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# DEFENSE SYSTEMS MANAGEMENT SCHOOL

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## PROGRAM MANAGEMENT COURSE INDIVIDUAL STUDY PROGRAM

OPERATIONAL TEST AND EVALUATION IN THE  
ARMY: AN EVALUATION

STUDY PROJECT REPORT  
PMC 76-1

Bruce F. Stout  
LTC USA

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) <u>6</u> OPERATIONAL TEST AND EVALUATION IN THE ARMY: AN EVALUATION		5. TYPE OF REPORT & PERIOD COVERED <u>9</u> Study Project Report, <del>75-1</del>
7. AUTHOR(s) <u>10</u> Bruce F./Stout		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS DEFENSE SYSTEMS MANAGEMENT COLLEGE FT. BELVOIR, VA 22060		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEFENSE SYSTEMS MANAGEMENT COLLEGE FT. BELVOIR, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) <u>11</u> May 76		12. REPORT DATE <del>76</del> <i>repetitive</i>
		13. NUMBER OF PAGES 38 <u>1241p.</u>
		15. SECURITY CLASS. (of this report)  UNCLASSIFIED
16. DISTRIBUTION STATEMENT (of this Report)  UNLIMITED		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  SEE ATTACHED SHEET		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  SEE ATTACHED SHEET		

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DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE: OPERATIONAL TEST AND EVALUATION IN THE ARMY: AN EVALUATION

STUDY PROJECT GOALS:

To research and relate the historic rationale for OT&E as it exists in DOD and the Department of the Army. To trace the path from the major criticisms of OT&E to current Army regulations. To examine the Army's organization for OT&E. To examine how well the Army is fulfilling its major OT&E roles. To look into future trends in the Army's OT&E program.

STUDY REPORT ABSTRACT:

*This study*  
The study was written to trace the evolution of the Army's current OT&E effort and examine how well it is satisfying some of its major objectives. The content is based on the author's experience in OT&E, interviews with DA and DOD staff personnel, and research of OT&E policies and test literature.

*First*  
In the report, the history and evolution of the Army's current OT&E structure are traced. The organization of the US Army Operational and Test and Evaluation Agency is discussed. In an analysis, five areas of major Congressional criticism are considered. The DOD guidance covering each area is given, and the Army's current policies and procedures which ameliorate the criticisms are cited. The Army's OT&E policies are found to be responsive to history of the recent past. Present OT&E procedures: provide adequate evaluation of a new materiel system prior to a production commitment; respond to user needs; assist in measuring incremental effectiveness of new systems; and produce an independent and objective evaluation of the operational effectiveness of new materiel. Some future areas of interest are discussed which will assist the continuation of a viable OT&E organization within the Army.

KEY WORDS

MATERIEL EVALUATION ORGANIZATION ANALYSIS OPERATIONAL TESTING

MANAGEMENT CONCEPTS

KEY WORDS: Operational Test and Evaluation, Test and Evaluation, Independent Evaluation.

NAME, RANK, SERVICE

Bruce F. Stout, LTC, US Army

CLASS

PMC 76-1

DATE

May 1976

**OPERATIONAL TEST AND EVALUATION**

**IN THE ARMY: AN EVALUATION**

**Study Project Report  
Individual Study Program**

**Defense Systems Management School**

**Program Management Course**

**Class 76-1**

by

**Bruce F. Stout  
LTC USA**

**May 1976**

**Study Project Advisor  
LTC Helmer H. Behrens, USA**

**This study project report represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management School or the Department of Defense.**

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DFC	Buff Section	<input type="checkbox"/>
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## EXECUTIVE SUMMARY

Starting in the 1960's, the testing community of the Services, as part of the materiel acquisition process, came under criticism by Congress for inefficiency. Reacting to this criticism, DOD guidance, and the results of its own studies, the Army's current Operational Test and Evaluation (OT&E) organization evolved. This study provides a limited evaluation of how well the current Army OT&E organization has responded to the criticisms of the past.

The history and evolution of the Army's current OT&E structure are traced. The organization of the US Army Operational Test and Evaluation Agency is discussed. In an analysis, five areas of major Congressional criticism are considered. The DOD guidance covering each area is given, and the Army's current policies and procedures which ameliorate the criticisms are cited. The Army's OT&E policies are found to be responsive to history of the recent past. Present OT&E procedures: provide adequate evaluation of a new materiel system prior to a production commitment; respond to user needs; assist in measuring incremental effectiveness of new systems; and produce an independent and objective evaluation of the operational effectiveness of new materiel.

Some future areas of interest are discussed which will assist the continuation of a viable OT&E organization within the Army.

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## SECTION I

### INTRODUCTION

#### Purpose of the Study Project

In the last five years there have been few publications on the subject of the Army's operational test and evaluation (OT&E) efforts. Since 1970, the field has seen significant changes as part of the revamping of the materiel acquisition process in the Department of Defense. These changes have focused on the important contributions of OT&E in times where funding has demanded efficiency in systems acquisition. The new Department of Defense (DOD) policies for OT&E are reflected in DOD Directive 5000.3, Test and Evaluation. This report traces the recent history of the Army's OT&E organization, and investigates how well its efforts respond to DOD guidance and past Congressional criticism of operational testing. An understanding of this evolution should be of value to those responsible for the development, production, and deployment of materiel systems for our Army. It is hoped that the report will motivate other studies in the OT&E area which will add to the body of knowledge on operational testing, and contribute to a greater appreciation of OT&E throughout the Army. To this end, the bibliography has been annotated to assist interested researchers.

#### Goals of the Project

Specific goals for this report are:

1. To research and relate the historic rationale for OT&E as it

is required presently by DOD and as it applies to the Department of the Army.

2. To trace the path from the major criticisms of OT&E in the materiel acquisition process to the regulations which prescribe its requirement in the Army.

3. To examine the Army's organization for OT&E.

4. To examine how well the Army is fulfilling its major OT&E roles.

5. To sample the Operational Test and Evaluation efforts to date.

6. To look into future trends in the Army's OT&E.

#### Definitions

Because it provides a common denominator, the definition of operational test and evaluation as stated in DOD Directive 5000.3 is quoted below.

Operational Test and Evaluation (OT&E). OT&E 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, OT&E provides information on organization, personnel requirements, doctrine, and tactics. Also, it may provide data to support or verify materiel in operating instructions, publications, and handbooks. OT&E will be accomplished by operational and support personnel of the type and qualifications of those expected to use and maintain the system when deployed, and will be conducted in as realistic as operational environment as possible. OT&E will normally be conducted in phases, each keyed to an appropriate decision point. (20:3) <sup>1</sup>

Operational testing (OT) also prescribed to be separate from development testing (DT), which is generally technically oriented, e.g., toward

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<sup>1</sup> This reference notation will be used throughout the study. The first number refers to the source as listed in the bibliography. The second is the page number within the reference document. A single number refers to an interview source.

verification of system specifications and technical performance parameters.<sup>2</sup> Operational testing is different from DT in that it is to be executed in an operational environment and performed by typical user troops.

There is a difference between an operational test and the related evaluation. The former is that effort which actually causes the prospective system to perform in the field and yield appropriate data. The latter is the process of using this data, analyzing it along with other pertinent information such as related studies, and evaluating how well the system meets its expected performance. A simpler description is, perhaps, "... 'test' refers to physical activities designed to secure data, while 'evaluation' refers to the mental activity used in processing the test results and other relevant information to get useful conclusions." (25:46)

#### Scope and Limitations

The study effort consisted of research of the rationale for OT&E, the corresponding policies and requirements as they exist in DOD today, and a survey of Army OT&E efforts on contemporary systems. Guidance and impressions of the Army's success in its OT program were obtained by interviews with Department of the Army and Department of Defense staff personnel. A non-attribution guarantee was provided selected interviewees in an effort to gain candid impressions, either favorable or unfavorable.

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<sup>2</sup> For a history of the difference between DT and OT in the Army, the reader is directed to reference 25.

Because of time limitations, it was necessary to be selective in the criteria used to analyze the Army's OT&E efforts. DOD Directive 5000.3, which may be thought of as the "requirements" document, contains many statements of requirement or policy which could be so used. The major ones, however, are those which have in the past been almost chronic criticisms from the Congress, or which most significantly affect the adequacy, quality, and credibility of the DOD's test and evaluation program. Five criticisms are covered in four areas in the analysis below.

In discussing the organization and roles of the US Army Operational Test and Evaluation Agency, there is no detailed discussion of the general management of the operational testing of nonmajor systems (Categories II and III). Comprehensive research of this testing would have required a trip to Headquarters, US Army Training and Doctrine Command at Fort Monroe, VA. Time prohibited such a trip.

## SECTION II

### HISTORY OF THE OT&E REQUIREMENT

The Department of the Army (DA) has been struggling since 1965 with the establishment of an effective organization for testing as part of its major weapons acquisition system. There has resulted a series of studies and reorganizations of T&E agencies. Two of the study efforts, the study of Army Test and Evaluation (SATE) and the DA Board of Inquiry on the Army Logistics System (Brown Board), made a careful and needed distinction between materiel testing, now known as development testing, and operational evaluation. (3:B-1)

In spite of the fact that the Army had initiated fruitful corrective measures, along with the other Armed Services it suffered severe criticism from the Congress of its acquisition process. The interested researcher can explore literally hundreds of readings on this criticism. One of the particular areas that Congress had been wont to cite was the improper or ill-advised testing of defense systems. Key examples of this Congressional tone, expressed by the House and Senate Armed Services Committees from 1969 to 1972, are cited topically:

1. Operational testing was not started early enough in the acquisition cycle. (29:3) (28:5)
2. Service must identify user problems and insure that the new system responds to them. (31:77)

3. System suitability must be determined prior to commitment to production. (31:82)

4. No one in the acquisition process knows the value of an incremental improvement in performance factors such as rate of fire, vehicle speed, etc. (31:109, 131)

5. Tests do not appear to be independent from influences of the developer; objectivity of the testing is doubtful. (31:8, 15) (29:9)

By 1969, the Department of Defense had already commenced to investigate and correct the problem. Specifically addressing the objectivity of testing with the Army, The Blue Ribbon Defense Panel reported on 1 July 1970:

In the current Army system, OT&E is subordinate to organizations which are also responsible for development of the systems and equipment tested. Both Engineering Tests and Service Tests are performed by the Army's Test and Evaluation Command (TECOM) which is a subordinate element of the Army Materiel Command (AMC). (3:20)

...theoretically it is not in the best interests of unbiased and objective OT&E to have those who perform it report through the developer to the Chief of Staff level where important decisions may rely extensively on test results or expert but basically subjective evaluations. (3:21)

On 11 February 1971, Deputy Secretary of Defense (DepSecDef) Packard formally responded to the Blue Ribbon Panel's Reports, and issued a memorandum to the Services initiating two critical actions:

"...it is apparent to me that this (OT&E) can best be performed by an agency which is separate and distinct from the developing command and which reports the results of its test and evaluation efforts directly to the Chief of the Service. (18:1) (Underlining is author's.)

He further called for a dedicated OT&E office to provide staff assistance directly to the Chief of Service, and continued:

"As a second step, I am establishing a Deputy Director for Test and Evaluation within ODDR&E with across the board responsibilities for OSD in test and evaluation matters. This office will review and approve test and evaluation plans prepared by the Service and will provide an assessment of results obtained." (18:2)

The new office was that of the Deputy Director of Defense Research and Engineering, Test and Evaluation (DD(T&E)). The first Deputy Director of the new T&E unit was LTG Alfred D. Starbird, USA (Ret.). His office published the fundamental DOD Directive (5000.3) on Test and Evaluation on 19 January 1973, but even before then had been quite active in planning and implementing test and evaluation guidelines for the Services. The 1973 directive incorporated and superceded a total of three memoranda published by DepSecDef in 1971. (20:1)

The reform efforts of DOD were not focused solely on T&E during this period. The above history is only part of this work which brought significant change to the entire materiel acquisition process within DOD. Signal in the new policies established was the publication of DOD Directive 5000.1, Acquisition of Major Defense Systems, on 13 July 1971. It laid the ground rules for T&E as part of the acquisition cycle as well as outlining virtually all other aspects of the revised acquisition policies within DOD.

Test and evaluation shall commence as early as possible. A determination of operational suitability, including logistic support requirements, will be made

prior to large-scale production commitments, making use of the most realistic test environment possible and the best representation of the future operational system available. The results of this operational testing will be evaluated and presented to the DSARC at the time of the production decision. (19:5)

Congress also clarified its interest in OT&E in 1971 by adding Section 506 to the 1972 Authorization Act. The section amended the annual report of the Secretary of Defense to require the reporting of OT&E results on all weapon systems for which procurement funds were being requested. (Public Law 92-156, 85 Stat. 423, Nov. 17, 1971.)

The Army's OT&E effort during the period 1970 to 1972 could be typified as one of response to the new policies and search for improvement of the areas in which the Services had been criticized. While AMC's Test and Evaluation Command continued the expanded service tests which included the use of typical troops under field conditions, the test plan now was approved by the Continental Army Command (CONARC), the user, through its Combat Developments Command (CDC). Unfortunately, this system generally delayed confirmation of reliability and maintainability estimates, as well as most examinations of organization, doctrine, and tactics, until after the prospective system was already in production. Thus, an effective evaluation could only recommend modifications or indicate shortcomings almost after the fact. (17:2)

After the DepSecDef memo of 11 February 1971, the Assistant Chief of Staff for Force Development became the OT&E focal point for the Army staff.

Independent evaluation was attempted by making CDC responsible for OT&E or its equivalent. CDC, however, was subordinate to CONARC, the user.

Army Regulation 1000-1 was published on 23 June 1972, describing revised policies for materiel acquisition. In keeping with these policies, a formal study group under MG John T. Carley, developed the plan for an Army operational test agency to be entirely independent of other Army commands. The US Army Operational Test and Evaluation Agency (OTEA) was formally activated on 25 September 1972. (17:4) Its organization and functions are prescribed in AR 10-4. (ref. 6)

In a 1974 change to DOD Directive 5000.3 "independence" of the Service evaluator was prescribed: "...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 OT&E...." (20:3) (Author's underlining.) This represented a change from the initial DepSecDef memo which called only for separation from the developing command. It also effectively dictated that each Service's independent evaluation agency could no longer satellite on a major command, which the Army had already recognized.

While the Army's new independent evaluation agency was transitioning into effective being, it was the subject of an April 1974 report by the Army Materiel Acquisition Review Committee (AMARC). The AMARC's recommendations were based on observations made in a time when the Army was still

settling many testing issues and responsibilities following the establishment of OTEA. The AMARC cited the following major recommendations pertaining to operational testing:

- a. Present independent DT and OT evaluations at IPR/ASARC meetings.
- b. Emphasize difference between DT and OT, based primarily on technical orientation of DT and operational orientation of OT.
- c. Retain DT tasks in AMC, and OT tasks in TRADOC and OTEA.
- d. Emphasize independence of test design and evaluation, rather than separate testing, as a key to independence of OT.
- e. Place OTEA directly subordinate to the OCSA. (5:22-23)

The above represents an overview of the atmosphere in which the current operational test organization and philosophy came into being. The next section will highlight OTEA and OT&E organization within the Army.

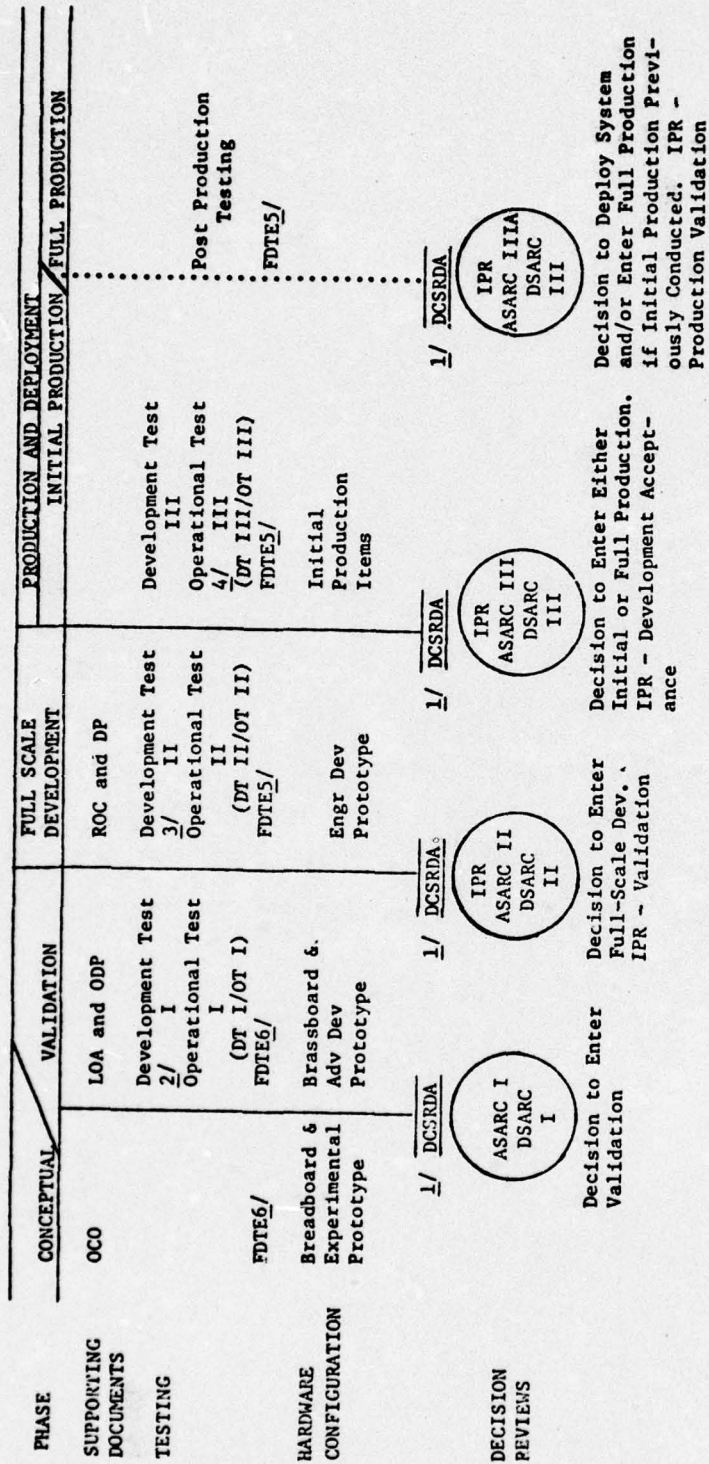
### SECTION III

#### US ARMY CONCEPT AND IMPLEMENTATION OF OT&E

The Army's policies for OT&E are set forth in succinct style in several Army regulations. AR 1000-1 (ref. 9) provides the relation of operational testing to the systems acquisition process. AR 70-10 (ref. 7) lays out the detailed implementation of DOD Directive 5000.3. It covers both DT and OT. Related also are AR 71-3 (ref. 8), User Testing, and AR 10-4 (ref. 6), OTEA Organization and Functions. In the Army, "All OT is the responsibility of and is managed by the Operational Test and Evaluation Agency (OTEA)." (7:1-2) This includes joint user testing. (6:2)

AR 70-10 is the key document for OT&E. It was only after four major staffings and a great deal of coordination with DD(T&E) that this regulation was published in its current form. (ref. 21, 22, 23, and 48.) To provide the reader an overview of the relation of OT&E to the materiel acquisition process, Figure 1-1 from the regulation has been included.

In this regulation, the Army has defined a range of operational tests to satisfy its needs. The "normal" OT's are I, II, and III, and are included in the acquisition process as shown in the figure. Another type of operational test is defined also: "(Force Development Testing and Experimentation) FDTE includes innovative and operational feasibility testing and may support the combat and force development and the materiel acquisition processes by providing essential information at decision



NOTES:

- 1/ Applies to responsibility for ASARC/DSARC.
- 2/ Competing systems are tested to determine if gross specifications are met. Initial OT performed to assess initial effectiveness and suitability.
- 3/ DT II and OT II serve as a basis for decision to enter Initial or Full Production.
- 4/ DT III and OT III determine if production units have capabilities demonstrated in prototypes and are operationally suitable and effective.
- 5/ FDTE may continue throughout life of system. May provide basis for product improvement and other system modifications.
- 6/ Aggressive use of FDTE to develop the employment concept, to determine the operational feasibility, and to estimate the potential operational advantage of a proposed system.

Figure 1 Materiel Acquisition Process Chart.

reviews." (7:2-9) Appropriate exemplary schedulings of FDTE are shown on the figure.

The categories of Army systems which apply to testing are given in AR 10-4. Major systems are as defined in DOD Directive 5000.1; however, the Army has three levels of nonmajor systems, categories I through III, which are classed in decreasing order of cost and visibility. (6:1) OTEA manages the testing of all systems, but directly executes only the OT&E of major and selected nonmajor (category I) systems and major FDTE as required. (6:2) DOD guidance in testing lower categories of systems is given in DOD Directive 5000.3. The directive "...provides principles to be applied by the DOD Components in their acquisition of Defense Systems that do not fall in the 'major acquisition programs' category." (20:1) OTEA manages nonmajor systems (categories II and III) under this guidance.

Other of OTEA's general functions include involvement in the planning, conducting, and evaluation of user testing and formulation of user test policy. Thus, OTEA serves as the Army's focal point for test programs and information.

In performing its principal duties, OTEA has contact with the project offices of all major Army systems. It assists the project manager in formulating the required coordinated test program. This, as well as other coordination with the project office, is accomplished through the

Test Integration Working Group as prescribed in Chapter 4 of DA Pamphlet 70-21, The Coordinated Test Program.

OTEA's products during a test cycle are, in order: an independent evaluation plan, a test design, a field test report, and an independent evaluation report. It is the last of these which is presented to the appropriate decision review.

OTEA coordinates with other agencies during the formulation of the independent evaluation plan and the test design. To properly test the prospective system, OTEA must have the user's criteria. The user must be involved by providing scenarios, doctrine, tactics, threat and the like, which impact on the system. The T&E agencies of the developing command, DARCOM, must be coordinated with to assure that there is no unnecessary duplication of testing. Thus, although the four documents mentioned above are OTEA products, there is ample opportunity for other members of the testing community to contribute to the viability of operational testing.

OTEA's field test teams are generally composed of a cell of at least three full-time officers who supervise and control the test execution under the guidance of the test design plan. The entire test force consists of personnel in the strengths and skills required for the specific test. An officer from the test installation, normally of O-6 rank, is appointed as the Test Director. He also supervises test execution and

signs the field test report. By using someone of appropriate rank who is familiar with the installation, test support coordination problems are minimized. The Deputy Test Director of an operational test is normally the senior full-time OTEA officer. He continues to be rated by his chain of command within OTEA. During execution, the designated OTEA Test Manager will visit the test site as the representative of Commander, OTEA. The Test Manager is specifically dedicated at all times to support the test, furnish guidance, and assist in resolving problems as required.

The independent evaluation report is written by the OTEA test evaluator. In the normal course of his duty, he coordinates in the test design, and is involved in the resolution of questions which may arise during test execution. Along with the field test report, he uses related studies, simulations, and the results of other system tests to prepare the independent evaluation for the approval of the OTEA commander, who reports directly to the Chief of Staff of the Army. The independent evaluation report is normally briefed by OTEA directly to the DSARC or ASARC for major systems. (7:3-3)

The preceding several pages have provided an encapsulated version of the OT&E structure for major and selected nonmajor (category I) systems within the Army. The next section is an analysis of how that structure serves to satisfy the guidance of DOD which are based on the Congressional comments of the early 1970's.

## SECTION IV

### ANALYSIS

The current organization for OT&E is relatively new. Insufficient time has passed since the establishment of OTEA to trace a single system through its normal operational test cycles and into deployment. It is, of course, the future post-deployment performance of a system that ultimately provides an indication of the efficiency of OT&E concepts.

Today, however, the Army's OT&E organization can be measured against its intended purposes through the medium of DOD guidance and the Congressional criticism cited earlier. Addressed below is the question, "Do pertinent regulations and policies prescribe compliance with DOD Directive 5000.3 and ameliorate the areas of past criticism of OT&E?" In researching a response to this issue, OT&E documentation was sampled. The sampling provided an indication of how the policies are being carried out, and an illustration of OT&E's responsiveness.

In the following subsections, the areas of Congressional criticism will be summarized without reference, along with the corresponding policy from DOD Directive 5000.3. The areas of Congressional comment are from Section II.

#### Testing Prior to Production

**Congress:** Operational testing not started early enough in acquisition.  
System suitability not checked before production of weapon.

DOD: Acquisition programs will be so structured that at least an initial phase of operational test and evaluation (IOT&E) will be accomplished prior to the first major production decision.

Paragraph 2-3 of AR 70-10 states specifically that "OT I and II relate to the initial phase of operational test and evaluation (IOT&E)...prescribed in DOD Directive 5000.3. OT III may support (IOT&E) when there is a need to the full production decision." The regulation allows a waiver on approval at Department of the Army level. Based on the author's experience and a search of OTEA's documentation, there has been no deviation from this policy for a major or selected nonmajor system.

Historically, OT I and OT II have served as IOT&E. OT III has generally been associated with test of an initial or post production model of the system as shown on figure 1. The question has been raised to the author on several occasions, however, "Is OT I really a valuable test?" A reflection on the potential of such a test, and in light of the regulations which prescribe it, indicate a reply in the affirmative. While OT I may not test an advanced prototype of a system, from an operational view it has the potential for establishing man-machine interface and verifying the adequacy of concepts connected with the system. An example is cited from the forthcoming XM1 Army Battle Tank OT I. The crew's ability to quickly load the main gun while on the move will be tested under operational conditions. This exercise will result in checking the adequacy of procedures and can provide useful information

related to the interior configuration of the tank and an insight into how the tank might be combat loaded most efficiently.

OT II provides the most critical test for the prospective system. This is a matter of policy within OTEA (47) and its logic is sound. It is OT II which normally checks the system in full scale development (FSD) prior to initial production. In FSD, the system design becomes virtually fixed, and future change becomes difficult. A favorable decision from OT II, reflected in DSARC III, commits the system to the point where a delay or major change may have serious economic consequences.

Both OT I and OT II serve to check the system prior to a commitment to production. They represent the action taken by the Army to insure a "try-before-buy" concept is implemented.

#### Response to User Requirements

Congress: Must identify user problems and insure that system properly responds.

DOD: OT&E is...conducted to estimate the...system's military utility (and) operational effectiveness.... Insure that OT&E is effectively planned and conducted.

Both AR 71-3 and AR 70-10 relate to the identification of user needs and establishing a system to insure that a proper response is made to those needs. In describing the route from need to response paragraph 3-2b of AR 71-3 on OT policy states, "There must be a clear thread from

item/system requirements, ...to the test design and test criteria for each phase of testing." The Coordinated Test Program (CTP) is established to do just this. Both critical issues and the more detailed test criteria are used. "...critical issues for testing will be identified by the materiel developer, the combat developer, and other participants in CTP coordination." (7:2-3) Test criteria are jointly defined by both the materiel and combat developers, representing the user, and coordinated with the operational tester for insertion into the CTP. (8:3-3) Also inserted into operational testing are the user's concepts for organization and doctrine as well as necessary training and maintenance. Support packages in each of these areas for use of the operational tester are required no later than OT II. (7:2-2)

Evaluation of the system's response to user needs then rests with the independent view presented at the ASARC and DSARC level for major systems. "The (CTP) will provide...operational testers and evaluators with criteria, against which their tests will be designed and the data evaluated." (7:1-2) This is further emphasized in paragraph 2-6 of AR 70-10 which states that OT will provide data to estimate from "...the user viewpoint a system's desirability, considering systems already available and the operational benefits or burdens associated with the new system." (7:2-7)

The above then provides the policy under which the OTEA operates. In surveying the operational test which have been executed in the recent

past, it was observed that the user's interests habitually were represented. The test designs and evaluations are replete with examples in which, for example, the user's doctrine has been encompassed, user troops participate, and reliability and supportability are checked. All OTEA evaluations address the adequacy of the test as a user test. One of the by-products of involving the user is to sharpen his perception of how he states his requirements. (47) Being involved in operational testing provides to the user a vivid demonstration of what his criteria means in terms of realizable equipment, performance, and doctrine.

Thus, not only in OT policies, but in T&E execution the user's needs are being recognized and fulfilled in the Army's program.

#### Value of Improvements

Congress: No one in the acquisition process knows the value of an incremental improvement in performance factors such as speed.

DOD: OT&E will estimate military utility and operational effectiveness.

The issue of added value by or to the new system is addressed in at least two different ways in the Army's acquisition process. The first is by conducting "substantive, credible cost and operational effectiveness (analyses) and trade-off (analyses)" as prescribed in AR 71-3 and other regulations. This is not an operational test function, but is assigned to appropriate agencies, depending on the system being evaluated.

For major systems this task would normally be undertaken by the Concepts Analysis Agency as prescribed in paragraph 1-14c of AR 70-1. These studies would provide for an evaluation of the benefit of improved capability generally before the full scale development of a candidate system.

The second way in which improved performance is addressed is in the manner in which the candidate is operationally tested. Typical user troops are employed in the test to insure that a net gain in operational effectiveness in fact can be realized when a better technical parameter, such as aircraft speed or weapon rate of fire, is built into a piece of equipment. Another technique used to provide an evaluation of increased performance is to test multiple weapon types side-by-side under like conditions. The comparative mode of testing is standard in OT II when insufficient data is available on a current system which is being replaced. (8:3-1) For example, the forthcoming XM1 Tank test will use the M60A1 tank as a baseline system for comparison against two prototypes. The tests for the XM204 light howitzer and the XM198 medium howitzer both employ the same technique by using the current M102 and M114A1 howitzers as references during OT II. Evaluation of test results then can yield the value of increased performance of a system under operational conditions.

#### Test Influence

Congress: Tests do not appear to be independent from influence of the developer; objectivity of the testing is doubtful.

DOD: Each Service will have one major field agency, separate and distinct from the developing/procuring command and from the using command, which will be responsible for OT&E and report the results of its independent T&E directly to the Service Chief.

The issue of independence and objectivity is perhaps the most basic one in that it directly reflects on the credibility of not only a given test, but the Service's entire program. Without credibility all other efforts in testing ultimately may be unproductive. As mentioned in Section II, it was the perceived lack of independence in the Army's T&E organization in the late 1960's that contributed to the establishment of an entirely separate OT&E agency. An examination of the Army's organization of OT&E for major systems reveals that the intended spirit of independence is being carried out, and objectivity of testing is retained.

Complete separation of operational testing execution from development testing is a desirable goal. It would assist in erasing any perceived influences of the developer on user testing. In fact, in the initial staffing of DOD Directive 5000.3, a policy of total separation was attempted. (48) Because of the economic implications of completely separate testing on all systems, however, it was not required at all points in the acquisition process. Totally independent evaluations, however, are required. The Army's policy which stems from the DOD Directive is:

Objective testing. ...OT will be independent of DT and normally will be conducted separately from DT. However, DT and OT may be combined when separation would cause delay involving an unacceptable military risk or an unacceptable increase in acquisition costs. ...DT and OT test designs are prepared and test results are evaluated independently, regardless of the degree of combined testing.  
(7:2-3)

In the research for this study, it was discovered that independence is most meticulously sought at all points in the process of an operational test and its evaluation. For instance, in the field the Deputy Test Director from OTEA works for, but is not rated by, the Test Director at the test installation. He continues to have his efficiency rating from his OTEA supervisors, even though he may work on a test for six months in the field. The basic reason for this policy is to avoid possible interpretation of influence from the test director, who is normally from a developing or using command.

The independent evaluation which OTEA prepares is subject to comment by the Department of the Army staff. However, by agreement with all concerned, that evaluation remains unchanged in its presentation to the highest level decision body for which it is intended. (47) OTEA's responsibility is directly to the Army Chief of Staff through the Director of the Army Staff. (6:4) While it is possible for the Army staff's position on a given major system to differ from that indicated in the OTEA evaluation, the independent evaluation would still be made available to the DD(T&E). (47) Thus, in policy and in practice the Army maintains independence and objectivity in its operational test program.

The foregoing analysis has concentrated on the organizational and policy aspects of the Army's OT&E efforts. Both of these areas are responsive to DOD guidance. During the research for this study an effort

was made to ascertain how well the Army is perceived as accomplishing its independent test and evaluation on major systems. It was found that both at the Department of the Army staff level and at OSD the Army's OT&E effort in general, and OTEA in particular, enjoy a reputation for excellent quality. The operational test program is coordinated well and is responsive both to the Army staff and DD(T&E). (48 and 49) The overall impression is that the credibility of operational test and evaluation are enhanced by OTEA's execution.

## SECTION V

### SUMMARY AND CONCLUSIONS

The history of the Army's operational test and evaluation program has been one of response and searching for the most effective method of supporting the materiel acquisition process. Through DOD guidance the Congressional criticisms and Service studies of the 1960's and early 1970's have resulted in the current Army policies as well as an independent evaluation agency at the top level of Army management.

Although OTEA is relatively young, an examination of its operation, along with the current Army policies, shows correction of the errors of past OT&E. Adequate testing and evaluation now are executed prior to a production decision on a prospective system. The user's needs are encompassed as a part of each of the operational tests during system acquisition. Comparative testing and the use of troops from typical units have provided valuable information with which to assess the effectiveness and benefits derived from prospective systems. Credibility of OT&E has been established by complete independence of the Operational Test and Evaluation Agency from other commands and its chain of reporting directly to the office of the Chief of Staff of the Army.

Thus, under DOD guidance the present Army program for the operational test and evaluation of major and selected nonmajor systems has answered the criticism of the past. Its major component, OTEA, is organized as

a viable independent evaluation agency whose record and reputation indicate a high level of effectiveness.

SECTION VI  
FUTURE AREAS OF INTEREST

To continue the favorable trend in operational testing, the Army's testing community must remain aware of the lessons of the past. Past criticisms could be generalized by the word, "inefficiency." Accordingly, the OT&E organization must continue to be alert to potential repetition of any inefficiencies in its policies.

With the recent emphasis on testing, the DOD already is investigating possible overemphasis. (49) Overtesting is costly to the project manager in terms of both time and money. The effect of potential overtesting has been felt by at least one project manager. In a message to the Army's development command, DARCOM, the Army staff has asked for a review of the 14 months of continuous testing currently required of the TACFIRE Command and Control system. (11:1) Operational testing is only part of that extended project burden, but the situation illustrates the point that coordination and efficiency in testing remain areas of concern.

In an environment of tight budgets test planners are naturally pushed toward increasing combined testing, especially the combination of DT and OT. Yet the necessity for objective testing argues for separate testing. Maintaining the right balance between the two extremes certainly will be a continuing area of interest in operational test planning.

There is, at present, no basis for a comprehensive feedback of operational testing's benefits. Certainly there have been immediate benefits to specific systems by virtue of the problems surfaced. However, an insufficient number of systems tested have gone beyond initial production, so that it is not yet possible to draw general implications of the long term benefits of OT&E. Thus, it will be to the Army's advantage as major systems are deployed to observe their operational problems for trends which might serve to improve OT&E policies.

Summarizing the above, it certainly will be to the Army's future advantage to maintain vigilance on its testing programs to insure that all possible efficiencies are realized. The Army has established a mechanism for doing this, the Test Integration Working Group (TIWG) (see Section III). Those responsible for testing policy should review TIWG proceedings for trends to insure that OT&E plays its most efficient role in the materiel acquisition process.

#### ABBREVIATIONS USED

AMC - US Army Materiel Command (now DARCOM)  
AR - Army Regulation  
ASARC - Army Systems Acquisition Review Council  
CDC - Combat Developments Command  
CONARC - Continental Army Command  
CTP - Coordinated Test Program  
DA - Department of the Army  
DARCOM - US Army Materiel Development and Readiness Command  
DD(T&E) - Deputy Director of Defense Research and Engineering, Test and Evaluation  
DepSecDef - Deputy Secretary of Defense  
DSARC - Defense Systems Acquisition Review Council  
DSMS - Department of Defense Systems Management School  
DT - Development Testing  
FDTE - Force Development Testing and Experimentation  
IOT&E - Initial phase of Operational Test and Evaluation  
OSD - Office of the Secretary of Defense  
OT - Operational Testing  
OT&E - Operational Test and Evaluation  
OTEA - US Army Operational Test and Evaluation Agency  
T&E - Test and Evaluation  
TECOM - US Army Test and Evaluation Command  
TIWG - Test Integration Working Group

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