been accorded preeminence over the function of evaluation. In reality it said that "evaluation" had become little more than "test assessment" and that a broader view of evaluation was required.

Significant findings were:

--Controls over test programs and test schedules are generally inadequate.

--Test reports are not required for DA decisions, but thorough evaluations are essential.

--There is no comprehensive test program which embraces all phases of acquisition management.

In summary, the Brown Board recommended substantial changes in test philosophy and dealt lightly with organizational relationships. The Board believed that testing had two primary roles: (1) Provide

data to guide development and (2) provide data, the assessment of which is one input to evaluation. It is worthy of note that many of the philosophical flaws found in the test system by the Brown Board continue to exist.

The Fulton Committee (1969)

Under the leadership of BG William Fulton, a study was initiated to review the integration of the Defense Communications Planning Groups responsibilities into the Army. The committee also focused on the lack of a responsive operational test and evaluation capability within the Army.

In particular, the group sought to expedite the review and testing of surveillance, target acquisition and night observation (STANO) equipment which was essential to activities in Vietnam. As a result of the study, Project MASSTER (Mobile Army Sensor Systems Test Evaluation and Review) was established at Ft Hood, Texas, with a mission of providing centralized control of all test activities dealing with STANO items. This management technique reduced reaction times and facilitated coordination among Army commands. MASSTER was assigned to CONARC in order to facilitate troop support of testing.

In 1971, Project MASSTER expanded its function from that of only testing STANO devices to one of general force development testing and as a result, changed its name to Modern Army Selected Systems Test Evaluation and Review (still MASSTER).

This broadening of scope for MASSTER gave the Army two force development test centers, often duplicative in functioning and equipment.

It became generally accepted that MASSTER would perform large unit/subjective tests while CDEC would conduct small unit/objective experiments.

The Parker Panel Report (1970)

The Parker Panel, a well publicized study of the Army organization in 1971, recommended combining the CONARC schools and the doctrinal agencies of CDC under the command of CDC. By this action, the Panel believed that doctrine and training could be better integrated and that the functioning of both CDC and CONARC would be enhanced. The Panel also concluded that the Army could not afford to continue operating CDEC and MASSTER as separate agencies with a potential duplication of capability and without integrated test planning. It recommended combining the two facilities under CDC in order to facilitate coordination and planning.

Neither of the recommendations of the Parker Panel was immediately implemented; however, an Army reorganization three years later, in 1973, did consolidate doctrine and training under a single command.

USACDC CDEC/MASSTER Study (1970)

Shortly after the Parker Panel report was published recommending the combining of CDEC and MASSTER, the Commanding General of CDC directed a study to determine the optimum organization of this combined element. This study found, however, that it was impractical to move or disband either of the units and thus recommended the formation of a test command which would include both. This action would, according

to the report, insure coordination of effort and eliminate the fragmentation of limited expertise. It also recommended that consideration be given to assigning the test boards of TECOM to CDC.

Blue Ribbon Defense Panel (1970)

Mr. Gilbert W. Fitzhugh was appointed chairman in July 1969 of a special panel to study the organization and management of the entire Department of Defense. In making this appointment, President Nixon gave this prestigeous panel a broad charter which included evaluation of testing within the Defense establishment.

The Panel reported that developmental testing, "functional testing" as they called it, was being conducted well in all Services. On the other hand, they were extremely critical of operational testing and recommended a number of actions to improve procedures. Included among these were:

--Establishment of a Defense Department Operational Test and Evaluation (OTE) Group with civilian leadership, reporting directly to the Secretary of Defense.

--Establishment of a Defense Test Agency with broad authority and responsibility for DOD test activities.

--Increased emphasis on OTE.

--Improved joint OTE.

--Separate budgeting by Services for OTE.

Although the Secretary of Defense did not establish the OTE Group or the Defense Test Agency in accordance with the past two recommendations, he did give emphasis to the importance of OTE. This emphasis

became the guiding and predominant stress which is felt by the Services even today.

The Army responded to the recommendations of the Blue Ribbon Panel by initiating what was called an Expanded Service Test. This test emphasized the operational environment but was conducted by TECOM, for all practical purposes the developer. This modification, of course, did not satisfy the Department of Defense which would strive in the next few years for increased independence of operational testing.

Priority Project Four (1972)

Before reviewing other Army actions directed at stressing OTE, it would be beneficial to consider one final study of Army "test, evaluation and field experiments." In 1971, a study group was assembled to assist the Comptroller of the Army in making recommendations to the Chief of Staff for improving conduct of operational test and evaluation.

The report of the group concluded that the establishment of an Army test command for operational and field testing was appropriate. Also among its recommendations were:

--Better definition of test responsibilities.

--Consolidation of all test-associated Army regulations into one test and evaluation regulation.

--Elimination of TECOM headquarters.

--Closure of CDEC with gradual transfer of its mission to MASSTER.

--Improved test forecasting to enhance effective management.

The Army Reorganization (1973)

Just prior to the major reorganization of the Army, and in accordance with the Blue Ribbon Defense Panel study, DOD directives and Priority Project four recommendations, the Army established an Operational Test and Evaluation Agency (OTEA) under staff supervision of ACSFOR, but reporting its results directly to the Chief of Staff. This agency provided a strong focal point for operational testing within the Army and planned, directed and evaluated the operational tests of certain important systems. By the formation of this agency, the Army had complied with the DOD guidance to conduct operational tests in an organization separate and distinct from the developing/procuring command.

The reorganization of the Army in 1973 formed the Training and Doctrine Command and the Forces Command from the old Continental Army Command and the Combat Developments Command. Thus the proposed combining of doctrine and training into one command as the Parker Panel had recommended, finally became a reality.

Chapter IV will discuss in detail the current organization for test and evaluation. Suffice it to say here that many of the recommendations of studies conducted in the past were incorporated in the Army reorganization of 1973.

CHAPTER III

CURRENT ARMY TEST AND EVALUATION POLICIES

General

This chapter discusses the Army's current test and evaluation system, to include regulations under which test and evaluation is conducted, and the specific nature and type of tests to be conducted under this system.

DOD Direction

During 1970 and the first eight months of 1971, Deputy Secretary of Defense Packard made sweeping changes in the Services materiel acquisition procedures. On one hand, he delegated to the Services more responsibility, but on the other hand, he directed that more attention be given to performance testing. Mr. Packard's guidance which was, in part, based on the recommendations of the Blue Ribbon Defense Panel, included the establishment of the Office of Deputy Director for Test and Evaluation in the Office of Defense Research and Engineering. The Deputy Director was given overall responsibility for test and evaluation policies and procedures for DOD. In January 1973, DOD Directive 5000.3, Test and Evaluation, was published as guidance to the Services. This directive provided that:

--Test and Evaluation shall be commenced as early as possible and conducted throughout the system acquisition process as necessary to assist in progressively reducing acquisition risks and in assessing military worth.

--Acquisition schedules will be based upon accomplishing test and evaluation milestones prior to the time that key decisions regarding procurement are made.

--Before the initiation of development of a new system, test and evaluation using existing systems, or modifications thereto, may be appropriate to help define the military need for the proposed new system and to estimate its military worth.

The Directive established the principal types of tests to be conducted as Development Test and Evaluation (DTE), Operational Test and Evaluation (OTE), and Production Acceptance Test and Evaluation (PATE). These tests were defined as follows:

--DTE is that test and evaluation conducted to demonstrate that the engineering design and development process is complete; that the design risks have been minimized; that the system will meet specifications; and estimate the system's military utility when introduced.

--OTE is that test and evaluation conducted to estimate the prospective system's military utility, operational effectiveness, and operational suitability (including compatibility, interoperability, reliability, maintainability, and logistic and training requirements), and need for any modifications. In addition, OTE provides information on organization, personnel requirements doctrine and tactics.

--PATE is that test and evaluation of production items to demonstrate that the items procured fulfill the requirements and specifications of the procuring contract or agreements.

Essentially, OTE procedures were not affected by the directive; however, the Services were given specific guidance on the conduct of OTE. Of major importance were the following:

--Each Service will have one major field agency separate and distinct from the developing command which will report its test and evaluation results directly to the Service Chief, recommend the accomplishment of adequate OTE and insure that OTE is effectively planned and conducted.

--Each Service will have a full-time, strong, focal point on its headquarters staff to assist the independent OTE field agency.

--As a minimum, an initial phase of OTE will be conducted prior to the first major production decision in order to provide a valid estimate of system operational effectiveness and suitability. For complex systems, additional phases of OTE may be required prior to the first major production decision.

--When sufficient production items become available, follow-on phases of OTE will be accomplished in order to fully determine the systems operational effectiveness and suitability.

Army Direction

To comply with Mr. Packard's guidance on improving the materiel acquisition process, the Army published AR 1000-1 and a Letter of Instruction (LOI), dated 23 August 1972, promulgated the Army's basic policies for systems acquisition which sought to minimize costs, shorten development time, and assure adequate performance. These basic policies were dealt with:

--Shortened requirements generation time.

--High-level decisionmaking.

--Shortened development time.

--Funding priorities.

--Cost versus quantity.

--Program cost control.

Of major importance to the Army policy for test and evaluation was the decision to establish an Army Systems Acquisition Review Council (ASARC) paralleling the already established DOD Defense System Acquisition Review Council (DSARC). Figure one shows the level of decision for the various types of acquisition. ASARC meetings are scheduled to coincide with the developmental cycle of the system:

Milestone	Meeting
Enter Validation	ASARC I
Enter Full-Scale Engineering Development	ASARC II
Low Rate Initial Production	ASARC II-a
Full-Scale Production	ASARC III

Development testing (DT) and operational testing (OT) are planned and conducted so that the results can be provided to the appropriate ASARC. As an example, the policy states that for ASARC IIa the basic output of DT and OT should answer the question, "Is the system basically OK, can any identified deficiences be corrected, and if corrected, do we want the system considering what we already have?" The policy also states that the final OT of low rate initial production units is intended to determine:

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LEVELS OF DECISION

TYPE ACQ. (APPROVAL LEVEL)	DECISION BODY	DOLLAR THRESHOLD (MILLION)	REMARKS
MAJOR SYSTEM (SECDEF)	DSARC ASARC	RDTE (50+) PEMA (200+)	SEC. ARMY CAN DIRECT ASARC TO APPROVE OTHER SYS.
SELECTED NON-MAJOR SYSTEMS (CRD)	IPR	RDTE (0-50) PEMA (0-200)	SELECTED BY ACSFOR OR CRD
OTHER NON-MAJOR SYSTEMS (MATERIEL DEVELOPER)	IPR	RDTE (0-50) PEMA (0-200)	NO DA PARTICI-PATION

Fig. 1, Levels of Decision

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(1) The overall system's field effectiveness in the hands of troops (benefits vs burdens) to include performance against expected countermeasures.

(2) The system's maintainability and reliability within the limits of the test period.

(3) The readiness of the system for deployment in terms of basis of issue, organization, tactics, and the training package.

In the policy to shorten development time, testing was divided into only the two categories--DT and OT. The policy further stated that DT would be conducted by AMC and would include engineering testing and only that part of service testing which assesses operability and maintainability of the system by the prospective user. It further directed that OT would be conducted by troops or individuals, preferably in units, to determine if the system is operationally suitable from a doctrinal, organizational, and tactical point of view. Figure two graphically presents the entire system acquisition cycle.

Current DA Regulations

With the exception of AR 1000-1, which was published on 13 July 1972, the Army has been very slow in providing guidance for the new test procedures. The basic regulation of Research and Development, AR 70-1, was published in March 1973. The section on testing was limited to a repeat of the guidance in AR 1000-1, with the addition of DA staff responsibility for DT being assigned to the CRD and OT to the ACSFOR.

On 15 January 1974, DA published AR 10-4, which provided the mission, functions, and command relationships of OTEA and established official

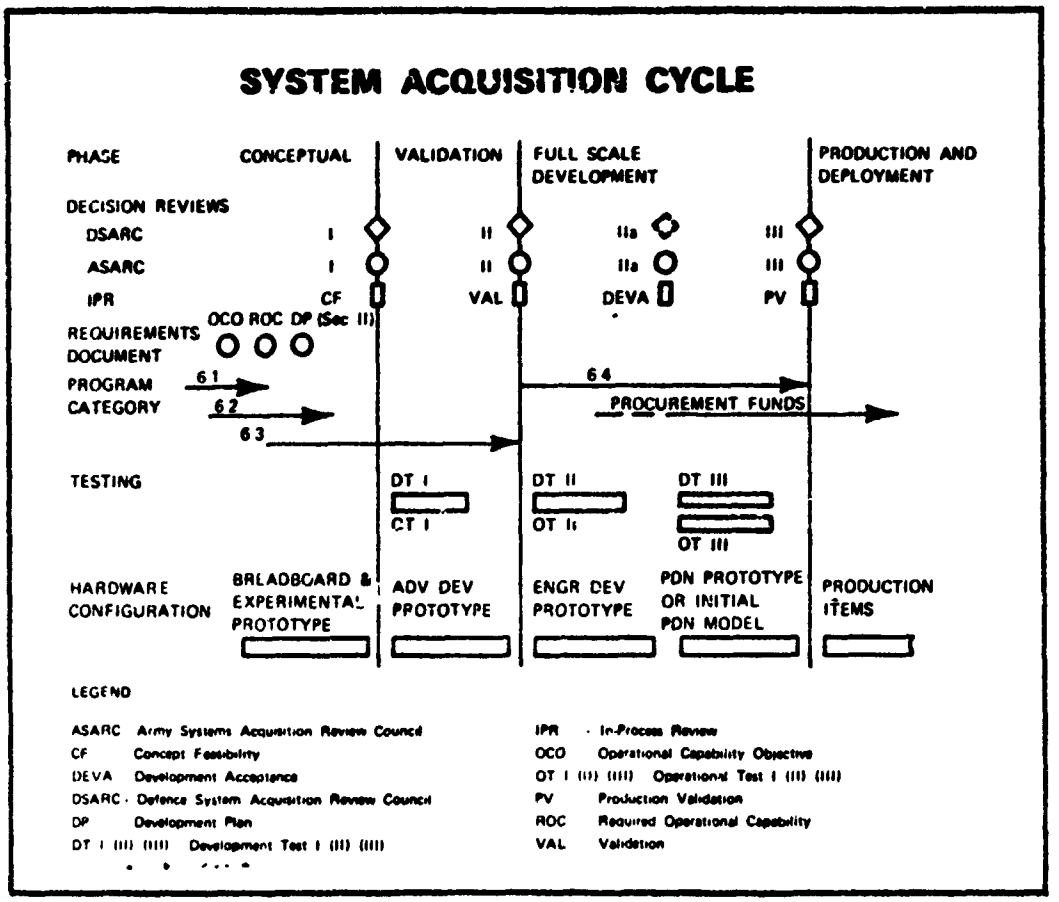

Fig. 2, System Acquisition Cycle

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definitions of User Testing, Operational Testing, Force Development Testing and Experimentation (FDTE) and Joint User Testing.

--User testing was defined as a generic term which encompassed OT, FDTE, and Joint User Testing.

--OT was as previously defined in the LOI.

--FDTE was defined as those tests, ranging from the small in scope, highly instrumented, high resolution field experiments to the broader in scope, less instrumented, low resolution and highly subjective field tests that are performed to support the force development process by examining the impact, potential and effectiveness of selected concepts, tactics, doctrine, organization and materiel. FDTE may support the materiel acquisition process by:

--Providing data to assist in the development of a Required Operational Capability (ROC).

--Develop data to fully understand the performance of a materiel system.

--Validate doctrine and/or tactics to confront a possible threat response to a deployed system.

--Joint User Testing is merely that testing in which the Army participates with another Service.

Annex H, Test and Evaluation of the LOI prescribed policy and provided guidance for the conduct of test and evaluation. This annex divides both DT and OT into three separate tests--I, II, and III. The policy in this annex directs that DT should first test components, then subsystems and finally prototypes or preproduction models of the

entire system. It further directs that DT will include "soldier proofing" through participation of representative user personnel. On the OT side, the policy directs that OT is conducted as necessary and as early as practicable, with early prototypes and continuing through production. Annex H defines the three DTs and three OTs as shown on figure three.

Regulations Under Revision

As a result of the new policies for materiel acquisition, the basic regulations governing testing, AR 70-10, Test and Evaluation During Development and Acquisition of Materiel and AR 71-3, Joint User and Force Development Tests, Experiments, and Evaluations, were rescinded and new regulations have been under revision to date.

AR 70-10 - The latest draft is dated 7 November 1973 and contains detailed guidance for the conduct of DT and OT. In the draft AR, the characteristics of DT and OT are consistent with those in DOD Directive 5000.3; however, the draft regulation gives considerable emphasis to the fact that the OTE process will be independent and normally separate from the DTE process. Although the draft AR specifies that DT II, OT II, and DT III will be conducted on all development items/systems as a minimum, the tone is such that the full series of DT and OT would normally be conducted on all development items regardless of their classification as major, selected nonmajor or other nonmajor systems.

The DT portion of the draft regulation directs "that DT will be accomplished under carefully controlled conditions utilizing scientific

I	This test is conducted early in the development cycle, normally during the Validation Phase. Components, subsystems, or the entire system are examined to determine whether the system is ready for Full-Scale Development. This test may, in the case of competitive systems, provide a comparison between the systems tested. Where appropriate, operational testing is conducted concurrently with this test.
II	This test provides the technical data necessary to assess whether the system is ready for production. It measures the technical performance and safety characteristics of the item and its associated tools, test equipment, training package, and maintenance test package as described in the DP. Technical reliability and maintainability will also be assessed during this test. The test encompasses all the elements of the formerly designated Engineering Test/Expanded Service Test (ET/EST) except for the field test with a troop unit. DT II will include "soldier-proofing" by representative user personnel but not necessarily in a truly operational environment. Operational testing is normally conducted concurrently with DT II by the designated command or agency in coordination with the materiel developer's test command.
III	This test is conducted on systems from the initial production run to verify that the system meets the specifications prescribed for it. The test also serves to confirm that deficiencies found in DT II have been corrected and has the same scope and purpose as specified in AR 70-10 for the Initial Production Test.

OPERATIONAL TESTS

I	This test provides early information as to system operational suitability, and a comparison to existing systems, in order to assist in determining whether the system should enter Full-Scale Development. OT I may also help identify or refine critical issues to be examined in subsequent operational testing. In those cases where the opportunity exists for the conduct of OT I - for example, where competitive prototypes or well advanced prototypes exist - it will be conducted concurrently with DT I using a single, coordinated test plan.
II	This test is accomplished prior to the production decision (ASARC IIa/DSARC IIa for major systems) and provides an assessment of system operational suitability and effectiveness. It also provides information needed to refine or validate organizational and employment concepts and determine training and logistic requirements. OT II is normally accomplished concurrently with DT II, using complete preproduction prototypes. Complete interchange of information and data obtained during DT II and OT II is mandatory. During OT II, the system is subjected to a realistic operational environment, using a small troop unit typical of that which will ultimately be equipped with the system. OT II will produce sufficient and timely results to allow for an independent evaluation to be available to assist in making a Low Rate Initial Production decision at ASARC IIa/DSARC IIa for major systems, or a production recommendation at the IPR for other systems.
III	This test is accomplished using early production models and provides information to refine or validate earlier estimates of operational effectiveness, to determine the operational suitability of the production model, to optimize organization and doctrine, to validate training and logistic requirements, and to identify any additional actions that should be taken before the new system is deployed.

Fig. 3, Definition of DT and OT

techniques, instrumentation, statistical methodology, and simulation." The regulation does provide, however, that typical user weapon and vehicle crews may be used to accomplish human factors tests to observe the man (soldier)-machine interface and that interface between military operators and the maintainers. The regulation also divides DT II into two phases in which engineering and service-use aspects are examined. The service-use phase provides for a technical estimation of military utility and is performed under limited and specific field conditions representative of the anticipated usage of the equipment. The draft AR does direct, however, that the service phase will be coordinated closely with OT II to preclude duplication and insure complete examination of all critical issues.

In the detailed guidance for OTE, the draft regulation specifies that OT will be conducted under realistic operational conditions using tactical scenarios and TOE troop units. At the same time, the draft AR directs that "conditions will be controlled utilizing scientific test techniques, instrumentation, statistical methodology and simulation and subjective military judgment of user personnel to assure validity and permit analysis of results." In the guidance for OT II and OT III, it further directs that the operationally critical issues be examined by testing in TOE troop unit field exercises. The idea of combining extensive scientific techniques with troop unit field exercises is not compatible and is difficult, if not impossible, to accomplish.

The last major portion of AR 70-10 (draft) provides guidance for the Coordinated Test Program (CTP). The CTP is the principle management

document for assuring that appropriate DT and OT are properly planned, coordinated, conducted and reported. The CTP has the making of a fine management tool, however, its preparation, coordination, distribution and updating are the responsibility of the materiel developer, who has no control over the input from the operational tester. The command agency responsible for OT prepares the chapter of the CTP which lists all the critical issues to be answered by OT and how they will be resolved. Figure four shows the content of the various sections of the CTP.

AR 71-3 - The other regulation in draft provides guidance for the programming, planning, budgeting and reporting of FDTE and Joint User Testing. The guidance contained in this draft has been nullified by the reorganization of the DA staff on 20 May 1974.

Five Year Test Program

The FYTP is a compendium of approved outline test plans for user testing (OT's and FDTE's). It is a tasking document for execution for the current fiscal year plus one and a planning document for the remaining years. It is updated and published semiannually by OTEA. Each outline test plan contains the test purpose, objective, scope, and personnel/equipment resource requirements, and tactical context. As such, the FYTP provides management visibility as to exactly what is being tested and why. Outline test plans are processed and challendged by a multi-command/agency general officer representative body called the Test Schedule Review Committee (TSARC).

The TSARC, chaired by the Commander of OTEA, coordinates and schedules overall resource requirements for user testing. General officer members

CHAPTER	CONTENTS	PREPARED	PROVIDE INPUT
1	DT PLAN	MATERIEL DEVELOPER	MATERIEL DEVELOPER
2	OT PLAN	COMMAND/ AGENCY RESPONSIBLE FOR OT	COMBAT DEVELOPER, TRAINER, USER, LOGISTICIAN
3	NON-RDTE FUNDS	MATERIEL DEVELOPER AND COMMAND/ AGENCY RESPONSIBLE FOR OT	
4	RDTE FUNDS	MATERIEL DEVELOPER AND COMMAND/ AGENCY RESPONSIBLE FOR OT	

NOTE: Each chapter to be coordinated by materiel developer, user, command/ agency responsible for OT, logistician, combat developer, trainer and test support unit.

fig. 4, COORDINATED TEST PROGRAM

of the TSARC represent OCRD, DCSOPS, DCSLOG, TRADOC, FORSCOM, and AMC. MASSTER and CDEC also provide appropriate representatives. The committee meets semiannually in June and December. A complete description of the TSARC/FYTP is contained in AR 10-4 and AR 71-3 (draft).

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CHAPTER IV

ORGANIZATION AND RESOURCES FOR TEST AND EVALUATION

Introduction

Now that the evolution of Army testing has been discussed and the policies which govern this testing reviewed, it is appropriate that the current organization an/ resources for this activity be studied-in some detail. As a general statement, it would be proper to say that for test and evaluation, DOD provides the broad policy direction while DA insures the coordination and management of effort. The actual testing is conducted by various agencies and commands throughout the Army.

This overview of test organization will discuss each level of command and separate agency involved in testing, outlining its function and providing a brief summary of the resources available. The type of testing--developmental, operational or force development--conducted by the organization will be stressed. Although not reflected in the discussion of this chapter, ACSFOR and OCRD were abolished on 20 May 1974. Chapter VI discusses this change.

Department of Defense

As a result of the Blue Ribbon Defense Panel Report of July 1970, a Deputy Director (Test and Evaluation) was established. It was the responsibility of this new office to provide test and evaluation direction as well as to review and approve test plans for major systems. More specifically, the first and incumbent Deputy Director, LTG Alfred D. Starbird, USA (Ret.), was to:

--Recommend directly to the Secretary of Defense any changes required in Test and Evaluation policies and procedures.

--Monitor closely all major acquisition programs, advising the DSARC and Secretary of Defense directly at key decision points as to the adequacy of the accomplished and planned test and evaluation.

--Initiate and coordinate accomplishment of such joint testing as necessary.

--Oversee all major Department of Defense ranges and test facilities.

This relatively small DOD Test and Evaluation Office consists of 15 military and 18 civilian personnel divided into three assistant directorates as shown in figure five.

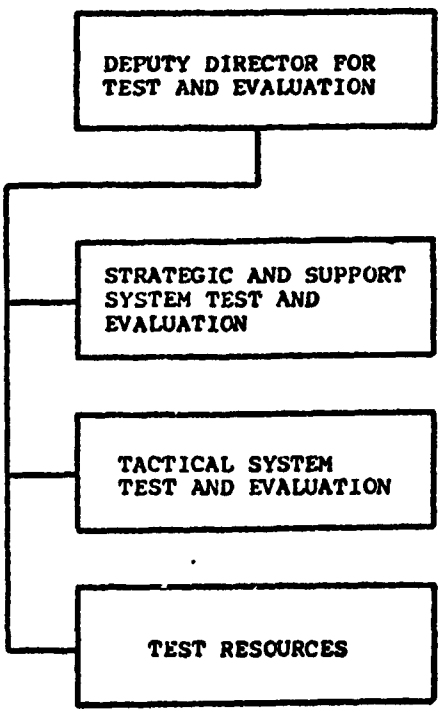

FIG. 5, DDR&E TEST AND RESOURCES

Although few in number, the impact of this organization on test and evaluation (particularly operational testing) has been immense. As LTG Starbird recently pointed out, "By far the most significant accomplishment to date is that all in DOD engaged in systems acquisition

now understand what is wanted in test and evaluation and are attempting to provide it." As this quotation implies, DOD is primarily interested in materiel acquisition; that is, developmental and operational tests. To date, it has shown very little interest in the Army's FDTE of organization, doctrine, and tactics.

Office of the Chief of Research and Development

The Test and Evaluation Branch of the Management and Test Division of OCRD (figure six) has as a primary mission that of monitoring, managing and supervising the developmental testing program of the Army. Some consider them to be the DA "proponent" for DT. This branch, consisting of approximately 10 people also coordinates operational testing with ACSFOR.

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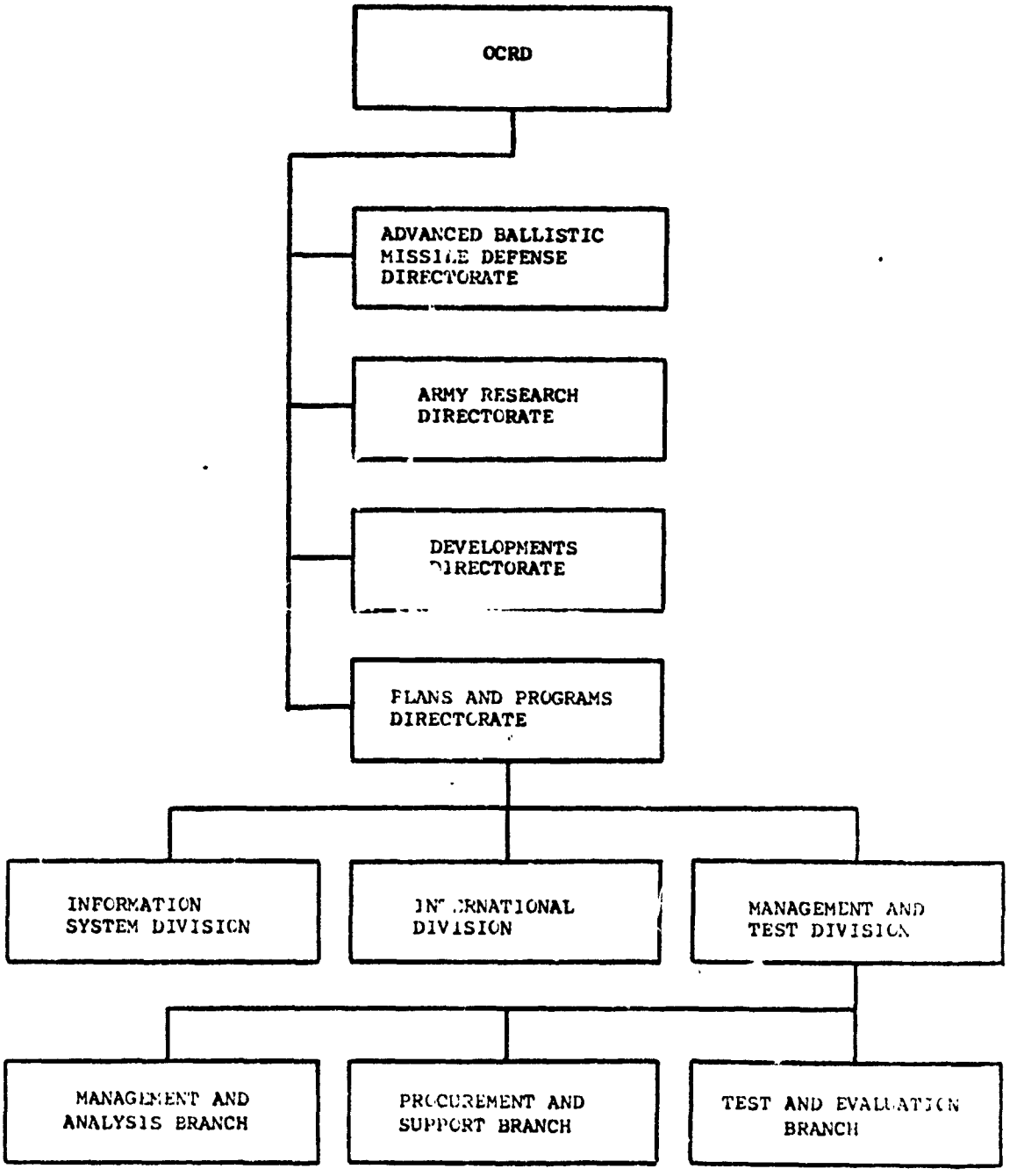

FIG. 6, OFFICE OF THE CHIEF OF RESEARCH AND DEVELOPMENT

Their efforts entail insuring the availability of developmental items for testing, as well as identifying the resource and test support required. They also review developmental milestones to insure test adequacy and conformity with governing regulations and interface the developmental effort with OTEA.

In short, the branch manages all developmental testing done by the materiel developer and coordinates closely with the operational testing agencies.

Asssitant Chief of Staff for Force Development

The Assistant Chief of Staff for Force Development has DA staff responsibility for all Army Operational Testing and Force Development Testing and Experimentation. Prior to 1973, the staff itself was organized to manage these user tests; however, with the formation of OTEA, this function was transferred to that field agency.

Currently OTEA functions as a field operating agency under the jurisdiction of the ACSFOR. Additionally, the Commanding General, OTEA, is designated the Deputy Assistant Chief of Staff for Force Development for User Testing, and in compliance with DOD policy, reports to the Chief of Staff of the Army throiugh the ACSFOR. The organization and functions of OTEA will be examined in detail later in this chapter.

The Test and Evaluation Command

The Test and Evaluation Command is an integral part of the Army Materiel Command. As one of the nine subordinate commands of AMC, TECOM conducts all Army developmental tests for proposed weapons

systems and materiel. In addition, they provide customer testing service for the Commodity Commands, private industry and other Government agencies.

To accomplish its mission, TECOM has 14 installations and activities located across the United States and in Alaska and the Canal Zone. Included among these are the six branch test boards; the six proving grounds and ranges; and the two environmental test centers as shown in figure seven.

The developmental test may consist of two phases: the engineering test phase, generally conducted at the proving grounds and environmental test centers; and the service test phase, usually conducted at the boards.

The bulk of the Army personnel involved in test and evaluation are assigned to TECOM. Although reduced in strength by one-third since its activation in 1962, the command still maintains a strength of 14,213. Approximately 30 percent of this total is military.

The Operational Test and Evaluation Agency

In September 1972, the Secretary of the Army directed the activation of the US Army Operational Test and Evaluation Agency under the DA staff supervision of ACSFOR and located at Ft Belvoir, VA. The mission of OTEA is to manage all User testing. Specifically, it is to:

--Plan, direct and evaluate Operational Testing of all major and selected non-major systems.

--Coordinate testing for other non-major systems.

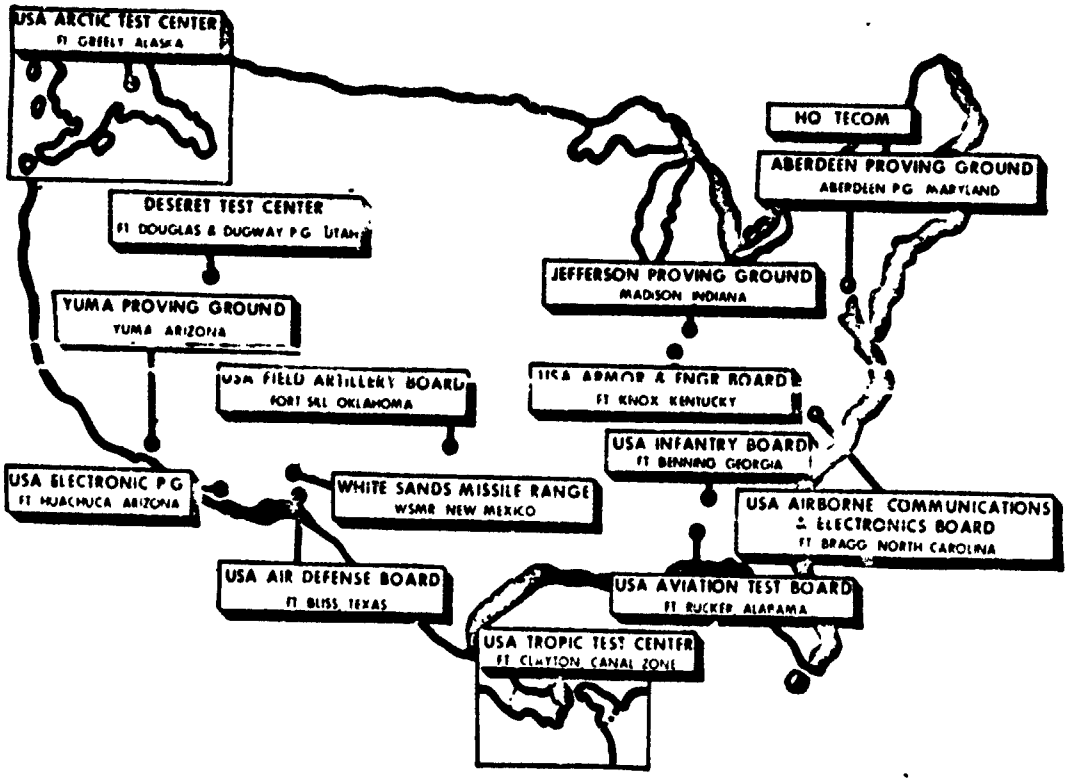

Fig. 7, TECOM Installations

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--Manage major and coordinate non-major Force Development Test and Experimentation.

--Coordinate Army participation in the planning for and the conduct of Joint User Testing.

--Provide a strong focal point for Army operational testing.

OTEA is organized along functional lines with seven divisions (figure eight). The Test Design Division plans the test which is conducted in the field by troop units of FORSCOM under the guidance of a five man element from the Field Test Division. The Operational Support Division insures that all support necessary is available for the actual conduct of tests while the Technical Support Division provides professional civilian talent. Data obtained from tests are reviewed by the Evaluation Division and final reports are prepared using test assessments and other material available.

OTEA also prepared the Five Year Test Program (FYTP) which includes major OT and FTDE. The agency is authorized a total strength of some 250.

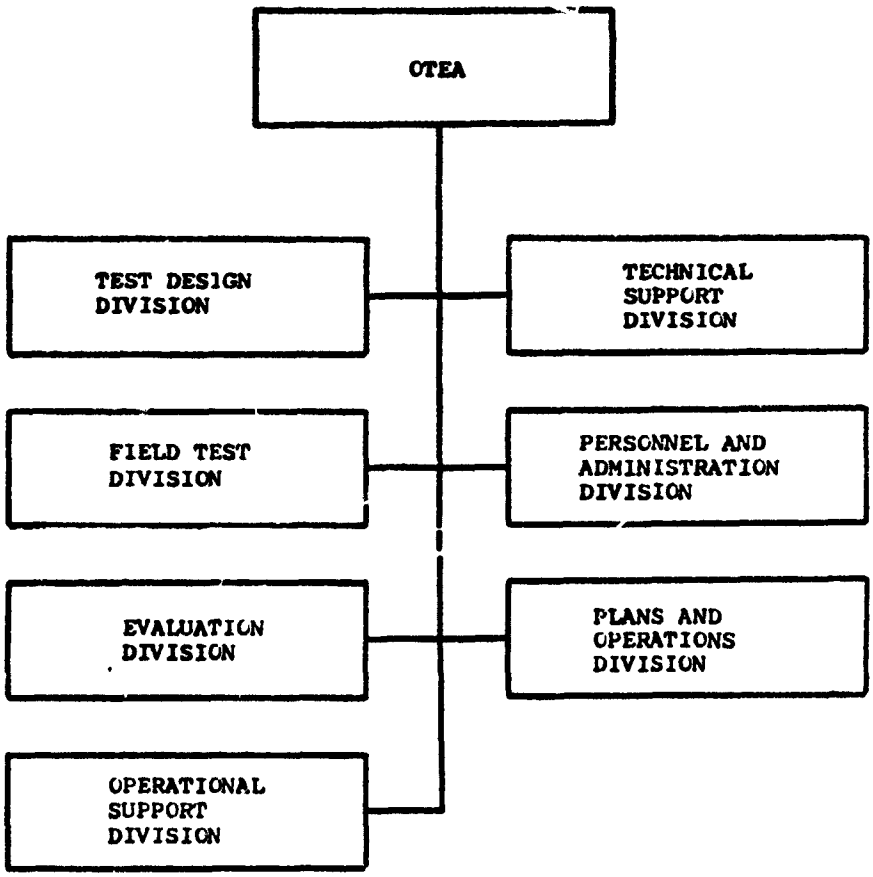

FIG. 8, OPERATIONAL TEST AND EVALUATION AGENCY

Training and Doctrine Command

Within the Training and Doctrine Command, a Deputy Chief of Staff for Combat Developments, among other duties, handles testing responsibilities for the organization. To assist him in this function, a 14-man Experimentation and Test Division has been formed. Subelements of this division are as shown in Figure Nine.

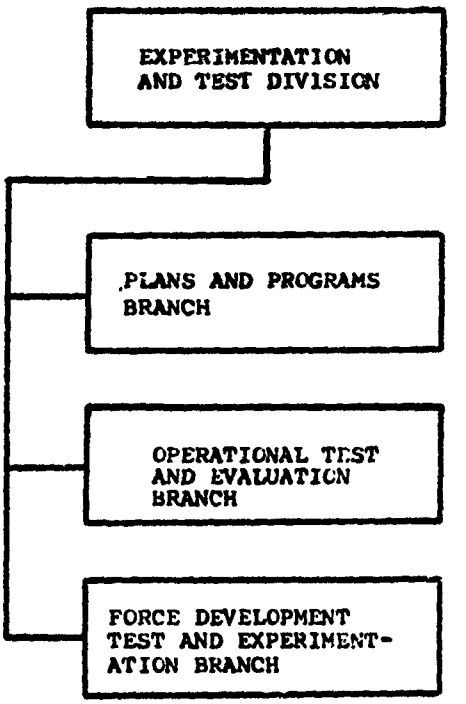

FIG. 9, EXPERIMENTATION AND TEST DIVISION, TRADOC

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Principal testing functions of TRADOC include:

--Management of operational testing for non-major systems other than those selected for OTEA control.

--Command of the Combat Developments Experimentation Command.

--Origination of the bulk of force development tests and experiments.

In order to accomplish the assigned OT, TRADOC normally delegates test responsibilities to the functional centers (Combat Arms at Fort Leavenworth, Administration at Ft Harrison and Logistics at Ft Lee). In turn, these functional centers pass these tests to the appropriate school for planning and execution.

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Force Development Tests and Experiments originating at TRADOC or the schools may be assigned directly to CDEC or, if appropriate, passed to ACSFOR for execution by MASSTER.

Combat Developments Experimentation Command

The Combat Developments Experimentation Command was formed in 1956 and is currently headquartered at Ft Ord, California, with its field test facility at Hunter Liggett Military Reservation. From its inception, CDEC has specialized in scientific Force Development Testing specifically field experiments. Its mission calls for it to:

--Develop and provide experimentally derived data as input for models, simulations and war games of the various combat development agencies.

--As directed, to test, analyze and provide experimentally--derived data on developmental options.

--To verify recommended solutions for operational concepts, materiel requirements and organization structure through field experimentation.

The Experimentation Command is authorized 2488 military and 76 DA civilian personnel. In addition, CDEC is augmented by a contract scientific support laboratory consisting of over 100 scientists and their administrative assistants. The organization of CDEC is shown in figure ten.

The Experimentation Group comprised of two infantry companies an armor company, and a transportation company along with engineer, maintenance and instrumentation elements, account for 75 percent of the

total CDEC strength. The majority of the required test player and support troops are provided by this unit, while FORSCOM supplies personnel with occupational specialties not available within the group.

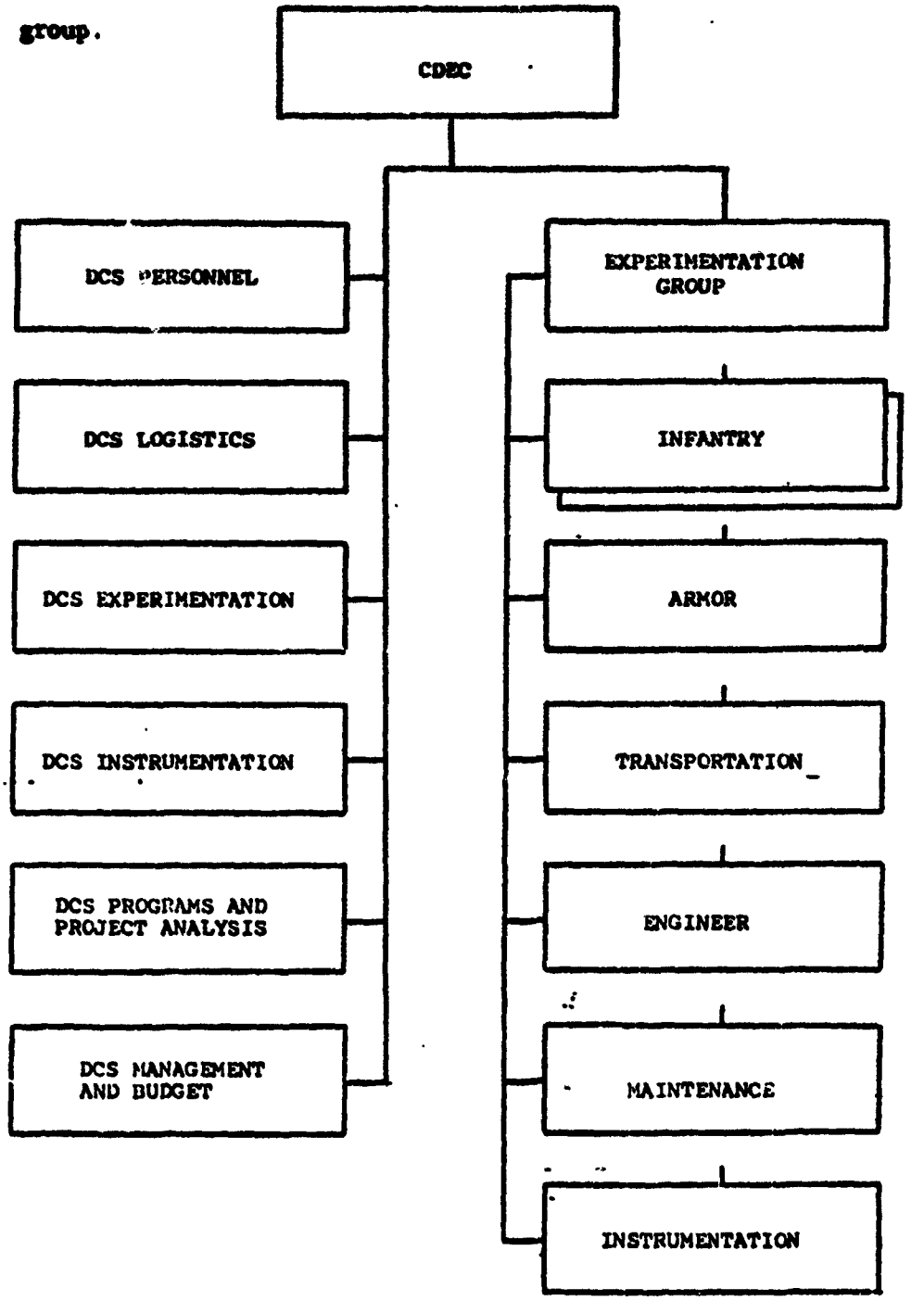

FIG. 10, COMBAT DEVELOPMENTS EXPERIMENTATION COMMAND

Summary

In summary, we see that at the Department of Army level, OCRD has responsibility of DT while ACSFOR manages the User Tests. TECOM actually conducts, with the assistance of its boards, the Developmental tests. The more important of the OTs are conducted by OTEA with TRADOC and the schools assuming responsibility of all remaining OTs. In the field of FDTE, both CDEC and MASSTER conduct similar tests; however, CDEC is commanded by TRADOC and MASSTER by FORSCOM. All-in-all, some 18,000 individuals are directly involved in the Army Test and Evaluation Process.

The Commanding General of III Corps located at Ft Hood also serves as the Commanding General of MASSTER. Since MASSTER does not possess dedicated test troops, the two divisions of the corps are called upon to actively support tests. This "dual-hat" arrangement facilitates testing and allows for the resolution of support problems at the lowest level. Figure eleven shows the MASSTER organization.

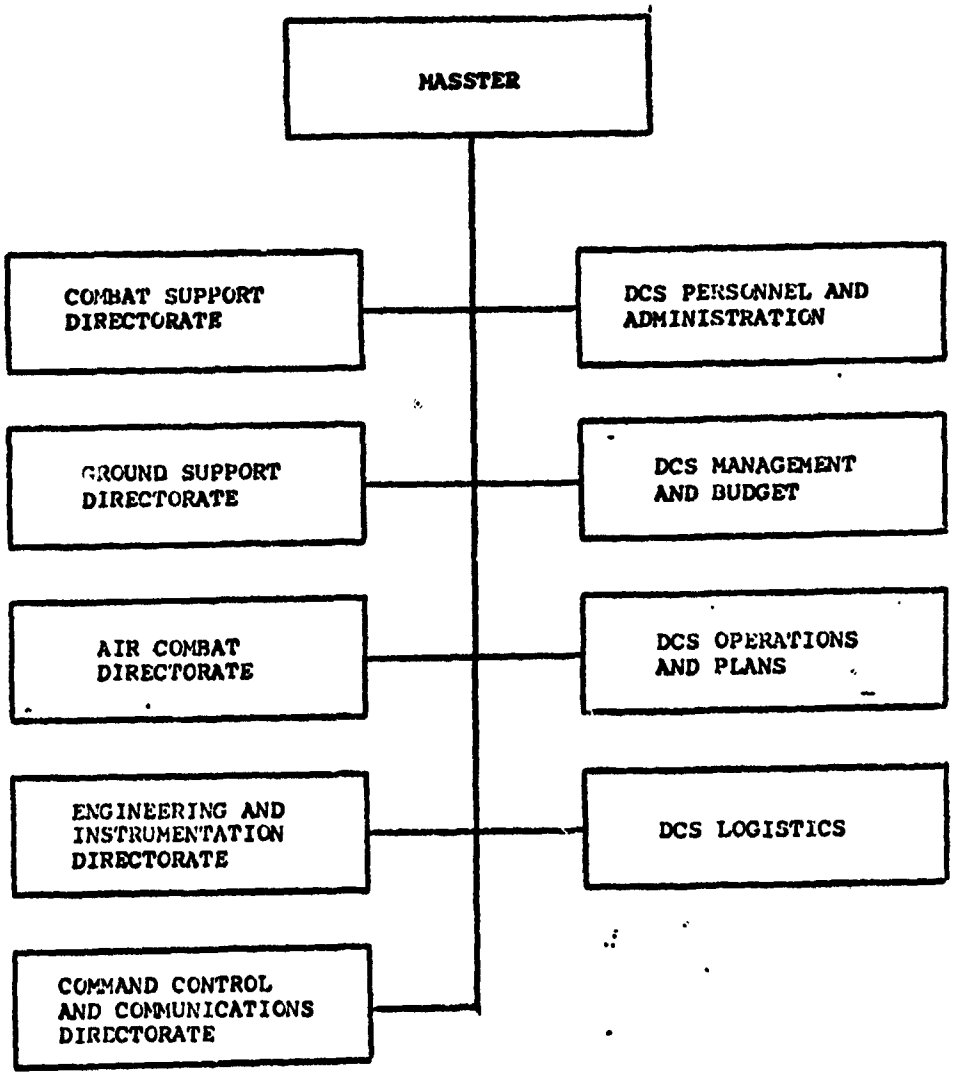

FIG. 11, MODERN ARMY SELECTED SYSTEM TEST, EVALUATION AND REVIEW

CHAPTER V

FUTURE TEST REQUIREMENTS

General

The purpose of this chapter is to discuss the foreseeable test requirements of the Army as it is with these requirements that any test system must cope. In specifying test requirements, the "further-the-fuzzier" rule applies. While near term requirements are normally well known, mid and long-range requirements are subject to the normal vagaries of events. It is, nevertheless, possible to provide estimates that place this study in sharper perspective.

The principle source document that details with considerable accuracy the test load for major Operational Tests and all Force Developmental Test and Experiments is the previously discussed Five-Year Test Program. Omitted from the FYTP are the numerous tests conducted by AMC and the minor OT's. Even though it encompasses only ten percent of the total Army test requirement, it does include all major Army material systems scheduled for testing.

Operational Tests

Perhaps the most important tests facing the Army during the next decade are those designated as Operational Tests of major and selected non-major equipment. Included in this category are such high dollar items as the Advanced Attack Helicopter, the Heavy Lift Helicopter, the XM1 Tank, and the new Infantry Combat Vehicle, to mention a few. A list of the 52 systems currently requiring the full range of Operational Tests is shown at figure twelve.

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MAJOR SYSTEMS		SELECTED NON-MAJOR SYSTEMS	
AAH	STINGER	AN/TSQ-73	IMP 8" NUC PROJ
ARSV	MICV	ADSM	LT WT CO MORTAR
NAVSTAR	DRAGON	ATMAC & DDL	MICV FPW
ARTY LOC RADAR	LANCE	AN/TTC-39	MORT LOC RADAR
CLGP	XM-1	CEFLY LANCER	M60A1 PIP
IMP HAWK	PERSHING II	DSCS	PER ARMOR
HLH	SAFEGUARD	FAMECE	REMBASS
HELLFIRE	SITE DEF	FUSE XM587	RPV/DRONES
SHORAD	SAM-D	XM204	SCAT MINES
XM-198	TACFIRE	8"HOW M11PE2	SEAS
TRI-TAC	TOS	UN ENG TRAC	SQD AUTO WPN
ASH	UTTAS	TOW NIGHT SIGHT	TACSATCOM
VRFWS		M60A2	TILT ROTOR
		COBRA TOW	

Fig. 12, Major and Selected Non-major Systems

88.

Looking at the test load another way, figure thirteen depicts how these tests are scheduled over time.

A second category of Operational Tests, the so called "other OT's," are OT's for less important systems such as generators, IR viewers, radios, certain radars, and night vision goggles. Figure thirteen also presents these test requirements over time. In excess of 150 tests of this type have been identified.

Developmental Tests

By far, the bulk of Army testing is done by TECOM. In addition to the conduct of all DT's, TECOM performs numerous tests for Project Managers, Commodity Commanders, and contractors as well as conducting "inhouse" testing. Nearly 80% of dedicated Army testing manpower is located in TECOM. For the purpose of this study, it is sufficient to use the 2nd quarter of FY 1974 to indicate the enormous test workload. During that period, TECOM had active either in the planning, executing, or reporting stage over 2000 tests. Of these, some 1200 or 60% were "customer" tests, i.e., those performed for specific hardware developers and 20 percent could be classified as development tests.

Force Development Test and Experimentation

The FDTE load has historically been the least predictable, for these tests are tied strictly to ideas and are not tied to the material acquisition budget cycle. The term FDTE brings under an umbrella such time-worn expressions as "Field Experiment," "Troop Test," "Field Test," and "Field Evaluation."

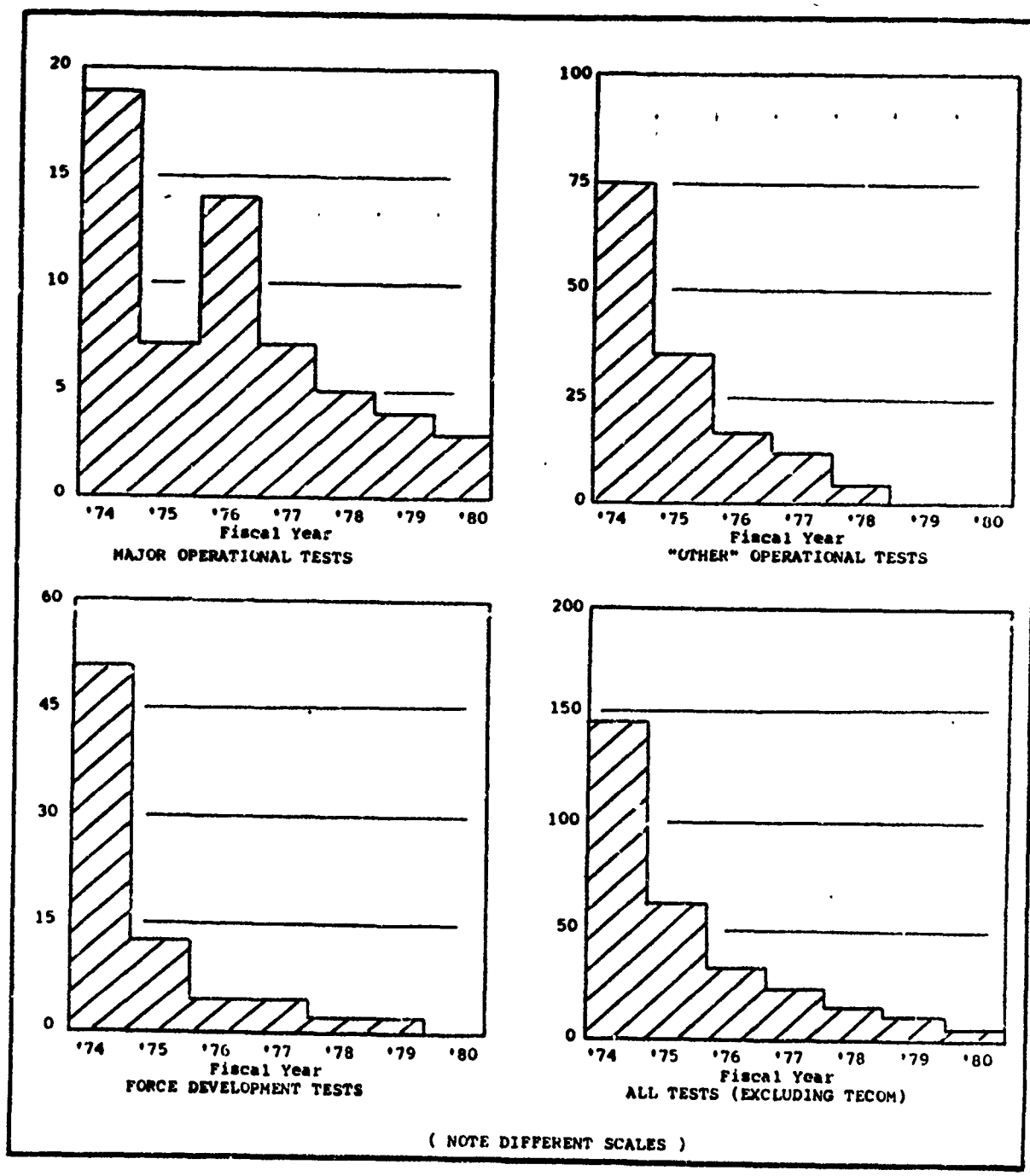

Fig. 13. Army Tests Over Time

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Examples of presently scheduled FDTE's include:

--Division Staff Organization and Procedures.

--Airspace Control.

--Attack Helicopter Daylight Offense.

--Army Combat Battalion Close Air Support Training.

--Vulnerability of Designator Equipped Forward Observer.

There are 70 such FDTE's required over the next 6 years, with their timefram as shown in figure thirteen. This rather unusual schedule is not surprising: Some tests will slip and many new ones will be scheduled as out-year resource availability becomes more evident. It does point out, however, the necessity for more innovative techniques of scheduling and the need for better overall management of the FDTE program.

Required Operational Capability

Another likely source that should generate test requirements are the ROC documents, especially those in the preliminary stages. These ROC's provide a fertile field for that FDTE that concentrates on conceptual hardware. There are currently approximately 330 ROC's pending approval. Specific areas where imaginative FDTE could bring the ROC's into sharper focus include:

--Principle performance characteristics.

--Operational Characteristics.

--Performance bands.

--Technical assessment.

As yet, few direct ROC related tests have been scheduled. It is hoped, however, this situation will change as ROC's are given greater scrutiny.

Summary

It can be seen from the preceeding paragraphs that the known requirements for Army tests are immense. One to two year requirements are fairly firm and it is reasonable to expect that the future annual Army requirement for tests will remain around the 125 level for "User" tests and, based on information received from TECOM, around the 1200-1500 level for AMC tests.

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CHAPTER VI

ONGOING ACTIONS BEARING ON THE TEST AND EVALUATION PROCESS

DA Reorganization

On 4 January 1974, a decision was made by the Chief of Staff to reorganize and streamline the Army staff. The principal objectives for this reorganization were:

--Improve the direction and control of the staff.

--Eliminate fragmentation of responsibilities.

--Remove staff layering.

--Establish clear responsibility for the key functions of people, dollars, planning, materiel acquisition and logistics. The reorganization was effective on 20 May 1974. Up to that date, the DA staff was as shown at figure fourteen. The new organization is shown at figure fifteen.

This new structure caused some major shifts of responsibility for test and evaluation. Effective with the reorganization; responsibilities for test management, previously under the Assistant Chief of Staff for Force Development and the Chief of Research and Development, were transferred to the Operational Test and Evaluation Agency, the Deputy Chief of Staff Operations and Plans (DCSOPS), and the Deputy Chief of Staff Research, Development, and Acquisition (DCSRDA).

The new organization established OTEA as a Field Operating Agency directly under the Chief of Staff, responsible for the overall management of User Testing. The management of Development Testing was

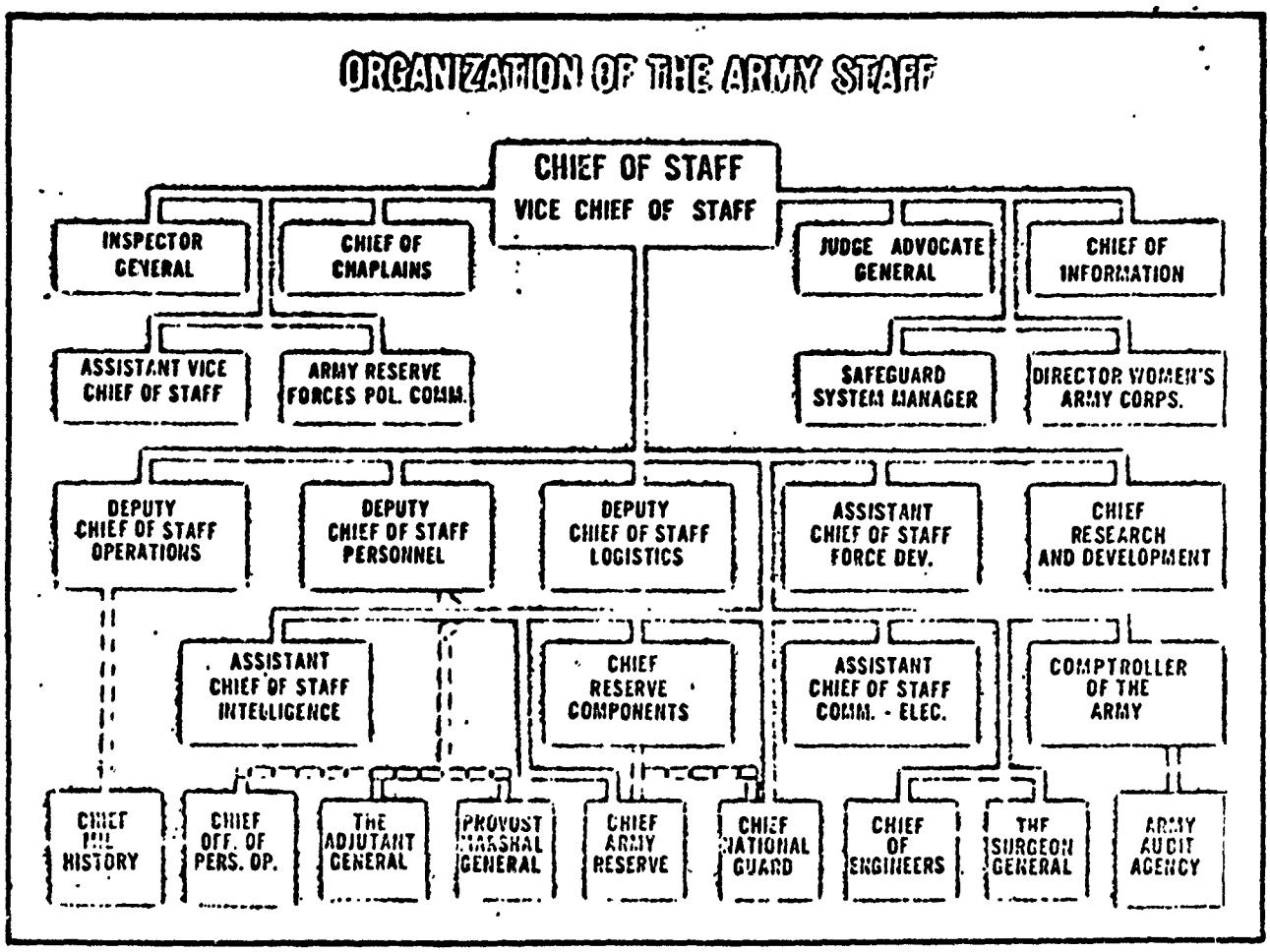

Fig. 14. Current Army Staff Organization

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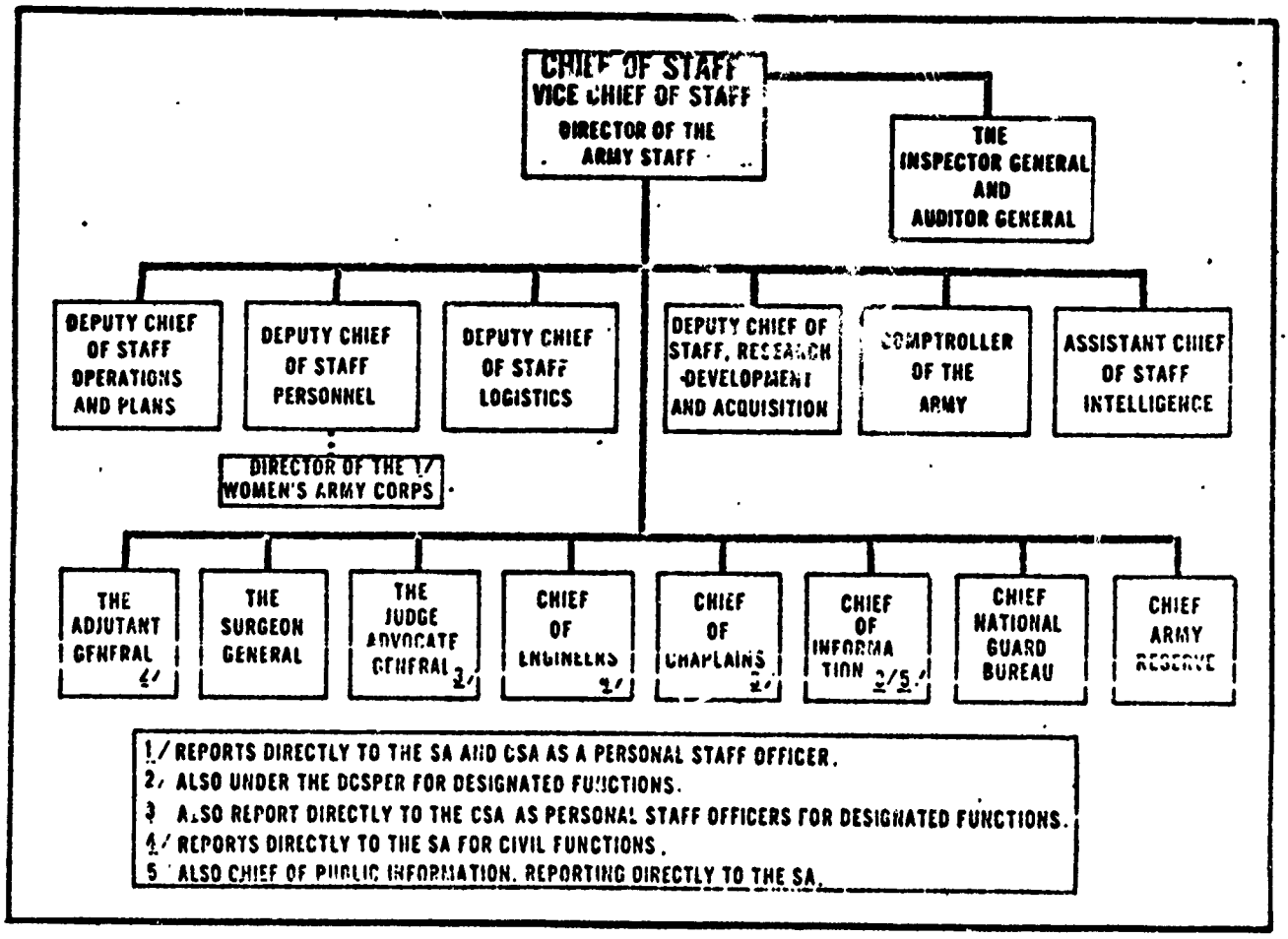

Fig. 15. Future Army Staff Organization

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assigned to the DCSRDA . Currently, there is still some discussion concerning the division of responsibility for User Testing between OTEA and DCSOPS. The directorates responsible for test and evaluation within DCSRDA and DCSOPS are shown at figures sixteen and seventeen.

Army Materiel Acquisition Review Committee Study

In November 1973, the Secretary of the Army directed that an independent review be made of the Army's total materiel acquisition process. On 6 December 1973, a memorandum, signed by the Under Secretary and the Vice Chief of Staff, was given to Dr. Wendell Sell requesting that he head the Army Materiel Acquisition Review Committee (AMARC). A separate team was organized to conduct that portion of the study dealing with test and evaluation.

Guidance to the AMARC included a list of issues to be addressed; however, the committee was free to consider other issues, if warranted. The directed issues that concerned the test and evaluation system were:

--Where can personnel reductions best be made?

--Should the Army have a separate command for testing?

--Are Test boards needed? If so, how many and what should their functions be?

--What should be the reporting chain for the various test activities?

--How much of proving ground, range and similar test activity operations can be by contract?

--Can we close some of our test facilities? If so, which?

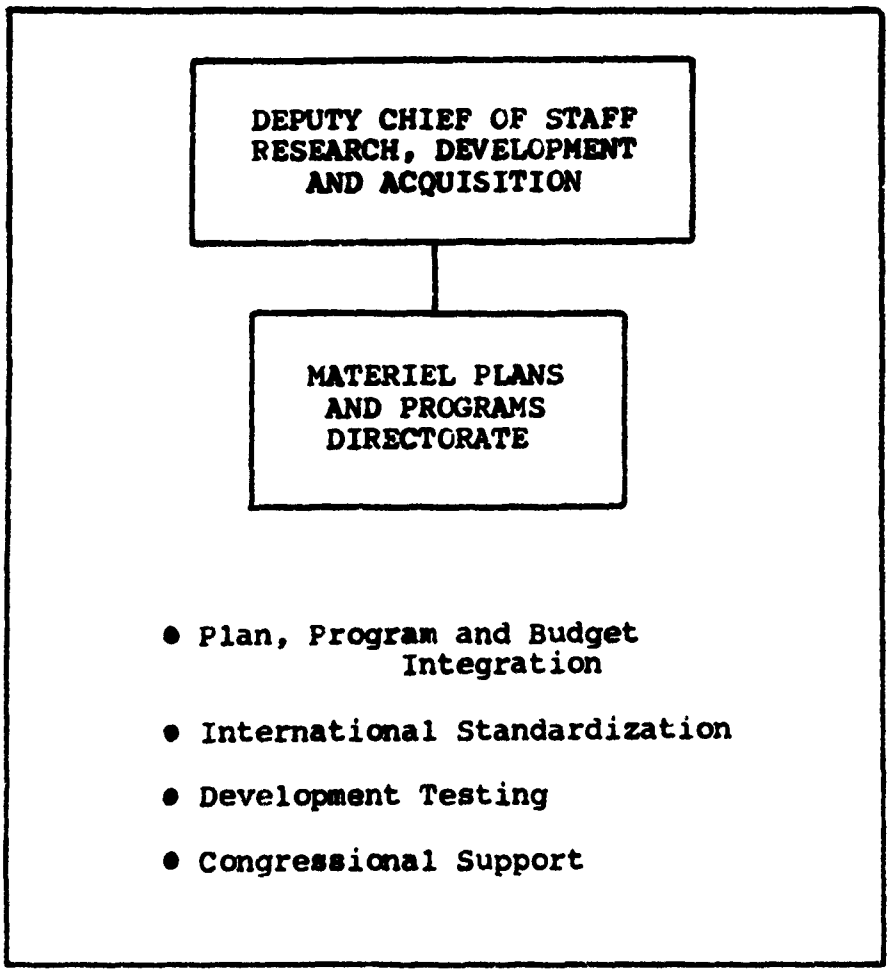

Fig. 16, Functions and Organization, Materiel Plans and Programs Directorate, DCSRDA

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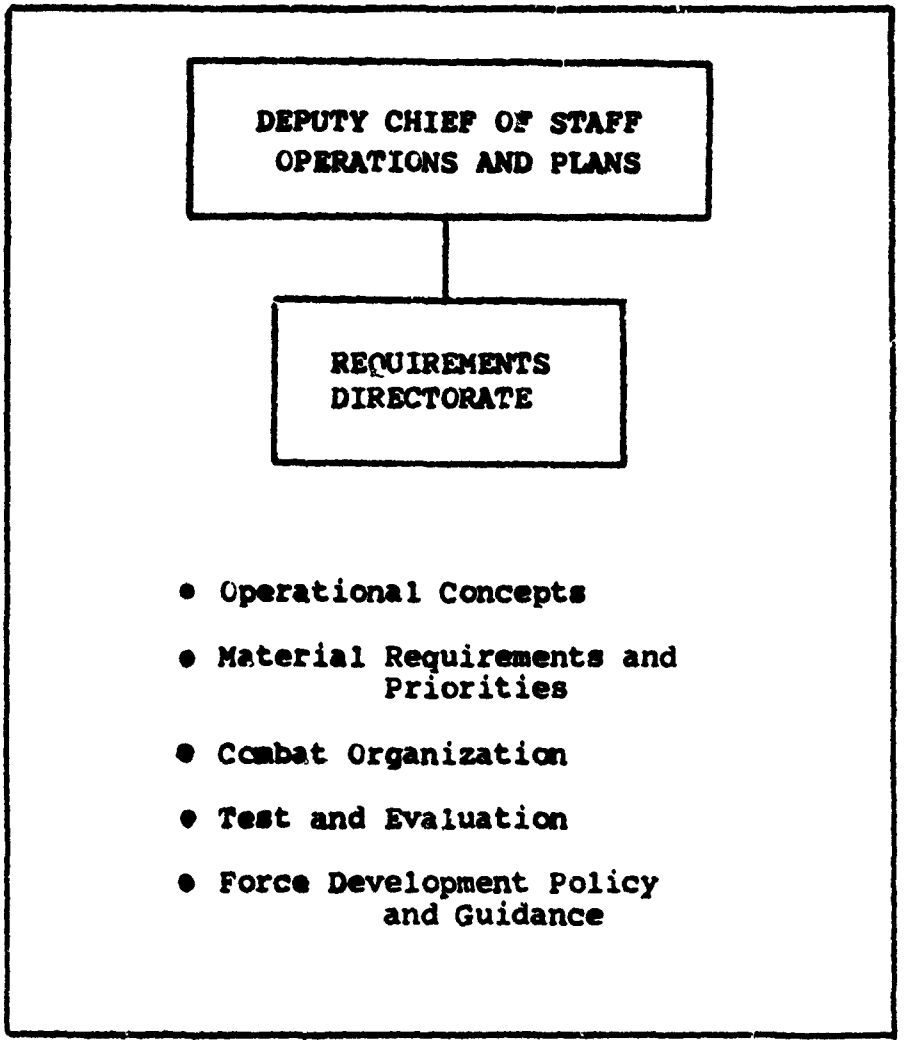

Fig. 17, Functions and Organization, Requirements Directorate, DCSOPS

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On 2 April 1974, the AMARC study was released to the Army Staff for comment. One full chapter was devoted to the Testing Team Report. In addition to the six directed issues, the testing team examined some 12 additional issues concerning Army testing and evaluation. These additional questions fall generally into six areas:

--Independent test evaluation.

--The organization for DT and OT.

--FDTE emphasis.

--Testing personnel qualifications.

--Discretionary testing programs.

--Testing facilities.

During its review, the Testing Team found that if it focused its review on the six areas identified above, the issues contained in the Under Secretary's memo would also be addressed. The team found that the Army, in striving to maintain OT independent from DT, was in fact injecting unnecessary costs into the test system. According to the AMARC study, there exists a significant overlap between OT and the service-use phase of DT. The team found that developers, users, and testers all expressed considerable difficulty in sorting out the proper division of testing responsibilities between DT and OT. Another major finding was that OT and DT were sufficiently different to justify separate facilities and organizations and that AMC must have a capability to accomplish DT as part of its materiel acquisition process.

As a result of their findings, the Testing Team arrived at the following recommendations:

--Designate a single Army Staff element to monitor the total acquisition process.

--Present independent DT and OT evaluations at IPR/ASARC meetings.

--Emphasis the difference between DT and OT, based primarily on the technical orientation of DT and the operational orientation of OT.

--Do not create a major testing command to accomplish developer and user testing separate from the materiel developer or the combat developer.

--The emphasis on the separation of OT and DT should be changed from separate testing to independence of design and evaluation to permit more efficient use of testing resources applied to integrated or combined tests.

--Enhance TRADOC FDTE and OT capabilities by assigning it MASSTER, the Service Test Boards, and an additional analytical capability.

--Assure independence of DT design and DT evaluation by assigning control of both functions to the Army Materiel Systems Analysis Agency leaving TECOM as a testing service.

--Review existing activities to reduce costs by consolidation, closures, or increased contractor support.

--Place OTEA directly subordinate to the Chief of Staff.

--Consider placing Dugway Proving Ground in standby status.

--Enhance personnel capabilities by expanding career development opportunities, and increasing use and duration of current stabilization programs.

--Institute discretionary testing programs (approximately five percent of budgets) to foster low cost, high payoff initiatives.

--Modify current test report and evaluation procedures to include individual opinions of knowledgeable personnel in test reports/evaluations furnished decisionmakers.

Summary

The impact of the reorganization and the AMARC study were considered in our evaluation as both have caused significant changes in the present test and evaluation process.

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CHAPTER VII

EVALUATION

General

This chapter provides the heart of the report. While Chapters I through VI laid the explanatory framework necessary for understanding the present test and evaluation system, herein is contained the evaluation of that system, including our findings and recommendations. The aims of the study were to:

--Identify problems.

--Develop an improved system.

--Recommend procedures and assign responsibilities to achieve the improved system.

Eight major problem areas have been identified as being sufficiently significant to be considered for substantive change. These are:

--Methods vs Goals of Test.

--Philosophy of FDTE.

--Fragmentation of FDTE.

--Interpretation of DOD Policy.

--The Coordinated Test Program.

--DA Staff Responsibility.

--Fragmentation of OT.

--Troop Involvement in DT.

From a format standpoint, each of the eight areas are addressed in separate sections. Each section is preceeded by the principal

finding, followed by a discussion of that finding. Included in the discussion is the argument for what we believe to be an appropriate solution to the identified problem. The section concludes with a specific recommendation or series or recommendations for action.

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FINDING

Methods vs Goals of Tests

Test goals are often mixed with test methods, one being defined in terms of the other. This leads to confusion and misunderstanding and is due, in part, to unclear regulations and, in part, to lack of understanding of the philosophy of testing.

Discussion

It became evident during the course of our study that considerable confusion existed concerning various test goals and various test methods to achieve those goals. There seems to be a penchant for either over-defining--hence restricting--or under-defining--hence confusing--many of the terms and definitions in the field of test and evaluation. The basis for this finding stems from numerous discussions, the contents of current regulations and the personal experience of the study group. On the surface, the distinction between methods and goals of tests may seem trivial. We hold, however, that the point is vital. Without clear definitions as a guidepost, it is easy to become lost. The confusion is most evident in the FDTE area. Consider the following extract from AR 10-4:

> Force Development Testing and Experimentation
> Tests, ranging from the small in scope, highly instrumented, high resolution field experiment to a broader in scope, less instrumented, low resolution and highly subjective field test, that are performed to support the force development process by examining the impact, potential, and effectiveness of selected concepts, tactics, doctrine, organization, and materiel.

Here we see goal and method lumped together in one stew, with neither having sufficient clarity to be of much help. Even digging deeper into the only other reference source defining FDTE--AR 71-3 (still in draft)--we find the following:

> Tests, ranging from the small in scope, highly instrumented, high resolution field experiment, to the broader in scope, less instrumented, low instrumented, low resolution field test. Data from the tests are evaluated largely by subjective rather than analytical techniques. These tests are performed to support the force development process by examining the impact, potential, and effectiveness of selected concepts, tactics, doctrine, organization, and materiel. FDTE assesses the interdependence among doctrine, tactics, organization, and materiel; further, FDTE may support the materiel acquisition process by providing data to assist in the establishment of the Required Operational Capability (ROC), to develop fundamental data necessary for a full understanding of the performance of a materiel system, or to assist in validating doctrine and/or tactics to counter threat response to a system once deployed. (Underlines added.)

Again, we observe goals and methods intertwined. Moreover, the first underlined statement is not true. With regard to the last underlined statement, an FDTE can just as easily validate doctrine and/or tactics that are simply better than present ones as well as those designed to counter a threat response.

Goals

The goals of Army tests will be covered in detail in sections that follow. At this juncture, it is sufficient to indicate the following goals that cover virtually all Army tests:

--Provide information concerning material performance.

--Provide information concerning material-soldier performance.

--Provide information concerning material-soldier-mission performance.

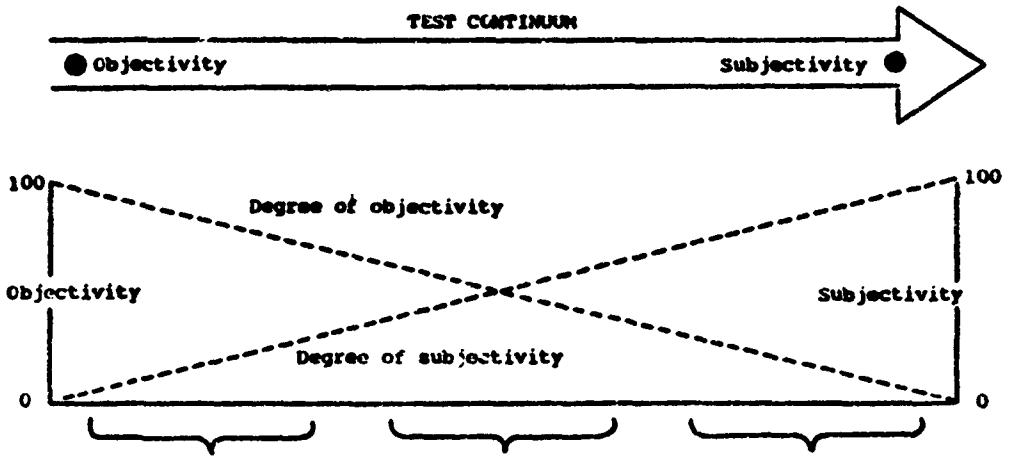
--Provide information concerning material concept validity.

--Provide information concerning organization, doctrine, tactics validity.

The first two are DT's, the third is an OT, while the last two are FDTE's.

To achieve any of the golas, there are a variety of test methods available. The method selected for conducting a test will vary as necessary to meet the specific information desired and to meet certain operational constraints faced in the real world. Across the continuum of test methods there are two extremes: the field experiment and the field evaluation. The former is classically scientific (a hypothesis, chance elements removed, repeatable, etc.) while the latter is, in essence, informed judgment. In some middle ground there is the field trial method, which incorporates elements of both. Figure eighteen illustrates the test method continuum and contains eight general characteristics for each of the three types. Note that an experiment is virtually all objective, while the evaluation is essentially all subjective. As in any generalization, there may be exceptions.

The term "can operationally define explicitly" used in row 1, column 1 simple means the tester or test requester is able to describe



	FIELD EXPERIMENT	FIELD TRIAL	FIELD EVALUATION
DECISION	Can operationally define explicitly	Can operationally define segments	Cannot operationally define
PROCEDURE	Many replications, objective analysis, measure variables	Few replications objective and judgmental analysis	No planned replications, long-term judgmental analysis
RESOLUTION	Seconds-Minutes	Hours-Days	Days-Weeks-Months
DATA	Objective, through instrumented physical measurement	Scaled judgment and objective	Judgmental and objective
CONTROL	Rigid	Limited	None
ANALYSIS	Statistical	Evaluator judgments supplimented by statistical summaries	Evaluator judgments and tabular data
TYPE RESULTS	Quantitative	Quantitative/ qualitative	Qualitative
USE	Reliable data for input to other analysis or decision. Can draw statistical inference	Objective and judgmental evaluation of system	Judgmental evaluation of system

Fig. 18, Test Methods

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numerically the operation under consideration. As an example, the phrases, "the system must be able to achieve a .90 kill" or "the system must transmit 75% of all messages in no less than one hour" precisely define what is expected and an experiment can then be designed to determine if the system can achieve these objectives.

Tests should ideally be conducted as pure experiments. The proper experiment removes doubt and provides firm information upon which to base a decision. There are, however, reasons why an experiment cannot be run and some other method of test must be substituted in its place. Several such reasons follow:

--Impossible to operationally define. Many tests fit this constraint. While tests of material and very specific tactical questions may usually be defined, tests of organization, broad tactics and doctrine are normally too complex to define in toto.

--Lack of instrumentation. Suitable instrumentation is required to conduct an experiment. Oft times, such instrumentation (generally expensive) is not available.

--Low budget. Fund availability is sadly self-explanatory.

--Time. An experiment normally takes considerable time in planning, designing and executing. Decisions sometimes can't wait.

--Hardware configuration. In the case of material, if the hardware under test is a weak representation of the item, it seldom makes sense to conduct a detailed experiment.

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--Troop availability. The best designed experiment often is not run, as the cost in terms of troops is sometimes prohibitive.

--Test expertise. Defining and designing an experiment is one of the most difficult tasks in the cycle of military research. The required expertise is often lacking.

The preceeding constraints all tend to drive testing to the subjective method, i.e., to the right of the scale in figure eighteen. The aim, however, should always be to achieve maximum objectivity within the constraints.

Summary. In sum, we believe that test goals and test methods should be clearly defined and separated. Once the goal of a specific test is understood, the method should then be selected based on the considerations just discussed.

RECOMMENDATION

Rewrite AR 71-8, Force Development: Army Program For Test Evaluation, to include separate goals and methods sections.

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FINDING:

Philosophy of FDTE

Though the requirement is valid and the capability exists, FDTE is not receiving sufficient emphasis due to vague regulations and loose definitions.

Discussion

There is little doubt that FDTE is of vital importance to the Army. The AMARC Study acknowledged this point specifically. One need only consider the impact of the McNair efforts in the late 30's, the work of the Howze Board in the late 50's/early 60's in the area of air mobility and the massive series of reserve component tests conducted in the early 70's to recognize the vital role Force Development Testing plays in the Army. While Force Development testing has always been done by the Army, it was generally done on an ad hoc basis until the formation of CDEC, and, later MASSTER. Fortunately, the Army has created two permanent organizations that are well staffed to carry out FDTE. The term itself--FDTE--is of recent origin. Previously, force development testing was camouflaged under a number of methodological terms that described test methods such as Field Experiment, Field Test, Field Evaluation, and Troop Test. By creating the term "FDTE," the Army went a long way toward properly defining the goal of force testing. It is our view, however, that the present definition is too broad to be useful to the planner and

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the current regulations too vague to be effectively implemented. Several regulations define FDTE and the full definition--given in the preceeding seciton--will not be repeated here. Generally, the definition says the purpose of FDTE is to test tactics, doctrine, organization, material. The definition stops at that point.

It appears to the study group that several changes could provide significant long-term benefits.

First, we propose a slight modification to the present definition as follows:

Force Development Tests are tests that are performed to support the force development process by examining the potential of proposed tectics, doctrine, organization, and material concepts. These tests aid in the material acquisition process by providing information relevant to the establishment of validation of a Required Operational Capability and assists in validating or rejecting new ideas concerning tactics, doctrine, and organization.

We believe this is a more meaningful purpose statement. It also deletes any reference to the method of conducting the test.

Second, we propose that Force Development Testing be separated into two parts:

--Force Test--Material (FT-M)

--Force Test--Structure (FT-S)

The first would focus on a hardware concept-as the prime test objective, while the second would focus on a force structure concept in either organization, tactics, or doctrine. The definition could be as simple as:

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--The purpose of the FT-M is to aid the material acquisition process by providing information relevant to the establishment or validation of a ROC.

--The purpose of the FT-S is to examine the validity of proposed tactics, doctrine, and organization.

In the FT-M, simulations of conceptual hardware would be used. In the FT-S, the equipment used would normally be that found in TOE units, as the answers sought would pertain to tactics, doctrine, or organizations. The evaluation of FT-S results could lead to revised tactics, doctrine, or organization or could identify materiel gaps.

It is useful at this point to cite some examples of tests recently conducted to illustrate more clearly exactly what the study group envisons for the FT-M and FT-S. In order will be described:

--FT-S: focus on tactics

--Ft-S: focus on doctrine

--FT-S: focus on organization

--Ft-M: focus on material in ROC development

FT-S (Helicopter Tactics). In a series of field trials evaluating the potential of various tactics concerning armed helicopters, various tactics were tested. These included aspects of scout helicopter tactics, low-level flight tactics, massed fire tactics, air defense suppression tactics, night tactics and point target attack tactics. Through these tests, new tactics involving the armed helicopter have evolved.

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FT-S (Army Airspace Control Doctrine). In a test involving a command post exercise, the problem of fundamental doctrine for airspace control was addressed. Three separate doctrinal issues were considered and major conclusions such as "There is no requirement for the Army to regulate Air Force traffic" and "Commanders should use a 'weapon hold' control status for the REDEYE as normal operating procedure" were reached.

FT-S (Division Staff Organization). The purpose of this test was to investigate the staffing of the division. In addition to many minor changes--G1 and AG functions combined, liaison officers under control of operation officer, etc.--a significant change in the overall structure was recommended; namely, abolish the Chief of Staff and the four traditional staff sections, and assign the two Assistant Division Commanders responsibility--one for operations and one for support.

FT-M (Unmanned Aerial Surveillance Material Concept). This test is an excellent example of the use of a simulated piece of hardware to evaluate a material concept. The purpose of the test was "to evaluate the UASS concept to determine the validity of the material requirement" through the use of specially configured drones. The report concluded "that an unmanned aerial surveillance system is not suitable to fulfill the requirement." As such, the test provided important data in a negative sense.

FT-M (Motor bike Concept). Using commercially available trail motorbikes, this test evaluated the potential for motorbikes. As a result of this test, it was determined that adding motorbikes to reconnaissance units would enhance unit mission capabilities significantly. A ROC was proposed as a consequence of the test.

Summary. Figures nineteen and twenty summarize our concept graphically. In figure nineteen, the four categories of Army tests are displayed. The outer blocks represent the entire test while the inner blocks represents the relative importance of the material to the test. In the FT-S, the hardware is of little importance. In the FT-M, a material concept of a piece of hardware is evaluated in terms of need, potential performance and into what organization, for what mission, using what tactics, it might be employed. The DT objectives are almost entirely hardware related, while OT placed the material into slightly broader perspective. Figure twenty illustrates the relationship of these four test types to one another, with possible outcomes.

Clearly not all ideas are "testable" in-the field, nor are all ROC's. It is not our intent that all ROC's and all ideas be subjected to the proposed test system--only those for which relevent and useful data can be logically derived through testing.

RECOMMENDATION

Adopt the proposed changes. Rewrite AR 71-8 to reflect the proposed system.

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ARMY TESTS

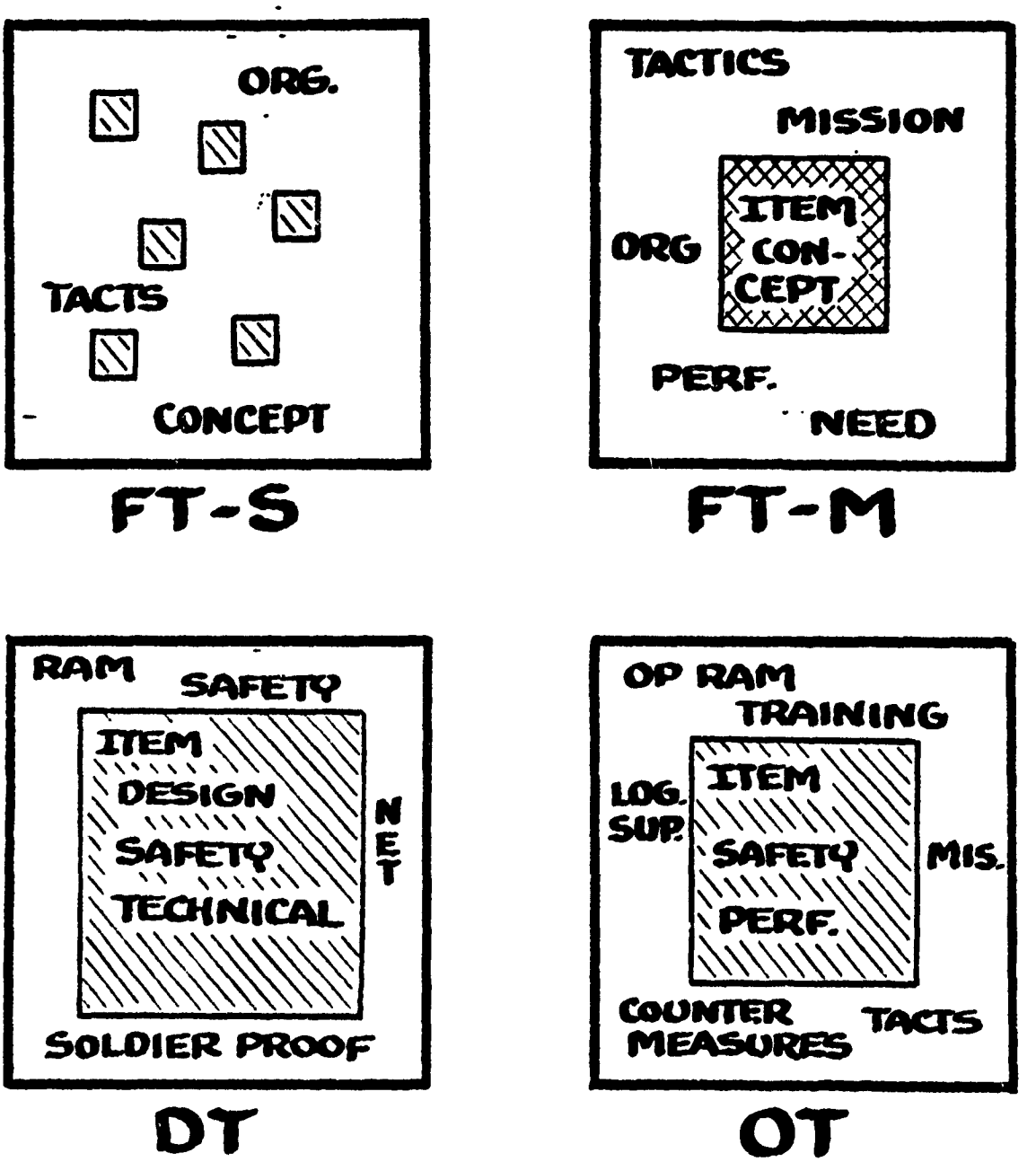

Fig. 19, Types of Tests

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TEST RELATIONSHIPS

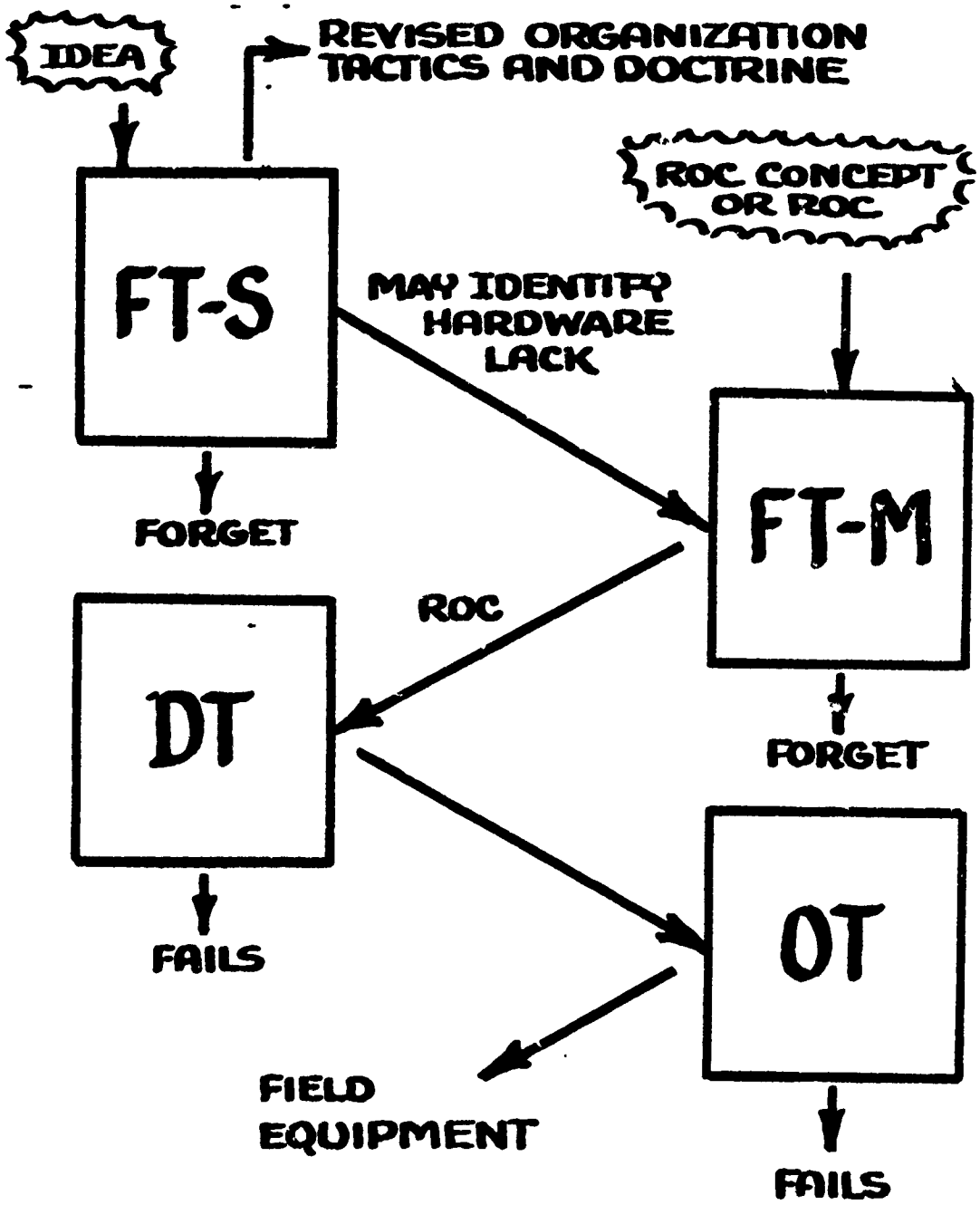

Fig. 20, Test Relationships

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FINDING

Fragmentation of FDTE

There are currently two organizations within the Army, MASSTER and CDEC, specializing in potentially duplicative Force Development Testing. MASSTER falls under command of FORSCOM while CDEC answers to TRADOC. Neither organization is adequately controlled or directed by higher command.

Discussion

From its inception, MASSTER has actively sought tests in various fields of interest. It has often acted as proponent for and initiated testing which was of interest to its staff. This well-intentioned enthusiasm for testing has resulted in some criticism as to test agency impartiality.

There is no doubt that MASSTER's test program has been active and far ranging, but as a result of this operational latitude, some of its tests have not been in consonance with Army needs.

Because of the suitable terrain and availability of troops at Fort Hood, MASSTER has often directed its attention toward the large unit test (battalion and higher). Although initially limited by its lack of instrumentation and criticized for its subjectivity, an extensive instrumentation procurement program has been initiated within the last few years.

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On the other hand, CDEC has viewed itself from the beginning as a highly scientific test laboratory only involved in the rather restrictive type tests known as experiments. These scientific experiments have involved small units (company and below) participating in highly instrumented and replicated trials. Test design at CDEC is tedious and time-consuming. As a result, lead times for testing are extensive.

Because of its attention to detail, numerous replications, and time required for text execution, CDEC's test program has been small. It has, therefore, been criticized by some for its limited output. In addition, CDEC looks upon itself as an independent test agency totally unaffected by the result of the test. It, therefore, does not solicit or initiate tests as does MASSTER.

OTEA has been given the responsibility of managing FDTE. For all practical purposes, however, the limit of this management has extended to the inclusion of outline test plans (OTP's) in the Five-Year Test Program (FYTP).

As a matter of reality, the management could not exceed this point to any great degree since OTEA has been principally involved in the field of OT since it was organized, as it should be, since OT is its major function.

In past years, there have been a number of studies concerning the redundancy of test capability at MASSTER and CDEC. As a result of this often-raised point of inquiry, the two agencies have come to

develop mission statements which provide justification for the continued existence of both. In general terms, this explanation says that MASSTER conducts the large-unit subjective tests while CDEC conducts the small-unit objective experiments. While the justification is plausible in many respects and widely accepted at high levels of the Army, nowhere in printed regulations or directives can operational scopes of this nature be found for the two organizaitons.

MASSTER receives its missions from a number of different commands and agencies. It is at the same time a subordinate element of FORSCOM, commanded the III Corps Commander at Fort Hood. Although FORSCOM has no responsibility in the field of testing, the command relationship has been justified on the grounds that troop support for tests is facilitated by this arrangement. Although support may in fact be facilitated, we see a situation where a unit receives all of its tasking from sources other than its higher headquarters. This is a violation of proven managerial procedure.

In order to give direction to and coordinate this divided force test responsibility, both CDEC and MASSTER should report to a common agency which has responsibility for all Force Testing. The agency should have no other responsibility and should command and assign tasks to both CDEC and MASSTER. Since the schools would ideally initiate tests, the agency should become an independent tester for TRADOC. TRADOC would, therefore, assume responsibility for all Army Force Testing through this force test and evaluation agency.

The total headquarters strength of CDEC and MASSTER exceeds 1,300. From these two headquarters, sufficient spaces could be withdrawn to establish the proposed test agency. Thus, no increase in Army total strength would result.

RECOMMENDATION

Assign TRADOC responsibility for all Army Force Testing (FT). Form a Force Test and Evaluation Agency (FTEA) within TRADOC to give direction to and coordinate FT. Constitute the FTEA from currently authorized spaces at CDEC and MASSTER. Place CDEC and MASSTER under command of FTEA.

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FINDING

Interpretation of DOD Policy

In implementing DOC policy, the Army has not maintained a flexible attitude toward testing. In particular, the Army has over structured its Operational Testing procedures and overemphasized its organizational placement.

Discussion

As previously stated in Chapter III, Army regulations and directives are either not published or vague in intent. Failure to publish either AR 70-10 or AR 71-3 for more than two years has added to the confusion. These draft regulations do not reflect the DOD concepts of OT and are contradictory in requiring both the use of significant scientific techniques and testing in troop field exercises. Moreover, there are many instances when "independent testing," "independent evaluation," and "separate testing" are all used to infer a need for two complete and independent systems for design, conduct, reporting, and evaluation of DTs and OTs. The basic principles in the DOD guidance are directed toward supplementary testing and independent evaluations, not duplicative testing.

A further confusion exists in the amount of testing required for each developmental item. Even though the various systems under development are categorized as either major, selected non-major or other non-major systems with differing levels of approval, no such

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differentiation is made for testing. The vagueness of the draft regulations is such that all phases (I, II, and III) of OT and DT could be expected for each item being developed, regardless of its relative importance.

The last apparent conflict between DOD intent and DA interpretation is in the organizational location of the Army testing activities. For example DOD Directive 500.3 states that:

> Development Test and Evaluation is planned, conducted, and monitored by the developing agency of the DOD Component, and the results thereof are reported by that agency to the responsible Military Service Chief.

The same directive further states that:

> In each DOD Component there will be one major field agency, separate and distinct from the developing/procuring command and from the using command which will be responsible for Operational Test and Evaluation and which will report the results of its independent test and evaluation directly to the Military Service Chief.

It is our opinion that this DOD guidance does not require either the developmental tester or the operational tester to be organizationally placed directly under the Office of the Chief of Staff. The Army, having decentralized the level of decisionmaking for a large number of its materiel developments, has in many cases placed the operational tester at a considerable higher command echelon than the approving authority for the materiel development. The location of OTEA at a lower echelon of command would not preclude reporting the results of OT evaluations directly to the Chief of Staff when necessary.

RECOMMENDATION

First, publish AR 70-10 immediately and in it specify that there not be a rigid requirement for all phases of OT. Secondly, give further study to the organizational placement of OTEA.

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FINDING

The Coordinated Test Program

The CTP is not being properly coordinated in order to insure that (1) the right issues are tested and (2) there is no duplication of testing between DT and OT.

Regulations covering the CTP are clear as to intent of coordination. In fact, they specify that everyone possibly concerned with the materiel (the developer, the tester, the logistician, the trainer, and so forth) will concur in the CTP. In short, the CTP has the making of a fine management tool; however, its preparation, coordination, distribution, and updating are the responsibility of the materiel developer who has no control over the input from the operational tester. Although there are detailed requirements for each involved agency to coordinate with all others, there is no mechanism for deciding which critical issues will be addressed, or which tester (DT or OT) will conduct what test. Since testing constitutes a significant part of the overall cost of development and time for testing is extremely limited, it would appear that the proper division of resources and testing time can only be managed at a higher echelon. It would be preferable that this echelon be the one which is responsible for the entire materiel acquisition process. With the new Army Staff reorganization such a staff element now exists--the DCSRDA.

RECOMMENDATION

Deputy Chief of Staff Research, Development and Acquisition should have the overall responsibility for the management of the CTP.

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FINDING

DA Staff Responsibility

The Department of Army staff is organized to manage testing by dividing responsibility in accordance with the categories of developmental and user testing. This division of responsibility causes difficulty in material acquisition test coordination.

Discussion

Through the years, OCRD formed rather close ties with the materiel developer and as a result was called upon to represent the developer's view on the DA staff. This position of DA proponency extended to the field of developmental testing as well.

In recent years as user testing came to the forefront, it was believed that these tests also needed a voice on the DA staff. The result was the appointment of ACSFOR to fill the role.

While user tests were the staff responsibility of ACSFOR, this function was largely removed from the coordinating DA staff when ACSFOR passed much of its user test management to its subordinate field operating agency, OTEA. OTEA has been, in fact, an operator heavily involved in the execution of OT and thus unable to effectively perform the DA staff coordinating role.

We, therefore, saw the DA ACSFOR staff looking to OTEA to manage user testing. While in fact OTEA is not located in the Pentagon and further, as operators, they had insufficient time to handle DA staff

OT coordination matters or to manage FDTE. Since the new DA staff organization places OTEA directly under the Chief of Staff without an intervening staff agency, the problem will be further aggravated.

With the formation of OTEA, there appears to have developed a certain-unnecessary spirit of confrontation between the developmental and operational testers. As a result of this conflict, agreement on scope of operation and responsibilities cannot be reached. Thus, regulations and directives which are most important to test and evaluation remain unpublished or badly out of date.

Since we now have a staff department responsible for both research and development as well as acquisition, (DCSRDA), it would appear that all testing related to the acquisition process should be the responsibility of that staff department. The result of assigning DCSRDA staff responsibility for both OT and DT would go far toward alleviating the current difficulties. The DCSRDA would then be able to provide policy guidance which would enhance operations in those areas where DT and OT tend to overlap.

Currently, DA staff agencies responsible for developmental testing display little interest in operational tests and the reverse is also true. Although some support this partisan test advocacy, there appears to be a crying need for a strong DA staff "honest broker" in the field of acquisition testing. DCSRDA could well perform that role.

It would be advantageous for all testing to come under one DA staff department; however, DCSRDA has no compelling reason to become involved in Force Testing. These tests of doctrine, organization, and tactics are far more compatible with the funcitons of DCSOPS.

The managment procedures outlined in AR 71-3 (draft) describing the FYTP and the TSARC should be continued for acquisition testing (DT and OT) with the exception of chairmanship transfer from OTEA to DCSRDA. In addition, the DCSOPS should establish a FYTP and TSARC for Force Testing. DCSOPS should chair this second TSARC.

RECOMMENDATION

Assign DCSRDA DA staff responsibility for both DT and OT, thus centralizing policy guidance for all acquisition testing. Assign DCSOPS DA staff responsibility for all Force Testing.

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FINDING

Fragmentation of OT

Operational test execution responsibility within the Army is currently divided between OTEA and TRADOC. OTEA conducts OT for all material with high visibility, while all remaining systems are forwarded to TRADOC. The TECOM Boards currently perform Service testing for the developer. This Service testing is basically a preliminary operational test performed by the developer.

Discussion

As we have seen, OTEA plans, directs and evaluates OT for all major and selected non-major systems while it coordinates OT for all other non-major systems. TRADOC directs other non-major OT which is actually conducted by the functional centers or schools.

Through this delegation of responsibility, OTEA is able to direct the attention of its small staff to those few acquisition systems of primary importance while managing by exception those tests conducted of other non-major systems.

By this management system, however, OT responsibility has been divided between two agencies. This naturally allows for varying policy and direction. In addition a system might begin the acquisition process with only limited high-level interest and thus OT would be executed by TRADOC. For numerous reasons, interest

could increase, causing redesignation of the system to major or selected non-major, and thus requiring a transfer of OT responsibility. Therefore, the vesting of responsibility for all OT in one agency would be desirable providing that organization had adequate resources to accomplish the mission and still not dilute the attention given to critical systems.

As has been pointed out earlier, one of the major disagreements between the Operational Tester and the Developer is the point of Service Test conclusion and Operational Test beginning. TECOM currently possesses a sizeable Operational/Service Testing capability within its boards. At the same time, it is generally agreed that although TECOM should do limited "soldier-proofing," it appears that they are currently encroaching into the operational testing field with their Service tests.

The assignment of the TECOM Test Boards to OTEA would substantially increase OTEA's capability and allow them to assume full responsibility for OT. TRADOC would then be removed from the material acquisition testing, where it has limited reason for involvement. TRADOC could then direct its attention to the neglected Force Development Testing, an area of appropriate and critical interest.

Testing of major and selected non-major systems could continue as currently executed by OTEA; however, OTEA with the boards available could assume responsibility for all OT. The boards would principally conduct nonselected OT but would also provide OTEA with added expertise in tests of major systems.

Not only would the reassignment of the Boards to OTEA provide opportunity for consolidation of OT, but it would also defuse the argument between the developmental and the operational testers as to the extent of Service testing in DT. The Service test capability, now available to TECOM, would be given to the operational tester.

RECOMMENDATION

Assign the TECOM Boards to OTEA for operational testing purposes, and have OTEA assume full responsibility for all OT.

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FINDING

Troop Involvement in DT

There is confusion concerning the amount of troop involvement required in Development Testing.

Discussion

The Service phase of DT, as presently conducted by TECOM, is duplicative in nature to OT. Although TECOM views the service phase as answering questions about the materiel while OT is to answer questions which are raised because new materiel is being introduced, this definition does not agree with the DOD guidance. In fact, the DOD requirement to accomplish OT with repreesentative user troops in a realistic environment is similar to the specified criteria for the service phase. At the same time, there is a definite requirement for the developer to have some user troops assist him during the development of materiel, particularly in trouble-shooting equipment. In the environment of a field test such as that used in Operational Testing there will be frequent occasions when it is almost impossible to determine the origin of a problem, that is to say whether the problem is materiel-oriented or soldier-oriented. This is something that the developer must know as the materiel proceeds through the evolution of development and testing.

Although current directives, both those published and those in draft, call for the developer to conduct "soldier-proofing" the term

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is-ill defined. To assist in the design and redesign of equipment AMC must have a limited number of user troops available and must have a limited capability to "soldier-proof." In order to preclude further duplication or confusion "soldier-proofing" must be better defined and understood. Since the term is poorly understood, another term, "soldier-materiel compatibility testing" may be clearer. A proposed definition of this term is:

> Soldier-materiel compatibility testing is that portion of development testing (DT, I, II, III) through which the developer verifies that the tested materiel has met design requirements and will attain the required technical performance characteristics when operated and maintained by user personnel. Such testing is performed on prototype models and production items, their component parts and, where required, the complementary interface of government-furnished equipment and demonstrates to the developer that the materiel will perform safely in the hands of user personnel. Test materiel includes both hardware and software (e.g., manuals) that the operator and maintainer will use. Personnel required for such testing are soldiers with about the same skills, training, and field experience that would be available in a troop unit equipped with that materiel. In other words, soldier-materiel compatibility testing relates to the ability to use a piece of equipment, rather than to tactical utility of the equipment itself. It is not the test of equipment in its operational environment.

RECOMMENDATION

AMC retain a limited capability to do soldier-materiel compatibility testing, as defined above.

RECOMMENDATION

Adopt the proposed definition for soldier-materiel compatibility testing.

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