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DEFENSE SYSTEMS MANAGEMENT COLLEGE

PROGRAM MANAGEMENT COURSE
INDIVIDUAL STUDY PROGRAM

DEVELOPMENT VS. OPERATIONAL TEST
AND EVALUATION FOR
NAVAL AIR SYSTEMS COMMAND
WEAPON SYSTEMS ACQUISITION

STUDY PROJECT REPORT
PMC 77-1

Ronald J. Schug
GS-13 DNC

FORT BELVOIR, VIRGINIA 22060

DEVELOPMENT VS. OPERATIONAL TEST AND EVALUATION

FOR

NAVAL AIR SYSTEMS COMMAND

WEAPON SYSTEMS ACQUISITION

Study Project Report

Individual Study Program

Defense Systems Management College

Program Management Course

Class 77-1

by

Ronald Joseph Schug
GS-13 DNC

May 1977

Study Project Advisor
Mr. Wayne J. Schmidt

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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE: DEVELOPMENT VS. OPERATIONAL TEST AND EVALUATION FOR NAVAL AIR SYSTEMS COMMAND WEAPON SYSTEMS ACQUISITION

STUDY PROJECT GOALS:

To research and review current directives, reports, factors, and criticisms, that determined the current structure and methodology for test and evaluation within the Navy. To determine the existance of overtesting or inadequate testing, and the emphasis on Operational Test and Evaluation, which effect the acquisition of weapon systems in the Naval Air Systems Command. To examine the extent and effectiveness of integrated testing.

STUDY REPORT ABSTRACT:

This report reviews the existing DOD and Navy directives and policy that have been published and are of import within the Naval Air Systems Command (NAVAIR). It identifies emerging concepts that affect the Test and Evaluation (T&E) process to describe a balance or imbalance in our present test methodology. It describes the effect that the emphasis on Operational Test and Evaluation (OT&E) has on the NAVAIR Project Manager(PMA).

A literature search was conducted to obtain as much background information consistant with the goals stated above. Interviews with NAVAIR Project Managers, and other NAVAIR division personnel, and Chief of Naval Operations (OP-983) personnel, were conducted to obtain current data and candid comments on the current policy and real world situations.

This study revealed that the Navy organization has been stable, efficient, and effective to the maximum extent possible, for the procurement of Weapon Systems throughout the period prior to, and since the inception of the new policy set forth in DOD Instruction 5000.1. OT&E has been over emphasized throughout the Services, but previous Navy organization permitted a smooth transition to accomodate an independent test agency. A balance of Development Test and Evaluation (DT&E) and OT&E exists and is supported by DOD reports that state "little or no overtesting is done". The Test and Evaluation Master Plan (TEMP) is required by the Navy at the earliest decision milestone and is an effective method to produce a balance of DT&E and OT&E. Significant T&E cost savings can be realized by data sharing which reduces testing. A T&E cost accounting tracking system is required, and interest should be generated at the highest levels to support sufficient funding for T&E.

KEY WORDS: Testing and Evaluation, Operational Test and Evaluation, Independent Evaluation, Project Management, Overtesting

NAME, RANK, SERVICE	CLASS	DATE
Harold J. Schug, GS-13, DMC	PMC 77-1	May 1977

EXECUTIVE SUMMARY

The high cost of Weapon Systems material acquisition in the Department of Defense (DOD) has been in the limelight on the Congressional and National level for many years. There is an inherent requirement for adequate test and evaluation of these weapon systems to ensure maximization of dollars spent for systems procured. DOD has shifted emphasis from Development Test and Evaluation (DT&E) to Operational Test and Evaluation (OT&E) by establishing Independent Test agencies, who perform OT&E and report test results essential to key decisions for weapon system acquisition.

This report reviews existing directives and identifies concepts that affect the balance of DT&E and OT&E, which concern Naval Air Systems Command (NAVAIR) Project Managers. Interviews with NAVAIR Project Managers and Chief of Naval Operations (OP-983) were the source for current data.

This study revealed that the Navy organization has been stable, efficient, and effective for the Procurement of Weapon Systems, throughout the period prior to and since the inception of the new DOD policy. There is little or no overtesting being performed at this time and the emphasis that the Navy places on the requirement for a Test and Evaluation Master Plan, at the earliest decision milestone, is an effective method to produce a balance of DT&E and OT&E.

The most significant changes required for improvement are establishment of an effective T&E cost accounting tracking system at Navy agencies, and high level interest to support sufficient funding for the design phase of each approved weapon system acquisition.

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SECTION I

INTRODUCTION

Purpose of the Study Project

The high cost of Weapon Systems material acquisition in the Department of Defense (DOD) has been in the lime-light on the Congressional and National level for many years. In times of War the emphasis wanes to a certain degree, but when conflict ends, attention is once again heavily focused not only on the military need, but on the high price of procurement and operation. The inherent requirement for adequate test and evaluation of these weapon systems to ensure maximization of dollars spent for systems procured, has been a major concern and emphasized since 1970. Additionally, the rising cost of the attendent test and evaluation process in an economy such as we live in today further perturbates this concern.

In an effort to provide a balanced cost effective test and evaluation program for all weapon systems acquisition, DOD has shifted their emphasis from Development to Operational test and evaluation, by establishing independent test agencies who provide operational testing and reports essential to the decision making process.

This report reviews the existing DOD and Navy directives and policy that have been published and are of import within the Naval Air Systems Command (NAVAIR). It will identify emerging concepts that affect the test and evaluation process to describe a balance or imbalance in our present test methodology. Additionally, it will describe the effect that this emphasis on Operational test and evaluation has had on the NAVAIR Project

Manager and the acquisition process.

Additional change and shift of emphasis in the test and evaluation Community will certainly occur, therefore, it is hoped that this report will help to generate future studies to identify more efficient and cost effective test and evaluation.

Goals of the Project

Specific goals for this report are:

1. To research and review the current directives and policy for test and evaluation as delineated by DOD and as they apply to the Navy.

2. To research pertinent reports, factors, and criticisms which have determined the current course of action, and structure of T&E emphasis in the Navy.

3. To determine the existance of overtesting or inadequate testing in respective areas.

4. To investigate selected NAVAIR projects to determine the impact of Operational Test and Evaluation (OTE) on the Development process.

5. To determine the impact that OTE has on the acquisition process and the level of difficulty in obtaining approval for Service use.

6. To examine the extent and effectiveness of integrated testing.

7. To make recommendations to influence policy and future direction of Test and Evaluation.

Scope and Limitations

This study effort was limited by the time available to conduct the Individual Study Program at the Defense Systems Management College. It consisted of research of the directives, reports, and policy statements that affect the current posture of the DOD policy on Test and Evaluation. A survey of Navy instructions, related policy statements, and briefing materials was also performed. Interviews with present and former NAVAIR Project Managers (PM) and Acquisition Managers (AM) were conducted to obtain current views, impressions and impact responses to the OTE emphasis on their projects. A non-attribution guarantee was provided each interviewee to obtain the most candid impressions possible. Travel to OPTEVFOR, Norfolk, Va., was contemplated, but rejected as time became premium. In lieu of this effort an interview with Chief of Naval Operations (CNO) OPNAV Code 983 personnel who represent OPTEVFOR was accomplished. The term of reference for this report therefore is biased to the DTE side of the acquisition process.

Definitions

In order to discuss what composes the term balance of test and evaluation, it is appropriate here to present two basic definitions of Development Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E) respectively. DOD Instruction 5000.3 provides the baseline for the myriad of Navy directives that have been published to implement policy.

> Development Test and Evaluation (DT&E). DT&E is that test and evaluation conducted to: demonstrate that the engineering design and development process is complete; demonstrate that

> the design risks have been minimized; demonstrate that the system will meet specifications; and estimate the system's military utility when introduced. DT&E 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 or Defense Agency Director. (1:2)[1]

Operational Test and Evaluation is more heavily emphasized in the basic document, DOD Instruction 5000.3 and specifically states that, "operational testing should be separate from development testing". (1:4) The definition of OT&E then follows:

> 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 modification. In addition, OT&E provides information on organizations, personnel requirements, doctrine, and tactics. Also it may provide data to support or verify material 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 a realistic and operational environment as possible. OT&E will normally be conducted in phases, each keyed to an appropriate decision point. During Full Scale Development OT&E will be accomplished to assist in evaluating operational effectiveness and suitability (including compatibility, interoperability, reliability, maintainability, and logistic and training requirements). OT&E will be continued as necessary during and after the production period to refine these estimates, to evaluate changes, and to re-evaluate the system to insure that it continues to meet operational needs and retains its effectiveness in a new environment or against a new threat. (1:3)

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1 This notation will be used throughout the report for source of quotations and major references. The first number is the sources listed in the bibliography. The second number is the page in the reference. Author underlining for emphasis.

SECTION II

BACKGROUND AND CURRENT POLICY

On 1 July 1970, the Report to the President and the Secretary of Defense on the Department of Defense, by the Blue Ribbon Defense Panel, was published. It was this catalyst which caused the significant change in the test and evaluation process for acquisition of weapon systems.

Prior to 1970 congressional pressure (more so in the 50's than in the 60's) had not demanded such strict accounting and attention to details of each test and evaluation process, that they would exert later in the 70's. They seemed satisfied until the late 60's when their attention was shifted toward the increasing cost of procurement and deployed operation of Defense Weapon Systems. The Blue Ribbon Defense Panel was appointed by the President in 1969 to conduct an indepth review of operation of the Department of Defense, which included a detailed analyses of test and evaluation in the component Service organizations. The "Fitzhugh Report" does not specifically mention or use the term DT&E in the discussion on Operational Test and Evaluation, but it is important to recognize that a differentiation between "functional" and "operational" testing is made:

> Functional testing (often called engineering testing) is done to determine how well various systems and material meet design and performance contractual specifications in other words, whether they meet technical requirements.
>
> By and large, functional testing in and for the Department of Defense appears to be well understood and faithfully executed. Serious policy deficiencies are not apparent, and such failures in functional testing as occur can be primarily attributed to lack of technical competence, oversight, or procedural breakdowns.

> Functional testing is not considered to be a major problem area.
>
> Operational testing...is done to determine...whether such systems...can meet operational requirements... must take into account interference with other systems and equipment, tactics and techniques, organizational arrangements, and the human skills and frailties of the eventual users. (2:88)

To emphasize a move to stress the OT&E position, and the merits of improved OT&E in itself, the Panel stated that:

> There has been an increasing desire, particularly at OSD level, to use data from OT&E to assist in the decision-making process. Unquestionably, it would be extremely useful to replace or support critical assumptions and educated guesses with quantitative data obtained from realistic and relevant operational testing.
>
> Significant changes are essential if OT&E is to realize its potential for contributing to important decisions, particularly where the tests and decisions must cross Service lines.
>
> There is no assignment of overall responsibility for deciding what OT&E should be done...or insuring that results reach those who need them.
>
> The most glaring deficiency of OT&E is the lack of any higher-than-Service organization responsible for overseeing Defense OT&E as a whole. (2:89)

The Panel seemed to find little wrong with the formal methodology used by the Navy; in fact, due to the long standing approach of Technical Evaluation followed by Operational Evaluation employed in the acquisition process (backed up by a long string of successful aircraft and missile procurements) it could have been the model for the other services to follow. The Panel found that the "Navy system of OT&E has two main characteristics":

> (1) It is principally implemented by an independent OT&E organization reporting directly to the Chief of Naval

> Operations, and (2) there is a formal way of getting operational evaluation (including some operational testing) done early in the overall process. The main deficiency in Navy OT&E is that it generally produces few hard data.

The staff report on OT&E concluded that:

> OT&E within the Services is done most effectively when OT&E organizations report directly to the Chief of the Service, representing both the developer and user, but organizationally independent of both. There are, however, considerable forces within the Service which resist the independence of OT&E organizations. (3:7)

The Navy method seemed to be the recommended approach which left only emphasis on independence and early involvement as the key issues to persue in the future towards creating a balance of DT&E and OT&E.

Deputy Secretary of Defense Packard was the driving force behind the DOD shift in emphasis from the concept of Total Package Procurement to Milestone Procurement for Defense Weapon Systems. He issued a memorandum to the Services, on February 11, 1971 which responded to the "Fitzhugh Report" and stated:

> Although each Service now has a somewhat different way of organizing for operational test and evaluation, it is apparent to me that this function 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. (4)

This was precisely what the Navy was doing as perceived by the "Fitzhugh Report" staffers. He went on to state that:

> ...within the service headquarters staff, there needs to be an office with a clear OT&E identification to provide staff assistance directly to the Service Chief and to provide a headquarters focal point for the independent OT&E field agency...each service is requested to restructure its organization for OT&E along the lines specified above. (4)

Since the Navy already had an independent OT&E test agency in Commander Operational Test and Evaluation Force, COMOPTEVFOR at Norfolk, Virginia, the remaining directive action would be accomplished by subsequent establishment of the Chief of Naval Operations in-house office designated OP-983. COMOPTEVFOR was appointed director of this office. The Deputy Secretary of Defense also established a Deputy Director for Test and Evaluation within DDR&E.

The concept of Milestone Procurement was formally established in 1971 by the issuance of DOD Instruction 5000.1 and has been updated twice since that event. OT&E and specifically the Operational Evaluation are mandatory prior to the Production Milestone III and emphasized as follows:

> Test and evaluation shall commence as early as possible. An estimate of military utility and of operational effectiveness and operational suitability including logistic support requirements, shall be made prior to large scale production commitments. The most realistic test environment possible and acceptable representation of the future operational system will be used in the testing,...(5:8)

The Congress had also had an opportunity to digest the thrust of the "Fitzhugh Report" which fit in line with their desires and in 1971 added section 506 to the 1972 Authorization Act which stated:

> Beginning with 1972, the Secretary of Defense shall submit to the Congress each calendar year, at the same time the president submits the Budget to Congress, a written report regarding development and procurement scheduled for each weapon system for which fund authorization is required and for which any funds for procurement are requested in such budget. Beginning with the calendar year 1973, there shall be included in the report data on operational testing and evaluation for each such weapon system for which funds for procurement are requested... the results of all operational testing, or, if operational testing and evaluation has not been conducted, a statement

of the reasons therefore, and the results of such other testing and evaluation as has been conducted. (6)

It is interesting to note that SECNAVINST 5000.1 of 13 March, 1972 was published before DODINST 5000.3 of 19 January 1973, which cleaned up a myriad of directives and established policy in tune with DOD directives. OT&E is stressed in SECNAVINST 5000.1 but seems to be in proper perspective to the predetermining DT&E. "Test and Evaluation effort shall be effectively correlated with previously outlined requirements concerning approval of material for service use." This directive presented a philosophy for "Balanced" test and evaluation in stating:

> The wide variety of naval weapons dictates varying approaches to the conduct of test and evaluation; such effort shall be tailored to the needs and characterizations of each individual acquisition--prime consideration being given to adequate operationally oriented testing. (7:13)

> New acquisitions includes conversions, major modification and modernizations. Adequate test and evaluation of these is also required to (1) support design and development activity, (2) measure performance against specified acceptance criteria, (3) ensure satisfactory operation with related interfacing systems, (4) confirm operational effectiveness and suitability, and (5) validate the adequacy of documentation for support and test equipment, personnel, training, maintenance and operation of the whole system/subsystems, and other elements. (7:14)

DOD Test and Evaluation policy is given in DOD Directive 5000.3 and defines that "The DD(T&E) has across-the-board responsibility for OSD in test and evaluation matters." More specifically DT&E and OT&E policy is thus stated:

> 1. DT&E shall be started as early in the development cycle as possible and include testing of component(s), subsystem(s), and prototype or preproduction model(s) of the entire system. Compatibility and interoperability with existing or planned equipments and systems shall be tested.

> 2. During the development phase...adequate DT&E shall be accomplished to demonstrate that technical risks have been identified...
>
> 3. During full scale development phase...DTE... to insure...engineering complete... significant design problems (including compatibility, interoperability, reliability, maintainability, and logistical considerations) have been identified; and that solutions... are in hand. (1:2)

Concerning Operational Test & Evaluation policy:

> 1. In each DOD component there will be one major field agency seperate and distinct from the developing/procuring command and from the using command which will be responsible for OT&E and which will:
>
> a. Report the results of independent test and evaluation directly to the Military Service Chief or Defense Agency Director.
>
> b. Recommend...the accomplishment of adequate OT&E.
>
> c. Insure that OT&E is effectively planned and conducted. (1:3)

Concerning Production Acceptance Test and Evaluation (PAT&E), which for the Navy, is conducted by the Board of Inspection and Survey (BIS), for major weapon systems and is defined with the following policy:

> PAT&E is test and evaluation of production items to demonstrate that the items procured fulfill the requirements and specifications of the procuring contract or agreements. It is the responsibility of each DOD component to accomplish the necessary PAT&E throughout the production phase of the acquisition process. (1:6)

The history of the Board of Inspection and Survey (BIS) dates back almost to beginning of the Navy in these United States and has functioned by charter in the same manner, but for this purpose BIS:

> ...is a shore activity...under the direction of a President...under the Chief of Naval Operations. The Sub-Board of Inspection and Survey office at Patuxent River functions...under the Board of Inspection and Survey, Washington, D.C.
>
> The mission...is to conduct acceptance trials of...aircraft...to make recommendations on their acceptance by the Navy (8:2)

The Operational Test and Evaluation Force (OPTEVFOR) was established during World War II and concentrated in the area of "tactics" for many years, supporting the NAVAIR through "development assists" (D/V) or flight testing. In fact it was common on Anti-Submarine Warfare (ASW) projects to obtain a (D/V) from CNO to do a TECHEVAL followed by OPEVAL on the same test aircraft. OPTEVFOR is now chartered with the stamp of independent testing authority as follows:

> To operationally test and evaluate specific weapon systems...aircraft and equipments including procedures and tactics, where required; and, when directed by CNO, assist development agencies in the accomplishment of necessary Development Test and Evaluation.
>
> ...carry out assigned responsibilities as an independent test agency for required operational test and evaluation under the command of CNO and serve as principal advisor to CNO for all Department of the Navy matter pertaining to operational test and evaluation. (9:1)
>
> Provide the results of operational test and evaluation to Defense Systems Acquisition Review Council (DSARC) production decision reviews...and to other reviews as required. (9:2)

Approval for Service Use (ASU) is the bottom line at the end of the T&E process when a production go-ahead is obtained. DT&E and OT&E success supports Milestone III Production decision. ASU in the Navy is:

> That determination made by the Chief of Naval Operations, or other delegated authority, that new systems or equipment or significant alteration to existing systems or equipments have undergone appropriate test and evaluation... (10:4)

Provisional approval for Service Use (PASU) can be granted after undergoing early phases of appropriate T&E in conformance with the directive. Additionally:

> A "provisional approval" may be sought on programs for which sufficient operational testing to support a final determination for approval for service use cannot practically be accomplished prior to making an initial production commitment. (10:5)

The direction for acceptance for service use rests with the BIS report and:

> The determination made by SECNAV to accept or reject an aircraft model...based on the results of an acceptance trial conducted by the Board of Inspection and Survey (BIS). The report of BIS includes a statement or finding that an... aircraft model is recommended for acceptance or rejection, based on a complete inspection and operational trial of the production article. (10:6)

When OPNAV Instruction 3960.8 dated 22 January 1973 was published many Navy personnel felt that the T&E policy was then firmly established, and that a "balanced" test and evaluation process had been instituted. However, a key issue began to emerge at high levels in CNO which would cause a significant change in 1975. It centered around the Test and Evaluation Master Plan (TEMP), which the Navy considered a key planning and controlling T&E document. The issue was, "Who should approve the TEMP?" OPTEVFOR also OP-983, under the Chief of Naval Operations was driving this issue, because the TEMP was being approved by the Project Manager, who had re-

sponsibility for funding T&E up to the Major Production Milestone III. On 22 October 1975, OPNAV Instruction 3960.10 was published, as authored by OP-983, with TEMP approval vested in the program sponsor (DCNO), who will resolve conflicts between the Developing Agency and COMOPTEVFOR. "Navy policy is the same as..." that stated in DOD directive 5000.3. In addition the main purpose of OPNAVINST 3960.10 is to:

- Establish policy for test and evaluation (T&E) in the Navy acquisition programs.
- Define the T&E responsibilities of CNO, Director RDT&E (OP-98), program sponsors (DCNOS/DMSOS), CHNAVMAT, Developing Agencies (DAs), COMOPTEVFOR, PREINSURV, and fleet commanders.
- Establish procedures for planning, conducting, and reporting T&E.
- Delineate the complimentary relationship of development T&E and operational T&E phases throughout the life of a program.
- Establish procedures for obtaining Fleet RDT&E Support for R&D that is not part of the acquisition program. (11:1)

The establishment of Acquisition Categories was a significant part and is the basis for the various phases of T&E in the Navy. Figure 1, describes these acquisition categories, however, as a result of DOD directive 5000.1 dated 18 January 1977, major program dollar thresholds have been raised to $75 million RDT&E and $300 million production. Figure 2, displays the various DT&E and OT&E relationships and phasing concept. The Technical Evaluation (TECHEVAL) and Operational Evaluation (OPEVAL) will be scheduled back-to-back to inhibit concurrent testing prior to the Production Decision Milestone III. Additional information describing these phase concepts should be persued by the reader.

ACQUISITION CATEGORIES

ACAT	DESIGNATED BY	NOMINAL DOLLAR VALUE THRESHOLD		OTHER CRITERIA
		RDT&E	PRODUCTION	
I	SECDEF or DEPSECDEF	$50M	$200M	Lesser programs designated by SECDEF or DEPSECDEF.
II	DSARC principal, SECNAV, or CNO	$20M	$ 50M	Lesser programs recommended by CHNAVMAT, Op-090, Op-098, or program sponsor (DCNO/DMSO).
III*	Program Sponsor	$ 5M	$ 20M	Lesser programs recommended by CHNAVMAT, Op-090, Op-098, or Developing Agency (DA).
IV*	CHNAVMAT			Includes all programs not designated ACAT-I, II, or III.

*NOTE: Programs below the ACAT-III dollar threshold will normally be designated ACAT-III if:

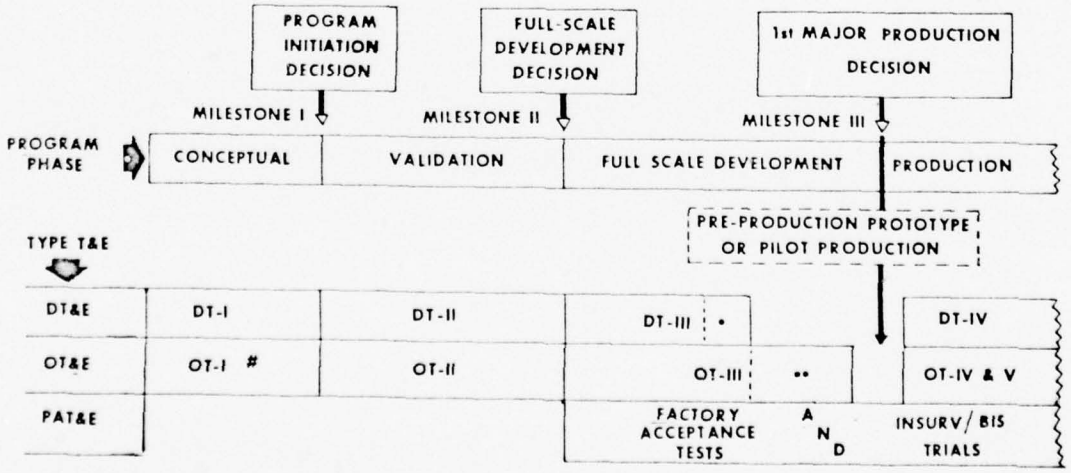
a. They directly affect the military characteristics of ships, aircraft, or other combatant units; or

b. They require OT&E to support key program decisions; or

c. They require Fleet RDT&E Support.

Navy Acquisition Categories

Figure 1



• TECHEVAL

•• OPEVAL

NOT REQUIRED FOR MOST ACQUISITION PROGRAMS.

Navy Test and Evaluation Phases

Figure 2

SECTION III

TEST AND EVALUATION ORGANIZATION

The T&E organizational relationships seem to be clear cut down to the Naval Air Systems Command (NAVAIR) level, where some departure from a formal chain reporting system takes place. Deputy Director Test and Evaluation (DDT&E) is the top T&E official who reports to the Secretary of Defense. From DDT&E who has an informal chain to OP-983, the Secretary of the Navy (SECNAV) controls RDT&E and policy for the Navy, down through the Chief of Naval Operations (CNO), and also has a vested interest in the Navy Laboratories, who conduct Basic Research and support testing (DT&E) up to the full scale development phase of weapon systems projects. CNO down through the Chief of Naval Material (NAVMAT), provides guidance and policy for the execution of Navy projects. CNO must asses the DT&E and OT&E results to determine Approval for Service Use (ASU) to sustain the production requirement and the Five Year Defense Plan (FYDP). OP-98 is the focal point for T&E, and OP-983 under him, who is also Commander, Operational Test and Evaluation Force (COMOPTEVFOR) for OT&E. In turn, the actual performance of OT&E and OPEVAL is conducted by the squadrons assigned COMOPTEVFOR. It is this chain that can provide OT&E and OPEVAL test results as high as DDT&E through the informal link without Program Manager awareness, as has been the case on some occasions on certain projects.

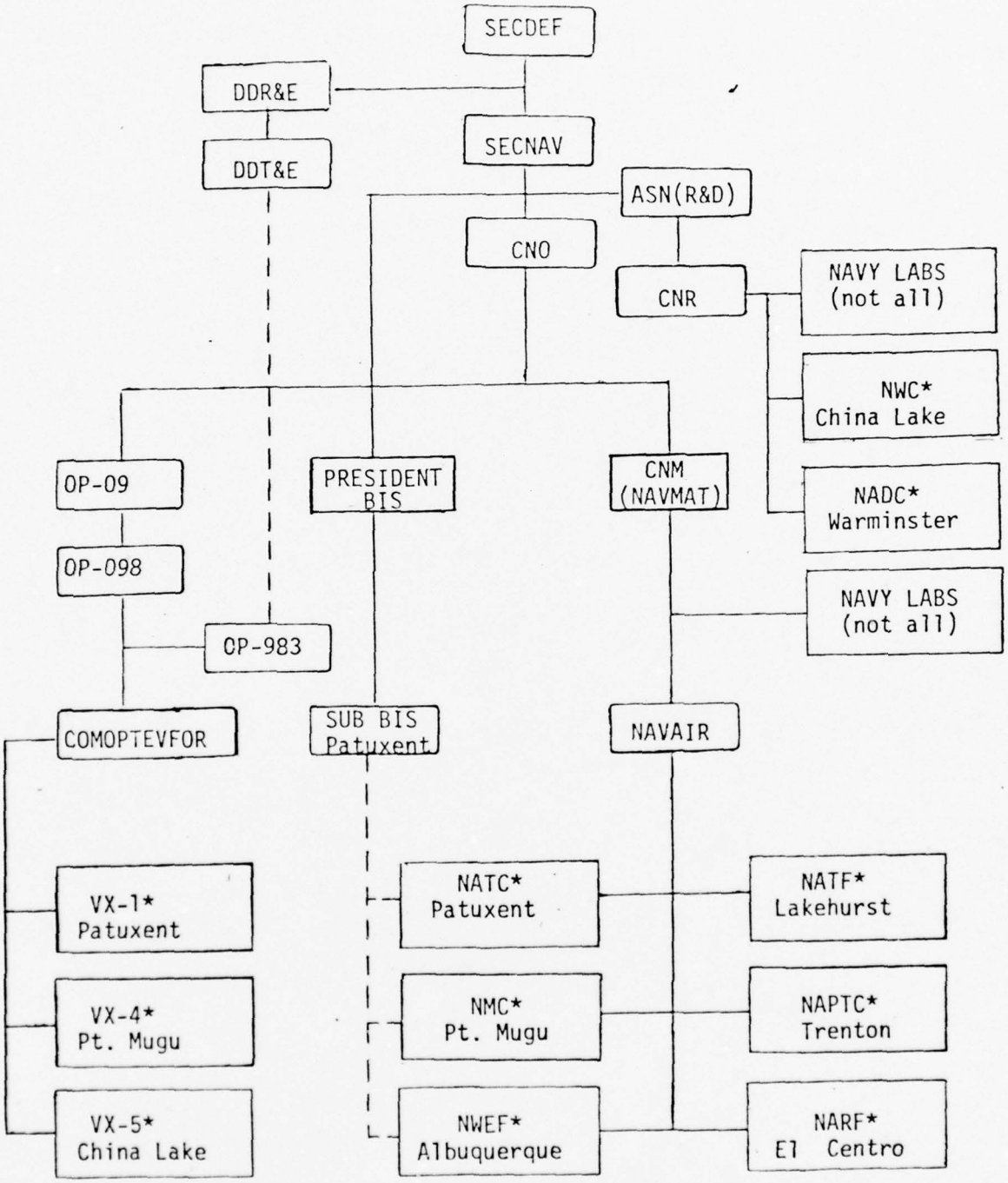
The second leg of this triumvirate T&E "Czarship" is through NAVMAT, who also has an interest in the Navy laboratories, down to the Commander, Naval Air Systems Command (NAVAIR), who has field activities to perform DT&E as required by the Projects assigned to the Command.

TECHEVAL can be performed by the laboratories, but usually in the form of Naval Preliminary Evaluations (NPE) in the case of aircraft, or Naval Technical Evaluations (NTE) in the case of missiles, it is done by the NAVAIR field activities.

The last T&E "Czar" is the President, Board of Inspection and Survey (BIS), who reports and is chartered by CNO, in addition he reports BIS test results to SECNAV. In the acquisition process of Weapon Systems for NAVAIR projects, BIS plays an important role to determine Service acceptability. As a sub board, (BIS) at the Naval Air Test Center (NATC) can call on NAVAIR field activities to do Production Acceptance Test and Evaluation (PAT&E) for which he is chartered. BIS trials are usually performed as a final phase of T&E, following the last NPE or NTE; BIS acts as an <u>independent</u> agent responsible to report deficiencies to SECNAV, CNO, and NAVAIR.

Figure 3, depicts the organization of Navy T&E, specifically through the Chain of Command of NAVAIR.

Today in NAVAIR there is an Assistant Commander for Test and Evaluation (AIR-06), <u>a flag officer</u>, but is not depicted on Figure 3 to avoid clutter. The establishment of AIR-06 in May 1975, is the culmination of events, that started in 1967 with an ADHOC study which caused the COMNAVAIR to create a management group called the NAVAIR T&E Coordinator. The main charter functions were resource management, (principally aircraft), long range planning for NAVAIR field activities, and T&E planning and resource allocation for NAVAIR projects. Today these functions continue, but AIR-06 has new, higher order, responsibility for management and control of the Budgets for NAVAIR field activities, and the Navy



PRESENT NAVAL AIR T&E ORGANIZATIONAL STRUCTURE

Figure 3

ranges, which are part of the Major Range and Test Facility Base. As the focal point in NAVAIR for T&E policy and resources, close liaison is maintained with DDT&E to whom he reports for NAVAIR on Budget matters. An additional function concerns the development and processing in the approval chain of the TEMP. AIR-06 is unique in his role within the T&E process and will surely be involved in new issues that can improve the balance of DT&E and OT&E.

DOD satisfaction that the services, and specifically the Navy, have sound organizational structure to conduct "balanced" test and evaluation is evidenced when DDT&E reported to Congress in March 1975, that:

> Each of the three Services now has a strong, mature organization for the accomplishment of independent operational test and evaluation. (12:3)

Dr. Currie, DDR&E, in February 1976 reported to the Congress that:

> High level emphasis on T&E was assured initially by creation of the Office of Deputy Director of Defense Research and Engineering (Test and Evaluation)...this office has closely monitored the T&E of all major, and many less than major, weapons acquisition programs. Further strengthening of DOD T&E has been achieved by establishment of independent operational T&E agencies within each of the services. Creation of these agencies has had significant impact on systems development and procurement as evidenced by the greater attention being directed to operational effectiveness within the Services and by the greatly improved quality of T&E data now being presented to the...(DSARC). (13:2)

No anticipated changes in the Navy, and specifically the NAVAIR organization are anticipated beyond those presented above.

SECTION IV

TEST AND EVALUATION MASTER PLAN

DOD emphasis on the need for a TEMP, which is required for each key milestone, directs that:

> The DOD component will prepare as early as possible in the acquisition process, and prior to initiation of Full-Scale Development, an overall test and evaluation plan to identify and integrate the effort and schedules of all T&E to be accomplished and to insure that all necessary T&E is accomplished prior to key decision points. The TEMP will be kept current by the DOD component. (1:6)

COMOPTEVFOR is in a powerful position as a result of the emphasis on OT&E since the publication of the "Fitzhugh report", and pressure that Congress, DOD, and the Navy exerted on compliance with OT&E requirements. He addressed the CNO Executive Board on March 25, 1975, "On the weakness in current Navy procedures that were detracting from the Navy's proper and complete implementation of OT&E and the directives which regulate it. He cited the lack of adequate **planning** by Project Managers for OT&E." (14)

It was through OP-983 (COMOPTEVFOR) that the new Navy instruction on T&E, OPNAV instruction 3960.10, was published. No significant changes to the "Navy way" for acquisition T&E were apparent, with the exception of the belabored detail of how to prepare a TEMP. The impact was a great deal more time and effort that is required to put one together, and the approval chain process. The connotation that "balanced" T&E exists, is reflected by the "position power" of OP-983/COMOPTEVFOR), in that the position of the TEMP submitted by COMOPTEVFOR is "sacred", and cannot be tampered with unless approved by the CNO, OP-98, who oversees both DT&E and OT&E. The author is personally aware that many heated debates have

occured over the issues, but in most cases were caused by personality situations, and were negotiated in the end analysis. In effect the TEMP forces the Project Manager to do his "homework" and ensure that a mutually agreed TEMP is derived at the working level early in the conceptual phase.

"The TEMP is the controlling management document which defines the test and evaluation for each acquisition program...it contains the integrated requirements of DT&E and OT&E, and the schedule and resources required for accomplishment. The TEMP will be prepared...and approved prior to Milestone I. The TEMP will be prepared by the DA in cooperation with COMOPTEVFOR and PRESINSURV (BIS). Approval of the TEMP constitutes CNO direction to conduct the T&E program..." (11:7)

The Program Manager is the one who must perform this "balance" act for the T&E he knows is necessary for his project, but is constrained by the present influence that COMOPTEVFOR has on the TEMP, and on "how much" OT&E he wants in that project. Unfortunately, it is sometimes most subjective, and requires pains taking negotiation on the part of the Project Manager. If there is too much OT&E some precious DT&E will be given up, due to funding constraints. There is no question that OT&E will be integral, early, and complete.

SECTION V

SELECTED PROJECT DATA

Data Collection

This author was principally concerned in this project to obtain current data from Project Managers, to identify a "balance", or "imbalance", of DT&E and OT&E in the Naval Air Systems Command (NAVAIR). It was postulated that with enough sampling of carefully selected mission areas, an analysis representative of the overall Navy status of T&E would result. Project Managers who served previous duty with OPTEVFOR test squadrons, was also a selection criterion. Fifty-seven percent of those interviewed had this experience, the remainer had been Squadron Commanding Officers, or had extensive Fleet exposure. Selected questions were prepared for common base data collection and are provided in Appendix A.

Data Base

Balance in Testing?

The first question asked of the interviewers concerned "balance" of testing, since first impressions were highly desirable. The majority response was "there is a balance of OT&E and DT&E testing", but two individuals were sure that there was no such balance, and that DT&E was being driven by the OT&E side of the house. Test planning and actual testing were performed "to satisfy OPTEVFOR" desires. Additional, redundant tests were performed because the "test data flow was in one direction only", ie. OPTEVFOR would not utilize DT&E test data, even though they were a participating member of the flight tests. This project manager had gone through <u>three</u> Milestone III exercises to obtain production

go-ahead for lot procurement. The maturity of the Project Weapon System is an important factor in establishing a balanced T&E process.

Milestone Acquisition?

Considering the new acquisition milestone procurement process, and its impact on the methods of T&E in the Navy that existed prior to 1970, the next subject centered on improvements to the DT&E process. An Initial Operational Capability (IOC) date had been slipped, which is not uncommon, but definitely recommended in directives governing the acquisition process. The Project Manager stopped and "fixed it" when OPEVAL discovered that a changing threat would require adaptation of circuitry, before OPEVAL could go on to achieve a production go-ahead. We are getting better DT&E evaluations but with the same amount of testing, even less testing, constrained by funding. More comprehensive test planning as the source of better test and data collection for the dollar. Another major fact is that "then" we used to do "black box" testing, and now it is full systems testing. A vast change, in that detailed flight test planning is mandatory to maximize the flight test period, and get some data even if partial system failure occurs. One Project Manager is facing the T&E "GAP" (to be discussed in a later section) and "that impact means a great deal of sustaining funding to a contractor, to wait for as long as two years after production go-ahead, to deliver the first article". It means a break in the production line, and that could cause the entire project to be cancelled. The less-than major, project manager is extremely vulnerable to the DOD 5000.1 methodology which created the T&E "gap". He can be forced into the "Gap" when his funding is deferred for reprogramming to the major project in trouble, and politically sensitive. Here limited

production go-ahead is mandatory to get through the "Gap", to prevent excessive sustaining contractor costs.

OT&E Impact?

The impact on DT&E by OT&E emphasis is another controversial issue which produced varied results. No one likes OPTEVFOR looking over their shoulder all the time, but it is a fact of life. In those projects that are in their infancy, the COMOPTEVFOR desire to have DT&E conceived with the OT&E future requirements in mind, ie. to look more like OT&E can be accomodated and areas of conflict ironed out in the formative stage. COMOPTEVFOR has even agreed to share data and strive for combined testing by mutual agreement, not to revisit certain areas where DT&E will be conducted, thus providing the data for OPEVAL. This is a great step in the right direction to reduce redundant testing, and thereby the cost to the Project Manager. Specifically, the number of test articles was reduced 60% in one project, when highly successful DT&E results forced use of that data for OT&E evaluation. On the other hand, COMOPTEVFOR tests to the "now" threat when the system was designed to the "then" threat. Inevitably, it ends up in the COMOPTEVFOR report as not meeting "the" threat.

Sufficiency of DT&E?

Adequate DT&E is performed for NAVAIR Weapons Systems, however software testing is not defined properly; "there just isn't a good understanding of what is involved in delivering a "fully capable" operational software tape". Software OPEVAL does not apply to "this" weapon system.

Cost of DT&E?

DT&E does cost too much in the minds of all project managers interviewed, but to put this idea in perspective, "the cost is about 10% too much not 50%." "Our overhaul cost are too high", and "we need someone to help us get more for our testing dollar." The cost of DT&E is the "nature of the beast", but "we were able to cut cost by captive-carry flight testing" for missiles." There seems to be a lack of direction so the project manager "does the best he can" with the dollars he is able to keep in the budget. Some solutions include "front-end loading "the T&E process, but Congress doesn't want to put that much money into the front to save as much as six or seven times the initial cost," in the later stages of development. Since the early design stage is the phase most critical to all else that follows in a project, "we should do a better job of specification tailoring and put more time into planning for the initial contracting effort, before that first Request for Proposal (RFP) is released and the first contract negotiations commence. A treatise on cost of testing could in itself be the subject of a study project, but for the sake of this paper, cost has to be considered as more than an equal critical driving force in the acquisition process.

Combined Testing?

It would appear that combined testing to some Project Managers is realistic, but to the majority, it is not. The definition of what constitutes combined testing is left to the interpreter, and there is no "DOD" definition for guidance, however, concurrent testing is to be avoided, and combined testing contemplated only in special case situations,

with careful segregation to retain independent OT&E. Obviously, a cost savings could result, but NAVAIR is doing very little combined testing on their projects. Combined testing is not realistic when one considers the philosophy of DT&E, and the constraints to obtain test data by careful detail test planning to "get the most out of the test dollar", ie. the desire to get useful and necessary "valid" test data even with partial systems failure. OT&E requirement for full systems capability is the dichotomy. Further discussion can be found in the other sections.

Emphasized OT&E - Better DT&E?

For about seven years now, NAVAIR has operated under the influence of increased emphasis on OT&E. The attention focused by all DSARC reviews, and political pressures from all sources, cannot but cause improved DT&E. "You can't avoid the subject," although one may be concerned with what could be termed more critical aspects or areas for concentration in the Weapon System Acquisition Process. T&E is a high cost driver and demands critical attention at the earliest point in project design and development. New ways to test may be needed for the evolving technology, but will go unnoticed until too late for correction, when a Project Manager "trades-off" adequate T&E planning. "We have formalized our methodology" and do more "contingency planning" as a result of this influence.

Approach to DT&E?

NAVAIR Project Managers agree that a change must take place in "How we presently approach Development Test and Evaluation." Hardware testing has been and will continue to be "rigid", but we need "new concepts" to approach the software testing, which is becoming more and more critical,

as imbedded computers manage the subsystems employment in the operational scenario. Software programs have to be "grown", and that usually takes more time and test effort for "debug" to finalize each module, and deliver an "operational" program. Reliability and maintainability are important concepts to "inject" at the earlist possible point in design of any weapon system. But particularly, reliability is the parameter that will in the end, "make or break" the project. With early stress and the attendant funding necessary to design for more reliability, an "earlier laboratory demonstration" can be scheduled, which gives NAVAIR an "earlier look" at each component. Mean-Time-Between-Failure is the measure of reliability, but historically what "we design for", even with successful laboratory demonstration of design criteria, is never what "we achieve in the operational world." Reliability "has to be designed in up front," for it is too late to test for reliability in the stage when an integrated prototype has been built.

Milestone "0" and Zero Base Budgeting?

Milestone Zero was instituted by DOD Instruction 5000.1, January 18, 1977 and it has been stated that the need for this additional milestone was to prevent too many programs from progressing to Milestone III, and because they are not "truly" ready for a full production go-ahead, the resultant was a progression of additional milestones, ie. III A,B,C etc., to sustain the production line and deliver weapon systems to the user. The Mission Element Need Statement (MENS) that is required to be prepared by the component for submission at Milestone"0", will hopefully help to prevent the wrong or mission "enhancing" project from the start. Coupled with the Presidents direction for Zero Base Budgeting (ZBB), which requires

identification and a prioritization of necessary future weapon systems matched to funding constraints, the two concepts should prevent buying systems that we don't need or that do not meet the threat. But what effect can this have on DT&E? In the early phase, ie. Basic Research and Exploratory Development, "ZBB is a way of life," "we have been doing it all along," in fact, "you might say DT&E is ZBB." Comprehensive T&E planning will negate any effect on DT&E. "ZBB will force exposure of those programs that get past milestone "O"." Milestone "O" will cause "better requirements definition where they do not exist." Many Navy projects just don't have an Operational Requirement (OR) document, or a very inadequate one in some cases. Detailed requirements are left to be presented in subsequent documents, which causes subjective interpretation and departure down the wrong road. Hopefully the MENS will require that operational requirements are clearly defined and will therefore permit better criteria for DT&E requirements.

Control of DT&E?

The Project Manager has to have control of DT&E. Some schools of thought consider the creation of a new T&E Czar who would control all Service T&E, and the budget to go with it. In fact, there is a Government Accounting Office (GAO) study which entertains such an idea, and even considers breaking it away from the Services. It is this authors opinion that such action should not take place. The creation of another "layer" of control cannot be cost effective and would most likely not survive present Executive Administration scrutiny. To be specific in the definition of control of DT&E consider the "golden rule" that he who controls the "gold" makes the "rules", and that would be the Project

Manager, but truly in the end analyses, it is the Congress.

COMOPTEVFOR Independence and Contributions?

Since OPTEVFOR was established it has been an independent test organization. Their charter and position established by CNO, support this issue. Some Project Managers wish they were not "so" independent since there is a high cost directly attributed to this factor, and it impacts the whole DT&E process. Once the OT&E approach is established by COMOPTEVFOR and testing philosophy is digested, DT&E has to be planned and performed to "Counter balance" OT&E. The OT&E or OPEVAL reports are a significant lever to hold over the Project Manager as he conducts his DT&E plan, but it is this OPEVAL report that causes most "heartache" for the Project Manager. Those in the Navy, especially Project Managers who have been in OPTEVFOR jobs, or are familiar with OPTEVFOR reporting, find little trouble in the interpretation of the data presented. They usually know how to counter, if necessary, with DT&E hard technical data support, but find little resource countering on "outside the Navy" source who use OT&E reporting for their own political position, or just do not have a full understanding of what the intended purpose of the reporting represents. In the case of the former, OPTEVFOR contributes to the DT&E process in a positive manner, but for the latter it is all negative. The Project Manager must become, or be made aware of the impact any COMOPTEVFOR report will have on his project.

TEMP Usefulness?

The variance of attitudes on the subject of a TEMP, and the measure of its use or application is of considerable interest. There are few projects that were conceived under the new Milestone Procurement concept

that have been completed; many others were started prior to the implementation date of DOD instruction 5000.1, which in their later stages were administered using its precepts; and fewer less that have been subjected to the Navy emphasis on TEMP requirements. "Why do I need a TEMP for this project when the production line will be closed next March?" "When the only testing to be done is Follow-On Test and Evaluation (FOT&E). COMOPTEVFOR should prepare the TEMP." "Who needs one more historical planning document" when we describe T&E in all budget documents, and in the Decision Coordination Paper (DCP), which is the key briefing document for Defense System Acquisition Review Council (DSARC) decision making at each major milestone. "I used the TEMP as an integral part of the Request for Quote (RFQ)." It defined all the necessary testing "we could identify at this time, " and shows the responding contractors the scope of testing that the government will require. "I am sure we would not have considered that a second set of support equipment would be required." "The additional cost, and potential time lost in the testing process, will more than pay for the TEMP effort." "I can use the TEMP to set Project office policy on T&E and resolve areas of conflict with COMOPTEVFOR early in the process." The TEMP becomes a contract between the Developing Agency (DA) and COMOPTEVFOR, when the various differences are negotiated in the formative stages, then it requires COMOPTEVFOR adherence once CNO approval is obtained. Project design problems cannot be designed out by the TEMP, but formal agreements of test plans can be achieved.

OP-983/OPTEVFOR Comments

Time did not permit a trip to OPTEVFOR, therefore, OP-983 personnel

were interviewed to obtain data relevant to this project. A question bank was prepared as provided in Appendix A.

The interplay between Project Managers and OPTEVFOR personnel is "personality oriented," ie. the "strong beget the strong," and the limelight projects not only get the attention, but are protected when critical issues center on their existence and survival. "We don't hear about or get very much involved in those projects with few problems." The Budget process, Five Year Defense Plan (FYDP), and Program Operating Memorandum (POM) are "out of phase" with Milestone Procurement. Project Managers just cannot meet the "windows," but DOD allows about "10%" when the DSARC process requires DCP staffing for test results. The "line must be kept open" as the alternative price to be paid for sustaining a contractor to sit idle through the "Gap" is not acceptable, especially when the risks have been satisfied to an acceptable measure. The question stands out! Just what does it take to obtain a production go-ahead at Milestone III? The answer can be found only in a unique set of rationale for each project when the decision day arrives. Historical information and lessons learned only serves the avoidance side of a Project Managers approach; the balance must be comprised of his ability, talents, and if one might accept, his charisma for the "given" decision scenario.

A balance of DT&E and OT&E is achieved by "each side pulling in their own direction," and sometimes OT&E "comes up short" because OPEVAL occurs at the end of a program, which is due to OT&E phase III being cut short, while awaiting fixes from DT&E phase III. Balance can also be achieved through the process of preparing, changing, and obtaining approval of the TEMP. At this time, considering that OPNAV Instruction 3960.10 has

directed implementation to have been accomplished for all projects cited for compliance, only 60 TEMP's are "in-hand", as recognized by OP-983. The TEMP is a "historical" not a working document.

Combined testing can be cost effective, but concurrency should be avoided. Once again there seems to be a semantics problem and lack of definition, when we discuss "data sharing", and how the data should flow DT&E to OT&E, but this sharing of data, at this juncture, is a one-way flow. One project, the F-18, does have a combined test team, and the planning to accomodate later decisions. The approach is encouraging, but only an effective cost tracking system will prove the merits of their results. Overtesting, like combined testing is an over-used term, but as viewed from this source, sometimes "we do too much, and at other times too little." The analyses is just too subjective to be of value, however when considering a fixed system introduction date, coupled with the removal of critical funds, the result is obvious.

SECTION VI

CONCLUSIONS

1. DT&E and OT&E within the Naval Air Systems Command is a "balanced" process with an organizational structure that satisfies DOD direction. Each Navy agency has its directed and useful function. Various studies have been conducted, to reduce, combine, or eliminate these agencies in an effort to eliminate "overtesting". No better way of doing business has resulted when the trade-off and impact is truly understood. Dr. Eugene G. Fubini of the Task Force on Test and Evaluation, Defense Science Board, reported to DDR&E 17 February 1977 (also the Fubini Report) that:

> The System serves the evaluation function adequately by providing a solid basis for a decision to proceed when the test results are generally satisfactory.
>
> There appears to be little or no overtesting done under the directives; what testing is done contributes its full value to the improvement and verification of system performance.

The process of developing a TEMP for NAVAIR projects, provides the basic "tool" to ensure a balanced T&E effort, and if commenced at the earliest appropriate time, will reduce the impact and cost growth.

2. NAVAIR Project Managers adhere to the Milestone Procurement concept, which in reality has not changed the Navy T&E methodology that was in effect prior to 1970. Improved DT&E has resulted for the testing "dollars" that are available. If he is an outstanding manager and planner he will obtain the significant DT&E test results to match the OT&E report, and give the DSARC the necessary decision making criteria for a Production Decision, and thereby approval for Service Use. If he is shy in his test

results, depending on the degree of remaining risk and OPEVAL report, he should come away with at least a limited production decision to meet long lead previous Navy budget (FYDP and POM) submissions. If he can achieve neither of these, he is the wrong man for the job and will surely be replaced as soon as possible.

3. The "Fubini Report" identified the T&E "gap" that can develop between the end of DT&E/OT&E (or TECHEVAL/OPEVAL), and the beginning of FOT&E, and which lasts about two years. "The time lost in the maturing of the production system, and the cost to the contractor and the government from stopping of hardware construction activities, as the program moves from R&D to production, are highly undesireable." (16:14) "The so called Test and Evaluation continues to exist." (15:7) The alternatives to avoid this "gap" are:

> 1. Plan at the start of engineering development for additional phase of testing to cover the T&E gap.
>
> 2. Early in the DT&E effort, defend long lead time production funding and seek production funds for low rate pilot production.
>
> 3. Simply allow the gap to exist, which may be preferred when the effort to reduce the gap would require commitment to a very large percentage... of the expected program cost before T&E assurance of a successful product could be obtained. (15:10)

4. The cost of Test and Evaluation is excessive and there is room to cut costs by whatever means that can be identified, but not to detract from the main purpose of DT&E and OT&E. Specification tailoring, and initial contract planning are significant methods to develop realistic design to cost concepts, but should be implemented before the first request for proposal leaves the project office. A satisfactory cost accounting system to permit an audit trail for test costs, does not exist.

Cost Schedule Control System Criteria (CSCSC) is imposed on all contractors for weapon system in the major category, and those specially selected by DOD. Some fall out of CSCSC is filtering down to some government agencies, but not throughout DOD. Navy Industrial Funding (NIF) is a step toward defining total cost at test activities, but no "audit trail" and only limited documentation is available.

5. Combined testing when well planned, structured, and coordinated, with common data sharing based on responsibility for data collection assignment, will drive the cost of testing down. The concept of TECHEVAL followed by OPEVAL must be retained in tact to retain the independent test activity concept. The TEMP provides the key to prevent concurrency when a combined testing approach is selected. Combined testing within the project is not deemed realistic by Project Managers, however, when different projects can combine their test schedules to utilize shared resources a distinct cost saving will result, eg., in the Anti-Submarine warfare test scenario, the same target submarine could be used.

6. A change has to take place in the NAVAIR approach to DT&E, in fact, certain changes are in progress. NAVAIR started a campaign two years ago to stress reliability and maintainability for designated projects. Adequate funding is usually lacking when it is most needed, ie. in the front end of the design effort. Congress does not seem to realize the merit of "front-end" funding highly technical weapon systems projects, and is only concerned with "this" year dollars. With the paucity of funds, NAVAIR performs Reliability Laboratory Demonstrations early in the development phase. Early reliability testing for validation pro-

vides the operational availability and reduces Operating and Support cost, and in turn life cycle costs. DDR&E emphasized these issues in his statement to Congress that:

> ...early T&E provides an indication of technical risk and potential operational value of a system prior to commitment of large amount of R&D funds.
>
> ...provides the basis for choosing from among competing technical approaches those which offer the greatest promise if further developed. (13:X-4)
>
> Reliability testing is another area of principal current emphasis.
>
> We are requiring Program Managers to specify, prior to the start of engineering development, interim reliability thresholds which must be attained before further advancement of a system through the acquisition cycle. (13:X-5)
>
> ...*purpose is to develop procedures* which will provide necessary incentive at the very start of a program for attainment of satisfactory field reliability. A prime example is the F-18 fighter program. (13:X-6)

7. Software testing is causing a stretch-out in the DT&E process which requires new concepts and understanding. Hardware test are rigid but software has to grow and testing has to change.

8. The Milestone Zero requirement for a MENS will force better Operational Requirements (OR) definition.

9. The control of DT&E has to remain in the hands of the Project Manager, and Developing Agency. The Project Manager does not tell the test agencies how to test, therefore, the test agencies control the actual conduct of DT&E and provide check and balance on design specifications.

10. OPTEVFOR has been an independent test agency since it was established and will continue as chartered. OPTEVFOR reports have not been timely, are quite often too qualitative or subjective in content

and sometimes cause unnecessary "fire-drills." The "Fubini Report" provides the following information:

> ...major systems decisions are judgements based on a wide range of qualitative considerations, rather than on statistical compilations, and the limitations and outcomes of the operational tests must be comprehensive and meaningful to the decision makers as well as the testing community. (16:75)

11. The TEMP is heavily emphasized in the Navy. It is a useful control document that DDR&E considers an "important tool" in conducting DSARC reviews, "a significant benefit...is early establishment of a close working relationship between the development and T&E agencies." (13:X-4). Most NAVAIR projects respond to the TEMP requirement due to establishment of and emphasis stressed by AIR-06. The TEMP becomes a contract between DT&E and OT&E parties once the test requirements are negotiated. CNO approval of a TEMP is as directed by appropriate instructions. Preparation of a TEMP for new projects can help to identify resources that may be overlooked without early preparation.

12. OPTEVFOR requires production systems for OPEVAL. Project Managers need OPEVAL to get a go-ahead for production. Limited production prototypes are therefore the only test articles available.

13. The Budget cycle and Milestone Procurement process are inconsistant, which prevents the accomplishment of adequate T&E of potential weapon systems.

SECTION VII

RECOMMENDATIONS

1. An important aspect of the potential to recognize a reduction in the amount of T&E, and thereby reduce overtesting, duplicative, or redundant T&E to a minimum, is valid data sharing. *DT&E and OT&E* data, including validated contractor T&E documented data, must be accepted and shared throughout the T&E process. Early identification of necessary data for future evaluation should be accomplished in the early design phase, and responsibility assigned for collection as mutually agreed to by DT&E, OT&E, BIS, and the contractor hierarchy.

2. The DSARC should continue to support the need for long lead funding to reduce the T&E gap when technical risk is reasonable, and operational requirements can be met.

3. A "Design to Test" concept should be generated within DOD and particularly within NAVAIR, for imposition of CSCSC on NAVAIR field activities, and also the laboratories who conduct NAVAIR sponsored work. CSCSC can be integrated with NIF, however those activities such as the laboratories should also be brought under NIF requirements, rather than present methods of fund accounting.

4. Project Managers should devise effective methods to obtain as much funding, as is humanly possible, early in the project design phase, where 70% of the project cost is frozen in the conceptual phase of development.

5. The NAVAIR Assistant Commander for Test and Evaluation (AIR-06) charter and functions should be emphasized to ensure proper test-tasking

assignments to the field activities who can provide more cost effective management without degradation of DT&E.

6. Test resources should be shared by DT&E and OT&E communities whenever the opportunity permits. Back-up flights should be scheduled.

7. Combined Testing should be encouraged and persued by Project Managers in all new projects, with test requirements and resources adequately defined in the TEMP.

8. COMOPTEVFOR should establish a policy of conducting more evaluation effort rather than test effort, based on data sharing, and acceptance of documented valid DT&E test data that is applicable to OT&E. A role of participate and monitor should be employed until the project weapon system is ready for OPEVAL. Crew sharing arrangements should be established with responsible assignments and test vehicles could be transferred from DT&E to OT&E activities when the system is representative of OPEVAL Configuration.

9. Somehow Project Managers have to "lobby" for more funding for design, in the conceptual stage, and validate the requirement to build the reliability up front where it is needed.

10. Software testing and its effect on a go/no go-ahead for production decision should be split into two categories. One that produces acceptable software programs that match the operation of the hardware that is proven and acceptable for go-ahead, and the second category which updates the "operational employment" of subsystems, which may be enhancements and need additional time to mature. Two ASU decisions could be conceived, one coupled to the hardware and the second to an

improved software effort.

11. No new or additional top-level T&E agency should be established.

12. COMOPTEVFOR should provide more timely reports for decision making. A quick look message report is almost mandatory when one considers the disparity of the budget cycle and Milestone Procurement process.

13. Better communication has to be developed between the Project Manager and OPTEVFOR to prevent surprises.

14. The OPTEVFOR report should describe how the weapon system countered the "then" threat, in perspective to how it can perform against the "now" threat.

15. DDT&E should continue to emphasize the requirement for a TEMP for DSARC I and subsequent milestones.

16. Project Managers should draft a TEMP and make it a part of the RFQ, RFP, and Contract. If not approved, the intent of a TEMP should be included in these documents.

17. COMOPTEVFOR should not accept any system for OPEVAL that is not representative of the production article.

18. COMOPTEVFOR should man the squadrons with pure operational personnel, rather than accept Aeronautical Engineering Duty Office (AEDO) personnel in the structure. Their tendency is to revert to the technical training that they have received, and develop test techniques beyond the needs of OPEVAL. Former Project Managers should be assigned billets at the Staff 0-6 level.

19. Project Managers and other DOD officials must convince the Congress that more funding is necessary early in the design phase of each project, and that necessary funding for T&E is available, when it is required, to transition through critical phases of development.

APPENDIX A

Interview Questions for Project Manager:

1. Is there a balance of DT&E and OT&E in NAVAIR projects?
2. Are we doing business any differently than before Milestone Acquisition was imposed?
3. Is there an impact on DT&E by OT&E emphasis?
4. Do we do adequate DT&E?
5. Are we paying too much for DT&E?
6. Can we reduce the cost of DT&E? By what means?
7. Is combined DT&E and OT&E a realistic approach?
8. Do you realize any additional cost in combined testing?
9. Has emphasized OTE improved the DT&E methodology?
10. Should our present approach to DT&E be changed?
11. What effect will Milestone "0" have on DT&E?
12. Will "0" base budgeting affect DT&E?
13. Who should have control of DT&E? Who does?
14. Do you feel OPTEVFOR is an independent Test Agency?
15. When OPTEVFOR performs OTE do they contribute plus or minus factors?
16. Is the TEMP a useful management tool or is it just required? What effect does it have on cost, schedule, and performance?

Interview Questions For OPTEVFOR/OP-983 Personnel:

1. Is there a balance of DT&E and OT&E in NAVAIR Weapon Systems Acquisition?
2. How would you describe the present PMA/OPTEVFOR relationship?
3. Do any significant interface problems exist?

4. Is the current Navy Instruction 3960.10 adequate to meet the requirements for T&E?

5. In your opinion, is combined testing a reasonable approach? Are we over testing in either the Developmental or Operational environment?

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