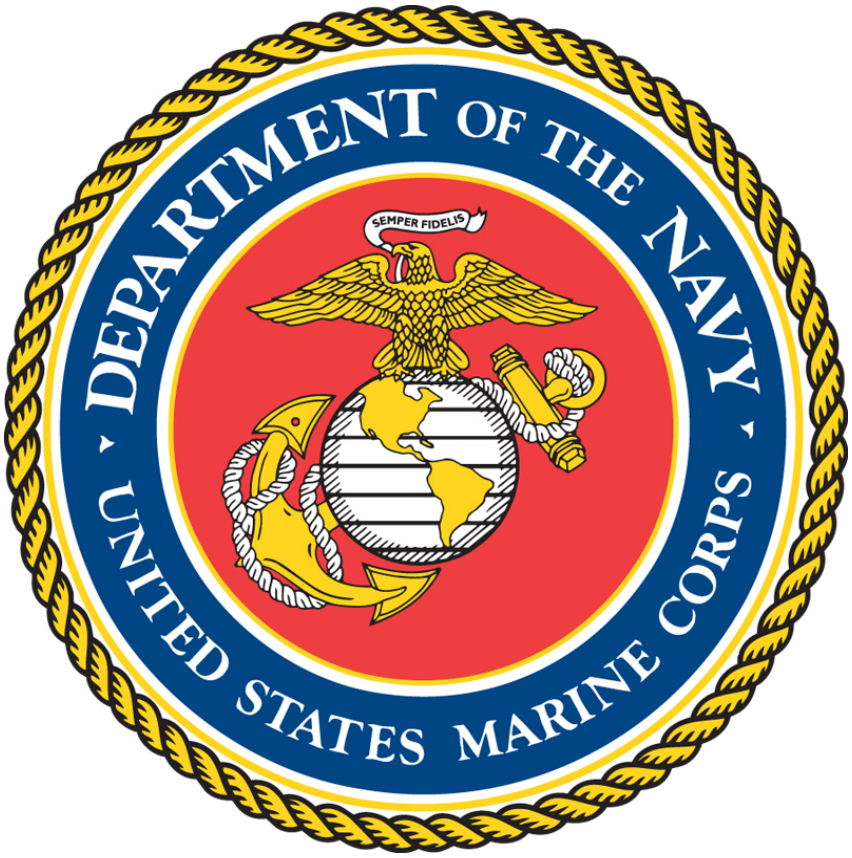
UNITED STATES MARINE CORPS



INTEGRATED TEST AND EVALUATION HANDBOOK

06 May 2010

MEMORANDUM

From: Deputy Commandant for Capabilities Development and Integration, Marine Corps Combat Development Command
Commander, Marine Corps Systems Command
Program Executive Officer Land Systems
Director, Marine Corps Operational Test and Evaluation Activity

To: Users of this Handbook

Subj: U.S. MARINE CORPS INTEGRATED TEST AND EVALUATION HANDBOOK

Ref: (a) DOD Directive 5000.01, The Defense Acquisition System
(b) DOD Instruction 5000.02, Operation of the Defense Acquisition System
(c) SECNAVINST 5000.2E, Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System
(d) U.S. Marine Corps Developmental Test and Evaluation Handbook

1. This Handbook, the "U.S. Marine Corps Integrated Test and Evaluation Handbook", provides essential guidance and direction for members of the U.S. Marine Corps combat development, acquisition and operational test communities who are directly concerned with the research, development, acquisition and life-cycle support of weapons and automated information systems.

2. This first edition constitutes the Marine Corps implementation of Department of Defense (DOD) policy to integrate developmental and operational test and evaluation activities in a broad process format, as required by references (a), (b) and (c). The intent is to define an overarching T&E process that dovetails smoothly with the individual organizational processes articulated in the annexes to this handbook.

3. Key to a successful test and evaluation (T&E) program is the establishment of the T&E Working Integrated Product Team (T&E WIPT). The T&E WIPT should tailor the procedures articulated in this handbook to the structure and complexity of each of their specific program.

Deviations from the fundamental policies set forth herein (e.g., the requirement for a Test and Evaluation Master Plan, etc.) shall be requested in writing to the responsible agency.

4. This handbook will pace itself with the dynamics of the evolutionary DOD acquisition community. It will therefore be changed when necessary to reflect evolving policies and organizational growth. This first edition of the U.S. Marine Corps Integrated Test and Evaluation Handbook awaits you – the user.

5. It is recommended that, after a first reading, PMs and POs read the appropriate section of this manual *before* starting the corresponding phase of program development.

6. This handbook supersedes reference (d).

Deputy Commandant
Capability Development and Integration
Marine Corps Combat Development Command

Commander
Marine Corps Systems Command

Program Executive Officer
Land Systems Marine Corps

Director
Marine Corps Operational Test and
Evaluation Activity

PREFACE

Approximately nine years ago MCCDC, MCSC and MCOTEA, prepared and distributed the "Developmental Test and Evaluation Handbook", providing a process to ensure that systems presented to MCOTEA are judged ready for operational testing.

The Integrated Test and Evaluation IPT was chartered to update the "Developmental Test and Evaluation Handbook" and incorporate current DOD acquisition and test and evaluation policy.

The objective of this handbook is to ensure an efficient and effective integrated test and evaluation program that reduces cost and improves system performance and reliability.

As in the current process, representatives from each command and stakeholder organization are brought together as a team identified as the T&E WIPT. However, much more emphasis is placed on the responsibilities of the T&E WIPT to effectively plan and manage the efforts of the combat developer, materiel developer, and independent operational tester/evaluator from the beginning of the program.

This handbook has been developed through the combined efforts of MCCDC, MCSC and MCOTEA. It is provided as a guide for Marine Corps personnel to implement DOD policy in executing integrated test and evaluation.

Address inquiries regarding this handbook to:

> Deputy Commander for Systems Engineering, Interoperability, Architecture and Technology
> Marine Corps Systems Command
> Quantico, VA 22134-5010

Any changes to this handbook will be coordinated by MCSC (DC, SIAT) with PEO LS, MCCDC and MCOTEA.

REVISION HISTORY

Change Number	Date of Change	Date Entered	Person Entering Change	Summary of change
V1.0				Baseline approved document
V1.1	3/15/2010	3/15/2010	MCSC, Director, SE&T	DT&E policy and procedure updates since baseline staffing.
V1.2	4/30/2010	4/30/2010	MCSC Director SIAT	SECNAVINST language regarding OTRR.

Contents

1 Vision and Implementation Concepts

1.1 Test and Evaluation (T&E)

As stated in Department of Defense Directive (DODD) 5000.01, *The Defense Acquisition System*:

> *"Test and evaluation shall be integrated throughout the defense acquisition process. Test and evaluation shall be structured to provide essential information to decision makers, assess attainment of technical performance parameters, and determine whether systems are operationally effective, suitable, survivable, and safe for intended use. The conduct of test and evaluation… shall facilitate learning, assess technology maturity and interoperability, facilitate integration into fielded forces, and confirm performance against documented capability needs and adversary capabilities as described in the system threat assessment."*

During the early phases of acquisition, the test community must be involved to help demonstrate the feasibility of conceptual approaches, evaluate design risks, identify design alternatives, compare and analyze tradeoffs, and assess testability of operational requirements. Developmental Test and Evaluation (DT&E) is concerned with attainment of engineering design goals and assessing system development to attain operational capabilities. Operational Test and Evaluation (OT&E) focuses on operational effectiveness, suitability, and survivability as well as assessment of mission capabilities. The iterative process of testing moves gradually from a concentration on DT&E, to increasingly comprehensive OT&E as a system undergoes design and development. Although these have historically been separate events, DT&E and OT&E should be integrated in the development of a weapon system.

1.1.1 Scope

This handbook provides guidelines to implement a set of standardized United States Marine Corps (USMC) procedures, which incorporate best practices, for T&E utilizing an Integrated Product Team (IPT) approach. This handbook will help IPT stakeholders plan and execute a T&E strategy ensuring systems developed by the Marine Corps meet operational requirements. Where appropriate, the handbook discusses procedures applicable to joint programs as well as programs managed by other services.

The T&E process is extremely complex because its interfaces with all other aspects of the acquisition process. To assist the T&E Working-level IPT (T&E WIPT) in deciphering this complex process, the handbook identifies other references that address specific topics in greater detail. Annexes or links to SharePoint sites (e.g., Marine Knowledge Online) are also provided to describe Marine Corps Combat Development Command (MCCDC), Marine Corps Systems Command (MCSC) and Marine Corps Operational Test and Evaluation Activity (MCOTEA) specific processes and procedures.

1.1.2 Definition

While the terms "test" and "evaluation" are most often found together, they actually denote clearly distinguishable functions in the Research, Development, Test and Evaluation process. "Test" denotes the actual testing of hardware/software – models, prototypes, production equipment, and computer programs – to obtain quantitative and qualitative data relevant to developing new capabilities, managing the process, or making decisions on the allocation of resources. A test represents an event or series of events. "Evaluation" denotes the *process* whereby data are logically assembled, analyzed, and compared with expected performance to aid in making systematic decisions.

1.1.3 Purpose

The fundamental purpose of T&E is to provide knowledge to assist in managing the risks involved in developing, producing, operating, sustaining systems and capabilities. T&E provides knowledge of system capabilities and limitations to the acquisition community for use in improving the system performance, and the user community for optimizing system use in operations. T&E enables the acquisition community to learn about technical and operational capabilities and limitations of the system under development, allowing the opportunity to resolve the limitations prior to production and deployment.

1.2 Organizational Responsibilities

This handbook has been developed through combined efforts of MCSC, PEO LS, MCCDC, and MCOTEA as a guide for Marine Corps personnel involved in T&E. The organizational responsibilities of capabilities development, acquisition management and T&E are collectively known as the "Triad". This handbook will help stakeholders plan and execute an effective and efficient T&E strategy that ensures systems developed by the Marine Corps meet operational requirements.

1.2.1 MCCDC

The mission of MCCDC is to develop fully integrated Marine Corps warfighting capabilities; including doctrine, organization, training and education, materiel, leadership, personnel, and facilities (DOTMLPF), to enable the Marine Corps to field combat-ready forces. CG, MCCDC is also the Deputy Commandant, Capability Development and Integration (DC, CD&I) charged with leading the integration of USMC warfighting capabilities and is the Marine Air-Ground Task Force (MAGTF) Integrator with the authority and responsibility to conduct Capabilities Based Planning (CBP).

Additionally, within TECOM, MAGTF Training Simulations Division provides the same functions as MCCDC (capability developer, resource sponsor) for all non-standard virtual and constructive training capabilities and as such, coordinates closely with Program Manager, Training Systems in supporting the acquisition process.

1.2.1.1 Capabilities Development Directorate

The Capabilities Development Directorate supports DC, CD&I. The directorate develops and integrates warfighting capabilities solutions, leads the capabilities planning process using the

Expeditionary Force Development System (EFDS) in consonance with the Joint Capabilities Integration and Development System (JCIDS). In consideration of overarching national strategic and service guidance and concepts development, the directorate will conduct analysis across the complete spectrum of DOTMLPF. The directorate provides subject matter experts in the areas depicted in Figure 1.1. The Capabilities Development Directorate shall develop the Concept of Operations (CONOPS, if applicable), Concept of Employment (COE), Operational Mode Summary/Mission Profiles, Mission Essential functions, and Failure Definition / Scoring Criteria for proposed non-Automated Information Systems (AISs) and interoperability and standards requirements for JCIDS documents.

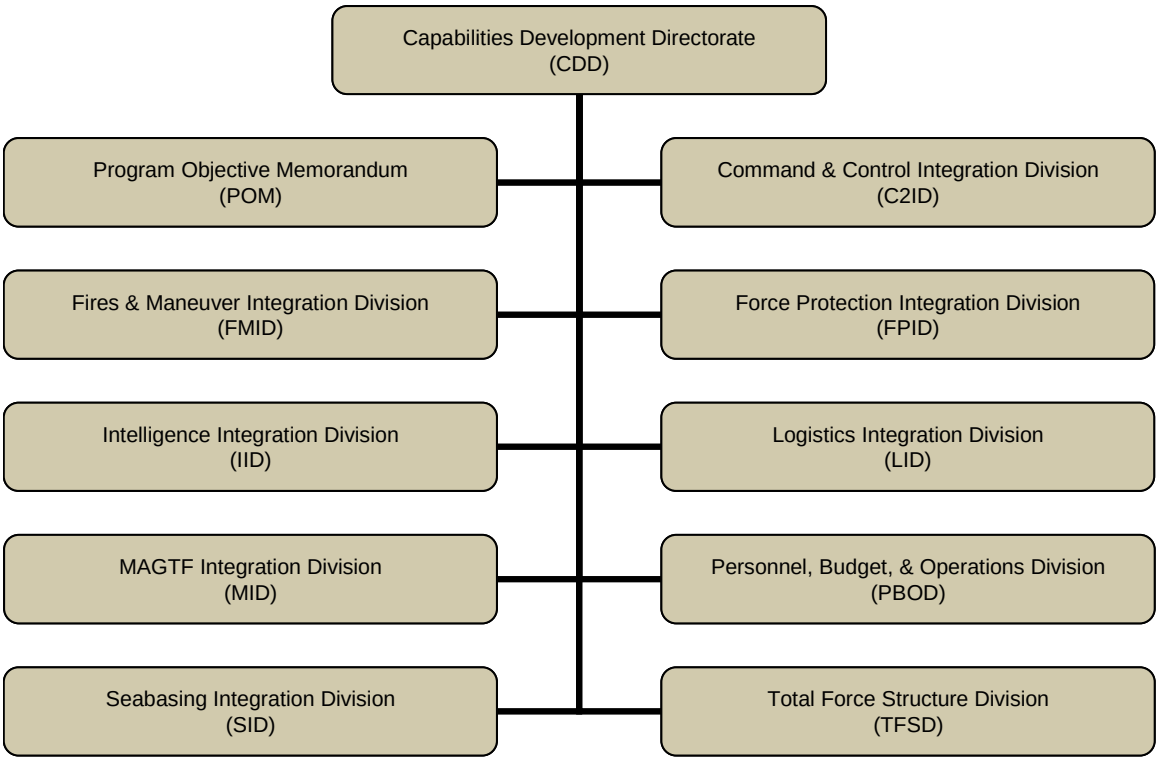


Figure 1.1 – Capabilities Development Directorate

1.2.2 MCSC and Program Executive Office – Land Systems (PEO-LS)

MCSC and PEO-LS are the Marine Corps materiel developing agents (hereinafter referred to as Acquisition Leads) and directly interface with the Navy Systems Commands. Per SECNAVINST 5000.2E and as Technical Authority, the Commander, MCSC develops and implements policies, procedures, and requirements for DT&E of all systems acquired by the Marine Corps. These policies are also applicable to programs managed by PEO-LS. The developing agents shall budget for DT&E and OT&E and provide oversight of programming activities related to T&E. Additionally, MCSC will ensure T&E activities directly support Commandant of the Marine Corps (CMC) responsibilities for sustained material readiness and

mission capability of the Marine operating forces. The Acquisition Lead shall coordinate the scheduling of resources for DT requiring support from the Marine operating forces through the Two Year Master Test Plan (TYMTP) published annually with quarterly updates and the Marine Forces Command (MARFORCOM)-sponsored Force Synchronization Conference (FSC).

1.2.3 MCOTEA

MCOTEA is the Marine Corps independent Operational Test Agency (OTA). MCOTEA shall ensure that OT for all Acquisition Category (ACAT) programs is effectively planned, conducted, evaluated, and reported. MCOTEA shall coordinate the scheduling of resources for OT requiring support from the Marine operating forces through the TYMTP and the MARFORCOM-sponsored FSC.

MCOTEA chairs and conducts an Operational Test Readiness Board (OTRB) to determine readiness of the resources required to proceed with OT&E. Director, MCOTEA, shall prepare and provide directly to the Assistant Commandant of the Marine Corps (ACMC), within 90 days after completion of OT&E, an independent evaluation report for all OT&E. When significant capability shortfalls are observed or a system fails to meet suitability/effectiveness requirements, the Director, MCOTEA, shall advise the Milestone Decision Authority (MDA) of risk associated in the procurement and fielding decisions.

1.2.4 Collaboration within the Triad

In order to ensure successful program execution, early and continuous communication between capabilities development, the acquisition community, and the T&E community is essential. The method to do this is through IPTs. There are generally two levels of IPTs: Overarching IPTs (OIPTs) and Working IPTs (WIPTs). OIPTs are established to evaluate the overall program prior to a milestone or formal Program Review, to address issues that may impact milestone or program review decisions, and to facilitate program communications among major stakeholders. WIPTs are formed to address issues and needs in a specific functional/topic area or to address integration of all program functions/products. WIPTs may utilize working level staff, managers at various levels, and program support personnel.

Figure 1.2 provides an overarching view of the collaboration that takes place within the acquisition Triad, specifically major "muscle movements" of the three organizations, and the input/outputs specific to the USMC acquisition process. Given that funding has been identified in the Planning, Programming, Budgeting, and Execution process, there are three key processes in the Department of Defense that must work in conjunction with each other to deliver the capabilities required by the warfighter: the requirements process which identifies the capability need; the acquisition process which provides the means to fill the approved need; and the T&E process that verifies the need has been met.

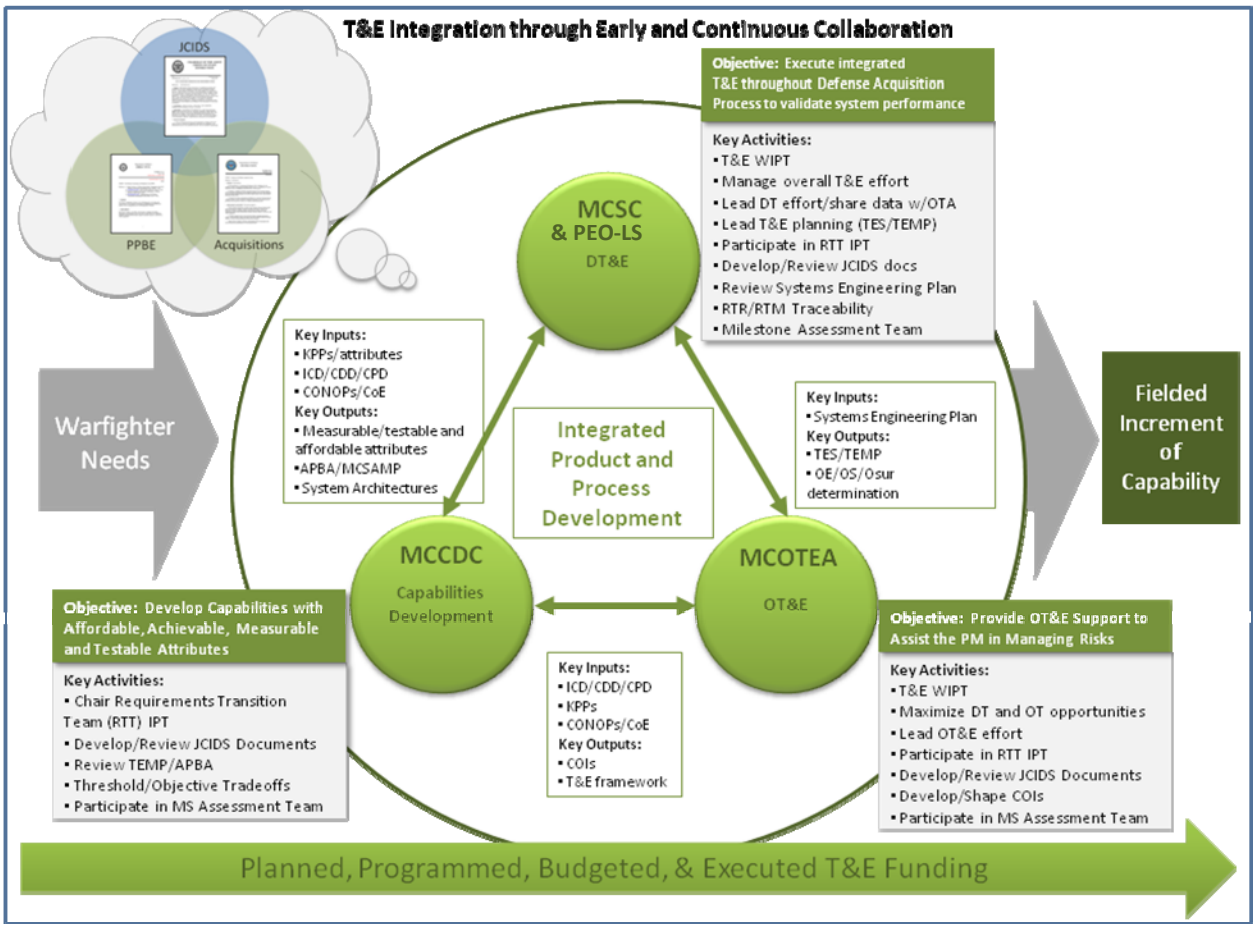


Figure 1.2 – Overview of the T&E WIPT Process

Throughout this process, there are numerous IPTs which are formed, chartered and led by different stakeholders within the acquisition Triad. Each IPT is chartered to produce specific deliverables which all contribute to the success of the program. Regardless of who chairs (or co-chairs) the IPTs, detailed interactions within and across the Triad are essential within each IPT to meet their objectives. Supported and supporting roles may change within the process but the importance of integrating all T&E activities is paramount.

The T&E WIPT will be formed and chartered as directed by the Program Manager, and the WIPT lead test engineer will normally report directly to the PM. This handbook addresses the T&E WIPT issues related to the Triad. The Program Manager (PM) is ultimately responsible for all aspects of T&E within a program, and thus should coordinate all testing activities into an efficient continuum through close collaboration with MCCDC and MCOTEA. The primary objective is to execute integrated T&E throughout the Defense Acquisition Process to validate system performance while concurrently reducing program risks. An integral part of this responsibility rests on the products developed and used by the T&E WIPT, specifically the Test and Evaluation Strategy (TES) and the Test and Evaluation Master Plan (TEMP).

The T&E WIPT provides a forum for all key stakeholders to be involved early in the integrated T&E process. Leveraging off the expertise of MCCDC and MCOTEA, the T&E WIPT enables

the PM to identify and resolve test issues early, develop an integrated TES and document a quality TEMP that is mutually agreeable to all stakeholders. Without collaboration, many problems will result affecting the PM's ability to ensure adequate testing is conducted to support milestone decisions. Additionally, poor collaboration can result in material solution decisions that are not measurable/testable, redundant testing due to poor sharing of DT data and a failure of a system in OT when deficiencies should have been identified in DT. The T&E WIPT will develop a mutually agreeable T&E program that will provide the necessary data for system evaluations and assessments.

Important activities requiring close collaboration within the T&E WIPT include but are not limited to:

- Assisting Capabilities Integration Officers (CIOs) in developing/reviewing Key Performance Parameters (KPPs)/Key System Attributes (KSAs) and other attributes in JCIDS documents
- Developing COE and CONOPS (if required)
- Developing evaluation framework
- Developing and refining Critical Operational Issues (COIs)
- Developing a TES/TEMP/System Test and Evaluation Strategy (STES) to ensure material is tested against established requirements set forth in the CDD/CPD or SON
- Developing capabilities with affordable, achievable, measurable and testable attributes
- Executing an agreed-upon T&E budget to yield an adequate test program
- Establishing and maintaining an event driven T&E schedule
- Ensuring testing adequately assesses whether or not the system meets these requirements in an operational environment
- Participate in the development and review of the RTM Test Criteria

1.2.5 Force Synchronization Conference

The MARFORCOM FSC is a semi-annual forum where the Marine Expeditionary Forces (MEFs) and Marine Force Reserve (MARFORRES) representatives are briefed on future T&E manpower requirements. Manpower allocations are negotiated and assigned to individual MEFs and MARFORRES to support Marine Corps operational testing, developmental testing, and experimentation. The conference provides an opportunity for the T&E stakeholders to clarify scheduling details and test support needs prior to any Feasibility of Support messages being released. Force Representatives are able to provide input on unit and test/exercise location availability and any known restrictions that may preclude accomplishment of the T&E event. Representatives from the Triad including, but not limited to, MCCDC, Training and Education Command (TECOM), Marine Corps Warfighting Lab (MCWL), MCSC, PEO-LS, and MCOTEA, shall meet prior to each FSC in order to coordinate/deconflict their requests for Marine Operating Forces support. In addition, MCOTEA attends quarterly MEF Training Exercise and Education Plan conferences to ensure fleet support for operational tests. MCOTEA shall coordinate the pre-FSC meeting in conjunction with MCCDC, MCWL and MCSC, PEO-LS to ensure efficient use of T&E resources.

1.3 Capabilities Development

A capability is the ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks. The top-down capabilities identification methodology identifies gaps in the ability of the combatant command to execute assigned missions and assess associated risk(s). This methodology also establishes the linkage between the characteristics of the future joint force identified in concepts and CONOPS.

1.3.1 JCIDS Process for ACAT Programs

The primary objective of the JCIDS process is to ensure the capabilities required by the joint warfighter are identified with their associated operational performance criteria in order to successfully execute the missions assigned.

The JCIDS process is initiated through the execution of Capabilities Based Assessment (CBA). The CBA is based on an existing Joint Operating Concept, Joint Integrating Concept, or CONOPS. The CBA identifies the capabilities and operational performance criteria required to successfully execute missions, the shortfalls in existing weapon systems to deliver those capabilities and the associated operational risks, and the possible solution space for the capability shortfalls.

There are four primary documents used in the JCIDS process, which describe required capabilities and provide the information that will guide the development of materiel and non-materiel solutions. Complete understanding of each of these documents is important since they work in a sequential manner. If information in the first document is inaccurate, then the subsequent documents will also be inaccurate.

1.3.1.1 Initial Capabilities Document (ICD)

The ICD presents the Marine Corps' case to use a DOTMLPF approach to resolve a specific capability gap or set of capability gaps. The authorization to develop an ICD comes from the Solution Planning Directive (SPD), which is published by DC, CD&I and endorsed by the Director, Capabilities Development Directorate or through the completion of a CBA.

The ICD defines the capability gap resulting from the analysis of current mission performance and an analysis of potential concepts across the Marine Corps and Department of Defense (DoD) Components, international system from allies, and cooperative opportunities. The ICD then captures the evaluation of different materiel and non-materiel approaches that were proposed to provide the required capability. The evaluation criteria include relative cost, sustainability, efficacy, environmental impacts, and risks that may result from implementation.

1.3.1.2 Capabilities Development Document (CDD)

A validated and approved CDD provides the capability development team with authoritative, measurable, and testable capabilities required to fill a gap. The CDD outlines affordable increments of capability, documents that the development process is addressing specific Marine Corps Capability Gaps and ties the materiel development effort to the overarching DOTMLPF changes needed to establish effective capabilities validated by the Marine Requirements Oversight Council (MROC) and/or Joint Requirement Oversight Council (JROC).

1.3.1.3 Capability Production Document (CPD)

The CPD provides the information necessary to support production, testing, and deployment of an affordable and supportable capability within an acquisition strategy. Specific parameters shall be documented to determine that the material capability is ready for production and deployment. The refinement of performance attributes and KPPs is essential during the development of a capability to ensure needs are reflected and fulfilled.

1.3.1.4 Joint DOTMLPF Change Recommendation (DCR)

Joint DCRs are used for non-materiel solutions to capability gaps. They may be submitted to:

- Change, institutionalize, or introduce new DOTMLPF and policy resulting as an output of experimentation, lessons learned, or other assessments to meet operational needs;
- Change, institutionalize, or introduce new DOTMLPF and policy resulting from the CBA but outside the scope or oversight of a new defense acquisition program;
- Request additional numbers of existing commercial or non-developmental items previously produced or deployed in addition to other considerations of DOTMLPF; or
- Introduce existing non-materiel solutions available from other DOD, U.S. interagency or foreign sources.

1.3.2 Statement of Need (SON)

A SON, based on a Universal Need Statement, is prepared by the CIO in lieu of a JCIDS capabilities document (ICD, CDD, or CPD). The SON defines the materiel attributes for a capability that, because of its projected cost, will meet the requirements for an Abbreviated Acquisition Program (AAP) or due to an unusual and compelling urgency when traditional JCIDS documentation would be unresponsive to the current operational need.

Acquisition Leads can receive SONs from various Program Evaluation Board related sources. Typically, a SON is addressed from the DC, CD&I (or his delegate), other Deputy Commandants, or the Director, C4 to the MCSC Assistant Commander for Programs (AC PROG). The letter should:

- Cite the specific studies, requirements documents, and/or test results that justify the SON;
- Identify the specific capabilities and an estimated cost;
- Address operational environment, concept of employment and performance characteristics;
- Include threshold and objective values to help MCSC evaluate alternative solutions; and
- Request that MCSC take action to acquire the recommended capability.

1.3.3 Letters of Clarification

After reviewing the capabilities documentation, the Acquisition Leads and/or MCOTEA may require additional clarification from DC, CD&I on required system attributes and/or methods of employment. The Acquisition Lead or MCOTEA will submit a request to the appropriate Division within the Capabilities Development Directorate. A Letter of Clarification from the DC, CD&I is the vehicle used to resolve ambiguities concerning required capabilities or to refine system characteristics. If the IPT process is working as designed, Letters of Clarification should be minimal.

1.3.4 Concept of Operations (CONOPS)

The CONOPS that are used in a JCIDS documents for all ACAT programs are normally based on a JROC approved Joint Integrating Concept or a CONOPs endorsed by a combatant command, Service, or defense agency. A summary of the CONOPS used is included in the appropriate JCIDS document.

For ACAT I and II programs, a separate CONOPS for that specific program may be developed that describes what activities need to be done, where and when they will be done, under what conditions, and who is going to do them. This CONOPS should be included as an Annex to the appropriate JCIDS document and is developed at the beginning of the capabilities-based process and matured as performance attributes evolve.

1.3.5 Concept of Employment (COE)

A COE is developed for all programs. The COE identifies anticipated users of the equipment, the mission that it will support, and how it will support that mission. The COE is prepared by CIOs and incorporated into the appropriate JCIDS documentation or SON.

1.3.6 DOD Architecture Framework (DODAF)

Architectures are very important in the capabilities development process and are included in the various capabilities documents (ICDs, CDDs, and CPDs). An architecture is the structure of components (organizations, systems, and functions), their relationships, and the principles and guidelines governing their design (concepts, capabilities, requirements, mission, task, purpose) and their evolution over time to enable warfighters to successfully execute their mission. Architectures inform concept development activities and serve as powerful tools for describing the qualities and characteristics of desired capabilities. They must be integrated to demonstrate relationships and to facilitate coordination and synchronization with related architectures.

The Department of Defense Architecture Framework (DODAF), Version 2.0 serves as the overarching, comprehensive framework and conceptual model or architecture development. The current version of the Framework provides extensive guidance on the development of architectures supporting the adoption and execution of Net-centric services within DOD. DODAF compliant architectures should be incorporated into test and evaluation strategies, planning and execution throughout the system's life-cycle.

DODAF 2.0 refers to architectures as "viewpoints" a selected set of architectural data that has been organized to facilitate visualization in an understandable way. Figure 1.3 provides a graphical representation of all the architecture viewpoints in DODAF 2.0.

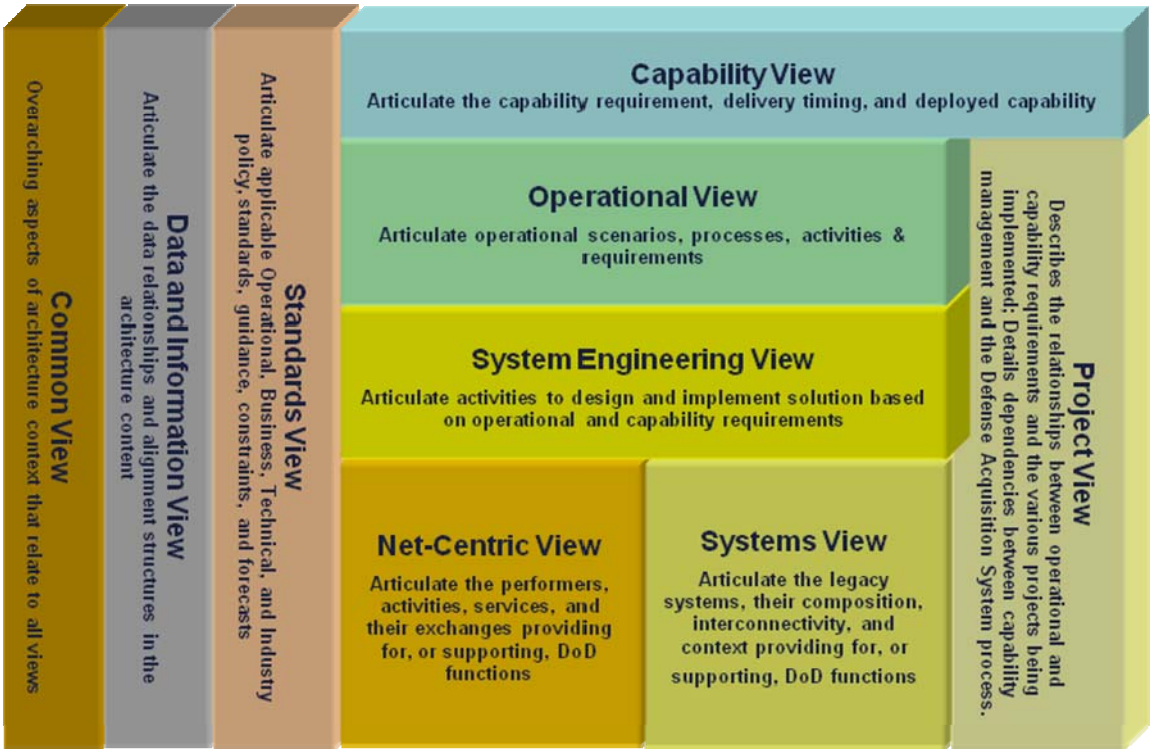


Figure1.3 - DODAF Viewpoints

1.4 Acquisition Environment

The Program Manager (PM) is ultimately responsible for all aspects of the system development, including testing. The T&E WIPT is chartered by the PM to manage all duties in the area of T&E. The input of the T&E WIPT to the contract, engineering specifications, budget, program schedule, etc., is essential for the PM to manage the program efficiently. T&E expertise may be available through matrix support or reside in the Program Management Team (PMT) engineering department during the program's early phases.

1.4.1 T&E Supporting ACAT Programs

An ACAT designation shall be assigned in an Acquisition Decision Memorandum (ADM) by the MDA, per SECNAVINST 5000.2E, after approval of a capabilities document establishing the need for a new program. While a proposed ACAT designation shall be provided on the cover of the ICD and the proposed CDD, the cognizant Program Executive Officer (PEO), Direct Reporting Program Manager (DRPM) or PM, shall request an ACAT designation or designation change as appropriate. An approved ACAT designation does not mean that the program has entered the acquisition process. Table 1 summarizes the dollar threshold and other criteria for ACAT designations.

This handbook primarily addresses T&E activities and requirements for ACAT programs requiring OT. AAPs and ACAT IV (M) programs not requiring OT&E will find the procedures within this handbook applicable to the DT&E portion of their programs.

Table 1 - Description and Decision Authority for ACAT I-IV and AAP Programs		
Acquisition Category	**Criteria for ACAT or AAP Designation**	**Decision Authority**
ACAT I	• Major Defense Acquisition Programs (MDAPs) (10 USC 2430) • RDT&E total expenditure > $365 million in FY 2000 constant dollars, or • Procurement total expenditure > $2.190 billion in FY 2000 constant dollars, or • USD(AT&L) designation as special interest	ACAT ID: USD(AT&L) ACAT IC: SECNAV, or if delegated, ASN(RD&A) as the CAE
ACAT IA	• Major Automated Information Systems (MAISs) • Program costs/year (all appropriations) > $32 million in FY 2000 constant dollars, or • Total program costs > $126 million in FY 2000 const. dollars, or • Total life-cycle costs > $378 million in FY 2000 constant dollars • ASD(NII) designation as special interest	ACAT IAM: ASD(NII)/DOD CIO ACAT IAC: ASN(RD&A), as delegated by the DOD CIO
ACAT II	• Does not meet the criteria for ACAT I • Major Systems (10 USC 2302(5)) • RDT&E total expenditure > $140 million in FY 2000 constant dollars, or • Procurement total expenditure > $660 million in FY 2000 constant dollars, or • ASN(RD&A) designation as special interest • Not applicable to IT system programs	ASN(RD&A), or the individual designated by ASN(RD&A)
ACAT III	• Does not meet the criteria for ACAT II or above • Weapon system programs: • RDT&E total expenditure ≤ $140 million in FY 2000 constant dollars, or • Procurement total expenditure ≤ $660 million in FY 2000 constant dollars, and • Affects mission characteristics of ships or aircraft or combat capability • IT system programs: • Program costs/year ≥ $15 million ≤ $32 million in FY 2000 constant dollars, or • Total program costs ≥ $30 million ≤ $126 million in FY 2000 constant dollars, or • Total life-cycle costs ≤ $378 million in FY 2000 constant dollars	Cognizant PEO, SYSCOM Commander, DRPM, or designated flag officer or senior executive service (SES) official. ASN(RD&A), or designee, for programs not assigned to a PEO, SYSCOM, or DRPM.
ACAT IVT	• Does not meet the criteria for ACAT III or above • Requires operational test and evaluation • Weapon system programs: • RDT&E total expenditure ≤ $140 million in FY 2000 constant dollars, or • Procurement total expenditure ≤ $660 million in FY 2000 constant dollars • IT system programs: • Program costs/year < $15 million, or • Total program costs < $30 million, or • Total life-cycle costs ≤ $378 million in FY 2000 constant dollars	Cognizant PEO, SYSCOM Commander, DRPM, or designated flag officer, SES official, or PM. ASN(RD&A), or designee, for programs not assigned to a PEO, SYSCOM, or DRPM.
ACAT IVM	• Does not meet the criteria for ACAT III or above • Does not require operational test and evaluation as concurred with by OTA • Weapon system programs: • RDT&E total expenditure ≥ $10 million ≤ $140 million in FY 2000 constant dollars, or • Procurement expenditure ≥ $25 million/year ≥ $50 million total ≤ $660 million total in FY 2000 constant dollars • Not applicable to IT system programs	Cognizant PEO, SYSCOM Commander, DRPM, or designated flag officer, SES official, or PM. ASN(RD&A), or designee, for programs not assigned to a PEO, SYSCOM, or DRPM.
Abbreviated Acquisition Program	• Does not meet the criteria for ACAT IV or above • Does not require operational test and evaluation as concurred with in writing by OTA • Weapon system programs: • Development total expenditure < $10 million, and • Production or services expenditure < $25 million/year, < $50 million total • IT system programs: • Program costs/year < $15 million, and • Total program costs < $30 million	Cognizant PEO, SYSCOM Commander, DRPM, or designated flag officer, SES official, or PM. ASN(RD&A), or designee, for programs not assigned to a PEO, SYSCOM, or DRPM.

1.4.2 T&E Supporting Other Programs

1.4.2.1 AAPs and ACAT IV (M)

Small DON acquisitions and minor system modifications may be designated an AAP or ACAT IV (M) if they do not require a MCOTEA-led OT&E and they meet dollar threshold and other criteria in Table 2 below. MCOTEA must concur in writing that MCOTEA-led OT&E is not required. MCOTEA requirements for concurrence with an AAP or ACAT IV (M) designation are shown in Table 2.

The Acquisition Lead is the decision authority for AAPs. An acquisition that qualifies to be designated as AAP may be handled as an ACAT program by its MDA if circumstances warrant, such as joint service involvement or high risk, or if greater visibility is justified. AAPs shall not be initiated without funding and a written requirement. At a minimum, requirements or capabilities shall be documented by a sponsor and approved at the appropriate level.

Table 2 - AAP and ACAT IV(M) Required Documentation Checklist
☐ Acquisition Lead for either planned ACAT IV(M) or AAP's makes formal request to Director MCOTEA that contains the following information (MCSC Project Team Leader's Pocket Guide, Version 1.3, April 2007) • Purpose (designation and concurrence. May also include request to delegate the PDA to PGD) • A brief description of the program. • A summary of the projected life cycle costs of the program. This does not have to be an "independent" LCCE, but needs to cover total ownership cost of the program. • A cost and funding summary. This is your estimated cost versus your budget figures. Use the Director, Financial Management (DFM) budget figures, since DFM will have to concur with your request. • A schedule or outline of significant program events that include objectives and thresholds as appropriate if contained in the requirements document. • A discussion of the developmental testing (if any) planned for the program. Discuss all testing you plan to conduct and present the results of any testing that has already been conducted by the contractor and/or government including any user events. Test data may be very important to MCOTEA's concurrence on your request. Though not mandatory, a requirements test matrix would also be beneficial. • A reference to, or a copy of, the MCCDC validated requirement for the program. For new-starts , the requirement may take the form of a Statement of Need or Capability Document such as an ICD, CDD, CPD which outlines the requirement • Rationale for recommending designation.
Desired Supporting Documentation
☐ Test Concepts/Plans, Gov or Contractor *(draft/final as available) (If MCOTEA concurs with IV(M) decision, MCOTEA will provide input/recommendations to the Acquisition Lead during development)*
☐ MCCDC COE or OMS/MP (*May be satisfied with COE/CONOPS contained in requirements document if sufficient detail is provided*)
☐ Test Reports and/or Evaluations, Gov or Contractor *(draft/final as available)*

1.4.2.2 Rapid Deployable Capability

When a system must be fielded quickly, an Urgent Operational Need Statement or Urgent Universal Need Statement is typically issued for the system in development, or the system may be granted Rapid Deployment Capability (RDC) status by the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN (RDA)). This urgency may necessitate modifying established Triad processes in order to rapidly procure and deliver the urgently needed capability.

In such cases, the program sponsor may request a Quick Reaction Assessment (QRA) from the Director, MCOTEA. If approved, the QRA should be conducted and a report issued as soon as possible. The QRA request should include:

- The purpose of the assessment and the specific system attributes the program sponsor wants assessed;
- The time available for the assessment;
- The COE;
- Any available threat documentation;
- The resources available for the assessment; and
- The forces that will deploy with the system prior to IOC.

1.4.3 Modifications

The term "modification" means any configuration change to a produced configuration item regardless of cost or test requirements, e.g., engineering change proposals, pre-planned product improvements, upgrades or technology enhancements.

See Table 3 for appropriate actions by the PM, CMC, and the MDA. Actions are based on criteria shown in the top row of Table 3.

Modifications will normally be considered part of the modified ACAT program, but may be managed as a separate program at the discretion of the MDA. Any identified new functionality or capability must be identified in an approved capabilities document.

A modification to any active ACAT program (i.e., any ACAT program that has not realized 90 per cent of total deliveries or has not exceeded 90 per cent of its total program cost) where the modification causes the program to breach an existing Acquisition Program Baseline (APB) threshold, shall result in revision to the APB and any other program information, as needed.

A modification to a program or system that is no longer an active ACAT program shall be treated as a separate program with its own assigned ACAT or AAP designation as documented by an ADM signed by the MDA.

Modifications to programs that are not ACAT programs shall be evaluated using Table 3 to determine whether an ACAT designation is necessary.

Table 3 - Modification Initiation Process Conditions

(The answers to the questions in columns 1 through 4 will determine the row that most closely relates to your ongoing program characteristics and proposed modification)

Pgm being modified is an active ACAT?	Mod breaches APB threshold?	Mod requires additional funding?[7/]	Mod cost exceeds "Abbreviated Acqn Program" $criteria[4,5/]	PM action	CNO/CMC action[6/]	Program Decision Authority or MDA action
YES	NO	NO	YES [5/] or NO	Execute mod	Approve/validate CDD/CPD [2,5/]	None
YES	NO	YES	YES [5/] or NO	Prepare funding request Execute mod	Approve/validate CDD/CPD [2,5/] or Requirement Provide funding	None
YES	YES	NO	YES [5/] or NO	Revise APB [1/] Revise TEMP [2/] Execute mod	Approve/validate CDD/CPD [2,5/] or requirement Endorse APB [1/] Endorse TEMP [2/]	Approve APB [1/] Approve TEMP [2/]
YES	YES	YES	YES [5/] or NO	Prepare fund-ing request Revise APB [1/] Revise TEMP [2/] Execute mod	Approve/validate CDD/CPD [2,5/] or requirement Provide funding Endorse APB [1/] Endorse TEMP [2/]	Approve APB [1/] Approve TEMP [2/]
NO	N/A	NO	NO	Prepare/submit AAP designation request to approval authority Execute mod	Approve requirement	Approve AAP designation request
NO	N/A	YES	NO	Prepare/submit AAP designation request to approval authority Prepare funding request Execute mod	Approve requirement Provide funding	Approve AAP designation request
NO	N/A	YES	YES	Prepare funding request Prepare APB [1/] Prepare TEMP [2/] Prepare ACAT [3/] design request Execute mod	Approve/validate CDD/CPD [2/] Provide funding Endorse APB [1/] Endorse TEMP [2/]	Approve APB [1/] Approve TEMP [2/] Approve ACAT [3/] designation request

1/ "Prepare APB" is for the "modification only" if the modification is to be managed as a separate program. "Revise APB" is for the original ongoing program. See APB format in Consolidated Acquisition Reporting System (CARS) section of the Defense Acquisition Guidebook.

2/ If a new, or change to an existing, CDD/CPD or TEMP is required, see formats for CDD/CPD and TEMP in reference (c) and Defense Acquisition Guidebook, respectively.

3/ "Prepare ACAT designation request" is for the "modification only", unless the original program is still ongoing (i.e., in production), in which case the ACAT designation request shall encompass both the original program and the modification(s). See the ACAT designation request and ACAT designation change request content memorandum in the DON Acquisition and Capabilities Guidebook.

4/ $ criteria for "Abbreviated Acquisition Programs" is less than: for weapon system programs, $10M total development expenditure, $25M production or services expenditure in any fiscal year, and $50M total production or services expenditure for all fiscal years; for IT programs, $15M program costs in any single year and $30M total program costs.

5/ If answer to column 4 is YES, an approved CDD/CPD or CDD/CPD revision is required.

6/ For IT programs, endorsement is provided by the IT functional area manager, approval is provided by the resource sponsor.

7/ For modifications that require additional funding, see ASN(RD&A) memorandum, Acquisition Program Cost Growth; Management of Engineering Change Proposals, of 4 December 2006

1.4.4 Evolutionary Acquisition

Evolutionary Acquisition is the preferred DOD acquisition strategy. It is used when achieving the desired overall capability will require the system to evolve during development, manufacturing or deployment. Evolutionary acquisition requires collaboration among the user, tester, and developer. In this process, a needed operational capability is met over time by developing several increments, each dependent on available mature technology.

The T&E strategy of a system acquired using evolutionary acquisition shall address each increment intended for fielding. In general, T&E that has previously confirmed the effectiveness and suitability of a previous increment need not be repeated in its entirety to confirm that the subsequent increment still provides those mission capabilities. However, regression testing to reconfirm previously tested operational capabilities and/or suitability might be required if the subsequent increment introduces a significantly changed hardware or software configuration, or introduces new functions, components, or interfaces that could reasonably be expected to alter previously confirmed capabilities. MCOTEA can recommend additional operational testing to reconfirm previously tested operational capabilities, in consultation with the T&E WIPT.

The PM shall ensure adequate DT&E, OT&E, and Live Fire T&E (LFT&E) are planned, funded, and executed for each new increment, as required. The T&E WIPT shall ensure an independent phase of OT&E is completed prior to release of each increment to the user. Potentially short cycle times between milestone decisions necessitate early collaboration between stakeholders in test planning for efficiency and testability that effectively evaluates system capabilities and performance.

1.4.5 Incorporating T&E Requirements into USMC Acquisition Contracts

The T&E WIPT will, in most cases, have a contractor test section counterpart. With this counterpart, the T&E WIPT works out the detailed test planning, creation of schedules, etc., for the entire test program. The T&E WIPT uses input from all sources (contractors, development test agencies, OTAs, higher headquarters, etc.) to formulate the test program's length, scope, and necessary details. The PM ensures that the Request for Proposal (RFP) reflects the test program envisioned by the T&E WIPT and the contractor's role in the testing process. The PM also ensures the RFP includes provisions for government attendance at contractors' tests and that all contractor data and test results are provided to the government.

After the RFP has been issued and the contractor has responded, the proposal is reviewed by the PMT. The T&E WIPT is responsible for performing a technical evaluation on the test portions of the proposal. In this technical evaluation, the T&E WIPT compares the proposal to the Statement of Work, Contract Data Requirements List (CDRL), test schedule, TES, TEMP, capabilities documentation, COE, and reviews each testing item. This is an iterative process of refining, clarifying, and modifying that will ensure the final contract between the Government and the prime contractor contains all test-related tasks and is priced within the scope of the proposed test program.

See *Incorporating Test and Evaluation into Department of Defense Acquisition Contracts*, published by the Office of the Deputy Under Secretary of Defense for Acquisition and Technology, for more guidance.

1.5 General T&E Principles

The test community (DT and OT) needs to be involved throughout the requirements definition and acquisition processes. Early tester input into the Solutions Analysis Phase, prior to the Materiel Development Decision (MDD), provides advice to Headquarters Marine Corps, CD&I and the Acquisition Lead personnel on the technical maturity and testability of potential materiel solutions to fill a gap in capability. As the requirements are refined and documented in the ICD/CDD/CPD or SON, testers continue to provide insight on the potential of prototypes to meet operational requirements and mission capabilities.

During Engineering Manufacturing and Development (EMD) phase, T&E results at the subsystem and system level help ensure the design is maturing as expected and provides the PM early insight into system performance and reliability. As changes in the design are made, T&E affirms the system is on track for entering Low-Rate Initial Production (LRIP).

As early as possible, but definitely between the LRIP and the Full-Rate Production (FRP) decision, T&E shifts from a structured "laboratory" environment to an "in the field" environment to ensure the system will perform as intended. T&E culminates with an Initial Operational Test and Evaluation (IOT&E) to provide an independent evaluation of the system's performance as used by the Marines that will employ it in combat. As changes and modifications are made throughout the systems' life cycle, T&E continues to assess the system performance to ensure operational capabilities are met.

1.5.1 Evaluation Framework

The key element to developing a successful test and evaluation strategy is to establish an evaluation framework that links the component-level specifications to the operational requirements and ultimately to the overarching capabilities, which must at least equal the CDD's KPP and KSA thresholds, the system must provide to the warfighter. The evaluation framework is a good way to outline the entire test program.

The first step is to determine what capabilities the system will accomplish and what needs to be evaluated in order for the MDA to make a production and/or a fielding decision. These are developed by MCOTEA, in coordination with MCCDC, MCSC and/or PEO LS in the form of COIs. KPPs and KSAs are traced to the COIs per the MCOTEA OT&E Manual. However, COIs are not just issues for OT&E. They are critical to the entire design and development effort. Before the first piece of metal is bent or the first line of code is written, there must be a clear understanding by all stakeholders of what capabilities the system is required to perform. All requirements and specifications flow down from (and are linked to) the COIs. A draft set of COIs should be defined as soon as possible, preferably as soon as the MDD is made.

Once developed, the COIs, KPPs, Critical Technical Parameters (CTPs), Measures of Effectiveness (MOEs), Measures of Suitability (MOSs), and Measures of Performance (MOPs) of the Evaluation framework form the basis for developing the System Design Specification (SDS) and Requirement Traceability Matrix (RTM). The evaluation framework also provides the foundation for Technology Readiness Assessments and entrance and exit criteria of systems engineering technical reviews. Finally, the evaluation framework provides the foundation to

determining the operational tasks and subtasks that must be accomplished to satisfy the COIs in an operational environment.

Figure 1.3 is an example of how an evaluation framework may be structured.

1.5.2 Event-Driven Schedules and Exit Criteria

Testing shall be event driven, within realistic cost and schedule constraints and the program's overall acquisition strategy, and allow for a realistic period of time to accomplish the planned T&E events, including correction, retest and report preparation. The event-driven acquisition strategy explicitly links program decisions to demonstrated accomplishments in development, testing, initial production, life-cycle support, and the availability of capabilities, to be provided by other programs, on which this program depends.

Test planners shall ensure the exit criteria (e.g., required test results) of integrated test events satisfy the objectives of each test community stakeholder participating in the event. The T&E WIPT shall ensure the DT&E program is robust in order to achieve a successful OT&E outcome and a successfully fielded system. The T&E WIPT shall develop hardware and software metrics in the form of T&E success criteria and OT&E entrance criteria to use in monitoring program maturity and to support decisions to progress through the development cycle. The T&E WIPT shall use the evaluation framework to assign specific DT and OT testing requirements to each scheduled integrated test event. The PMT shall use the evaluation framework and exit criteria in planning systems engineering technical reviews.

Figure 1.3 - Top-Level Evaluation Framework Matrix

	Key Requirements and T&E Measures					
COIs	**Key Reqs**	**Key MOEs/MOSs**	**CTPs**	**Operationally Relevant Thresholds in Capabilities Documentation**	**Test Event (DT-1/DT-2/DT Obs, EOA,OA)**	**Decision Supported**
COI #1. Is the XXX effective for…	**KPP#1:** Unrefueled range of XX NMs	**MOE 1.1.** # NMs driven on 1 tank of gas	Fuel efficiency of XX miles per gallon		Engine stand demo, manufacturers specification	PDR CDR
COI #2. Is the XXX suitable for…			Data upload time		Component level replication Stress and Spike testing in SIL	PDR CDR
COI #3. Can the XXX be…		**MOS 2.1.**				MS-C FRP
		MOE 1.3.				Post-CDR FRP
		MOE 1.4.	Reliability based on growth curve		Component level stress testing Sample performance on growth curve Sample performance with M&S augmentation	PDR CDR MS-C
	KPP #2	**MOS 2.4.**	Data link			MS-C
COI #4. Is training….	**KPP #3**	**MOE 1.2.**			Observation and Survey	MS-C FRP
COI #5. Documentation	**KSA #3.a**	**MOS 2.5.**				MS-C FRP

1.5.3 Tailoring

All MDAs should promote maximum flexibility in tailoring programs under their oversight. Prior to formal program initiation (normally Milestone B) and after consideration of the views of the PMT members, the PM shall propose a tailored execution, management, program information/documentation, and oversight structure for the program. The PM proposal shall consider program size, complexity, system service-life, total force structure, and associated risk.

Program information may be tailored to:

- Combine program information/documents with similar information and approval authorities;
- Establish a common reference for basic system and program information; and
- Eliminate non-applicable information.

The MDA shall approve in writing a tailored execution, management, program information/documentation, presentation medium, and oversight structure. Upon approval, all deviations from the program's documented tailoring plan require MDA approval. The MDA tailoring determinations made at program initiation shall be reexamined at each program decision point in light of then-current program conditions.

Both MDAs and PMs should be aware that there are statutory and regulatory requirements listed in SECNAVINST 5000.2E, enclosure (3), Tables E3T1 and E3T2, which cannot be tailored out of a program's milestone information requirements. Failure to comply with these requirements will preclude the successful completion of applicable milestone reviews.

1.5.4 General T&E Reporting Policy

The T&E WIPT must receive the test results and reports on time to enable stakeholders to make recommendations to the PM. The data received should be tailored to provide the minimum relevant information needed. The T&E WIPT must be aware that data requirements in excess of the minimum needed may lead to an unnecessary increase in overall program cost.

In order for any report or data to be used as a source of data for MCOTEA's independent system evaluation it must attain an unqualified endorsement from the Director, MCOTEA. If the Director, MCOTEA provides a qualified endorsement of a test report or test data, it means that the results may have limited, or no use in MCOTEA's independent system evaluation depending upon the qualifications.

1.5.5 Data Management

For integrated testing to be successful, it is important that the pedigree of the data be understood and maintained. The pedigree of the data refers to accurately documenting the configuration of the test asset and the actual test conditions under which each element of test data was obtained. In addition, the person or entity responsible for maintaining the data shall be identified. The T&E WIPT shall establish agreements describing the methods of collecting, validating, and securing the data as it becomes available from the contractor, DT, OT, and oversight

organizations, as well as supporting related activities that contribute or use test data (e.g., information assurance, interoperability certification, etc.).

In addition to establishing the pedigree, the T&E WIPT plays an important role in maintaining the pedigree of data for a program. The T&E WIPT establishes agreements between the test program stakeholders regarding roles and responsibilities in developing and maintaining data release procedures and data access procedures for a data repository where all stakeholders will have access to test data for separate evaluations. For example, the data from an integrated test could be used by the contractor for design improvements, by the developmental evaluators for risk assessments, and the operational evaluators for operational assessments. Measures shall be taken to ensure the integrity of the data isn't violated while it is being accessed and used.

The data management process should consider the following:

- Integrated data requirements list
- Instrumentation and collection methods
- Data transmission, reduction and storage
- Analysis and reporting
- Audit trail tracing all data related decisions

Elements for designing a Test Database should include the following:

- Accessibility to all stakeholders
- Used for all T&E data for the organization and/or the system under test
- Ease of use, and ease of data mining
- Fields for all necessary data
- Appropriate choice of software
- Traceable to the originator/generator of the data
- Current status of the data (for approval, for info; etc.) version/control number, and date
- Security of the database
- Permissions (read/write vs. read only) and other controls

1.6 Integrated T&E

Integrated testing is mandated by Office of the Secretary of Defense (OSD) policy to "maximize the efficiency of the T&E process" within DOD. The ultimate goal of integrated testing is a seamless test program that produces data that are evaluated by the DT and OT communities to resolve both developmental and operational objectives and issues. Integrated testing is not a new type of test or a separate phase of testing. It is a process intended to maximize efficiencies in schedules, costs, and resources by consolidating test events from both the DT and OT communities. The results of conducting integrated testing allows for multiple objectives to be satisfied without compromising the data used by all participants. Integrated testing focuses the entire test effort on developing and producing a system that will be effective and suitable for the warfighter.

1.6.1 Definition

Integrated testing is defined by OSD as:

> *"The collaborative planning and collaborative execution of test phases and events to provide shared data in support of independent analysis, evaluation, and reporting by all stakeholders, particularly the developmental (both contractor and government) and operational test and evaluation communities."*

The intent is to focus all of the test communities within the DOD on collaborative planning and execution of test events throughout system development while ensuring the data obtained during those tests can be evaluated independently by both the developmental and operational test agencies. The definition states what PMs and T&E WIPT need to accomplish. It does not define how it is to be accomplished. The Defense Acquisition Guidebook (DAG) provides some guidelines; however, it is up to each Service to determine how to implement this policy.

1.6.2 USMC Implementation

The key to formulating an integrated test strategy is for both the PMT and the T&E WIPT to understand the desired outcome of the test program before drafting a plan or strategy. In other words, the definition of "system success" shall be established before a test strategy is developed. The evaluation framework is the foundation of the T&E strategy. Once the evaluation framework is built, the T&E WIPT can develop a test approach that will gather the data to be used to evaluate the system's progress during design and development.

Integrated testing is more than just combining DT and OT objectives during a single test event. The focus of integrated testing is to design a test program that will coordinate all test activities to concentrate on gathering the data to effectively evaluate the system. Using the evaluation framework, the test community evaluates the data gathered to assess system performance (both effectiveness and suitability) throughout system development and ultimately provide the results to the MDA to support a FRP or Materiel Fielding decision. Although most of the effort to execute integrated testing occurs during detailed test planning, it must be an integral part of the overall T&E strategy. Not all test data can be used by MCOTEA. Specific DT events that need to be conducted may not be operationally relevant. However, those that are shall be leveraged by MCOTEA to meet operational test requirements. Likewise, development contractor participation in IOT&E is limited by statute. However, the entire test design effort shall be integrated in order to produce the data that will enable thorough evaluation of the system.

2 Types of Test

2.1 Major Types of Testing Overview

Although there are a myriad of acronyms for T&E events, all testing falls into two basic categories; developmental and operational. The majority of testing conducted during the acquisition process occurs during system design and development (i.e. developmental test). Developmental tests are overseen by the PMT, in conjunction with the T&E WIPT, and are conducted to ensure the system design will perform as required to meet the capabilities shown in the capabilities documentation. Developmental tests are conducted by the system contractor with government oversight and by government test organizations such as the Marine Corps Tactical Systems Support Activity (MCTSSA).

Developmental tests run the gamut from "bread board tests" to determine if a light illuminates when a switch is turned on to test events that exercise the system beyond design limitations. As many DT&E activities as possible should be conducted in a "mission-oriented" environment in order to predict system performance (both effectiveness and suitability) in an operational environment. Conducting DT&E in a mission-oriented environment also allows for deficiencies to be identified and addressed while the system is still in the design phase so changes can be made with the least impact to cost and schedule.

Operational tests are conducted by MCOTEA to provide an independent evaluation of system performance in an operational environment with typical users on a production representative system. Operational testing is conducted using Marines that would operate and maintain the system in the field and is conducted in an environment that replicates intended operating conditions, including combat, to the maximum extent possible.

This section describes the various types of developmental and operational assessments and tests. Not all of the tests listed below need to be completed for every program.

2.2 Developmental T&E

Developmental testing is conducted throughout the system life cycle from program initiation through system sustainment. DT&E is conducted to reduce design and programmatic risks and provides assessments of system capabilities and limitations. DT&E verifies that CTPs have been achieved and assists in engineering design and development. DT&E also assesses progress toward meeting COIs, assesses system satisfaction of the thresholds in described in the capabilities documentation, and supports the decision to certify the system ready for OT&E. In addition, developmental testing:

- Characterizes system functionality and provides information for cost, performance, and schedule tradeoffs;
- Verifies system specification compliance and contractor technical and manufacturing performance;
- Identifies and resolves deficiencies as early as possible during system design;

- Ensures systems can be operated efficiently and safely within the capabilities and limitations of the user population;
- Ensures fielded systems continue to operate as required based on changes in the operating environment (i.e. threat); and
- Verifies continued system performance of upgrades and modifications due to obsolescence issues.

2.3 Objectives of Developmental Testing

Developmental Tests conducted by the system developer, contractor, and government test agencies span the range from technical design and laboratory tests, field tests that are conducted in an operational environment, and tests that are conducted to ensure production quality and product acceptance. Below are the major objectives of DT that are common within the USMC. Chapter 9 includes additional information on tests conducted during system development.

2.3.1 Design Limit Testing

Design Limit Testing, also known as Proof Testing, is intended to ensure that the system or subsystem designs are adequate to meet specified performance characteristics when exposed to "worst case" environmental conditions expected at the extremes of the operating envelope.

2.3.2 Engineering Design Tests

This series of tests provides data for independent evaluation or assessment to support an engineering design review (e.g., Preliminary Design Review (PDR). The objective is to test system effects caused by natural and induced environmental conditions and serves to assist the engineering design, development process, and attainment of technical performance specifications and objectives. Normally, Engineering Design Tests are performed in a factory, laboratory or proving ground environment.

2.3.3 Environmental Testing

Environmental Testing is conducted to ensure the system will operate in the specified environments. Generic natural environment includes: weather, climate, ocean conditions, terrain, vegetation, electromagnetic, etc. Environment includes those conditions observed by the system during operational use, stand-by, maintenance, transportation and storage.

2.3.4 Functional Integration Testing

These tests are conducted to ensure various components function together at the system level in an efficient and logical way.

2.3.5 First Article Tests

First Article Test includes preproduction and initial production testing conducted to ensure that the contractor can furnish a product that meets the established technical criteria.

2.3.6 Pre-production Qualification Tests

Pre-production Qualification Tests are the formal contractual tests that ensure design integrity over the specified operational and environmental range. These tests usually use prototype or preproduction hardware fabricated to the proposed production design specifications and drawings. Such tests include contractual reliability and maintainability demonstrations tests required prior to production release.

2.3.7 Product Acceptance Test

Product Acceptance Tests consists of testing production items to demonstrate that items procured fulfill requirements and specifications.

2.3.8 Production Qualification Test

Production Qualification Test is a technical test completed prior to the full rate production decision to ensure the effectiveness of the manufacturing process, equipment, and procedures. This testing also serves the purpose of providing data for the independent evaluation required for materiel release so that the evaluator can address the adequacy of the materiel with respect to the stated requirements. These tests are conducted on a number of samples taken at random from the first production lot, and are repeated if the process or design is changed significantly, and when a second or alternative source is brought on line.

2.3.9 Production Prove-out Test

Production Prove-Out Test is a technical test conducted prior to production testing with prototype hardware to determine the most appropriate design alternative. This testing may also provide data on safety, the achievability of critical system technical characteristics, refinement and "ruggedization" of hardware configurations, and determination of technical risks.

2.3.10 Quality Assurance Testing

Quality Assurance Testing is necessary to provide confidence that adequate technical requirements are established, that products and services conform to established technical requirements, and that satisfactory performance is achieved.

2.3.11 System Qualification Testing

System Qualification Testing (SQT) is performed to demonstrate to the acquirer that system requirements have been met. It covers the system requirements in the SDS and in associated Interface Control Documents. SQT contrasts with developer-internal system testing, performed as the final stage of integration and testing. If a system is developed in multiple builds, qualification testing of the completed system will not occur until the final build. SQT in each build should be interpreted to mean planning and performing tests of the current build of the system to ensure the system requirements to be implemented in that build have been met.

2.3.12 Transportability Testing

Transportability Testing is conducted to ensure the system/item can be moved by towing, self-propulsion, or carrier through any means, such as railways, highways, waterways, pipelines, oceans, and airways as specified in the CDD and/or CPD.

2.3.13 Field User Evaluation

Field User Evaluations (FUEs) are developmental tests conducted using representative operators and/or maintainers. The degree of structure and independence varies. An FUE is typically conducted to help define system requirements or to assess extent of accuracy of material solution. The FUE is not to be confused with operational testing done by an OTA, although evaluation results may be used by an OTA. FUEs are used to assess military utility, usability, human factors and system capabilities when operational testing is not required by MCOTEA (e.g. programs designated AAP or ACAT IV (M)).

2.3.14 Usability Assessment Testing

Usability assessments, not to be confused with FUE, are conducted to evaluate the system's ability to accurately and efficiently aid the operator in performing required tasks. Usability assessments of human interfaces can be subject matter expert (SME) and human factors engineering (HFE)-based heuristic assessments, HFE evaluations of MIL-STD-1472F interface requirements compliance, user feedback surveys, and objective human performance testing using, if available, representative Marines. Usability testing can be conducted as a standalone test event or can be incorporated into other testing events such as an FUE.

2.4 Live Fire T&E

Title 10 United States Code (USC) §2366, mandates that major weapon system and munitions programs, as well as product improvements to those programs that are likely to significantly affect the vulnerability or lethality of those programs, undergo a realistic LFT&E to assess a system's vulnerability and/or lethality. LFT&E for vulnerability is conducted on "covered systems." A covered system (or a modification to a covered system that significantly affects the survivability) is defined as a system that provides some degree of protection to users in combat. LFT&E for lethality is conducted by firing a munition (or missile) at realistic targets to assess the effectiveness of the munition/missile.

Historically, only major defense acquisition programs (MDAPs) have been required to conduct LFT&E by USC and be subject to DOD independent oversight by the Director, Operational Test and Evaluation (DOT&E). However, a change in the law allows that any acquisition program, regardless of acquisition category, that is designed to provide ballistic protection to its users is a potential candidate for LFT&E, with DOT&E oversight. This has been especially true of nearly every Personal Protective Equipment type program.

The T&E WIPT is responsible for identifying potential candidates for LFT&E. The PM is ultimately responsible for ensuring LFT&E is completed. Within the USMC, the preferred method is for the PM to delegate the authority to oversee LFT&E to MCOTEA.

2.5 Types of MCOTEA Observations and Testing

This section describes the different types of MCOTEA tests, assessments, and observations. Figure 2.1 indicates where each of these generally fit with respect to the acquisition cycle.

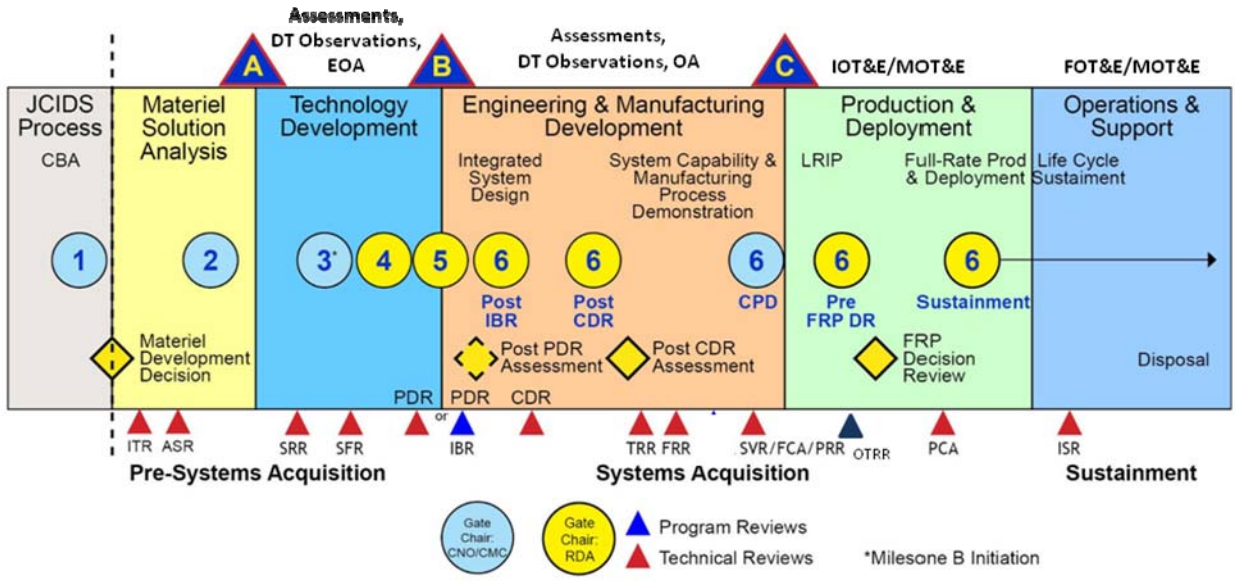


Figure 2.1 - MCOTEA Observation and Testing in the Acquisition Cycle

2.5.1 Quick Reaction Assessment (QRA)

If MCOTEA is simply observing QRA testing, the procedures described under "DT Observations" apply. If MCOTEA plans and executes the QRA testing, those described under "Assessments" are used to support the QRA process. The execution of a QRA test does not replace the scheduled operational testing as approved in the TEMP for programs of record. In accordance with SECNAVINST 5000.2E, systems in RDC status, as approved by ASN (RDA), will normally undergo formal OT&E when they transition to program status.

2.5.2 DT Observations

MCOTEA normally observes DT events to track program progress toward satisfying required thresholds and capabilities throughout development and enable the use of DT data in MCOTEA's overall evaluation of the system. In addition, MCOTEA participation gives the PM insight into the system's developmental progress, materiel maturity, and readiness to enter an operational testing or assessment phase. In these cases, personnel from MCOTEA generate a DT Observation Plan before the event for internal MCOTEA usage. MCOTEA also participates in collaboratively planning the actual event, but the events are staffed and executed by non-MCOTEA personnel.

MCOTEA attends the event and documents its observations in the form of an Observation Report (OR). The ORs, in conjunction with the associated DT Report, formalize MCOTEA opinions regarding the conduct of the test event and adherence to the published test plans. DT Observation represents an excellent opportunity to collect early Reliability, Availability and Maintainability (RAM) data that may be used to augment OT phase RAM results for the MCOTEA-authored system evaluation.

2.5.3 Assessments

MCOTEA can also direct events conducted during DT by conducting an Assessment. In these cases, personnel from MCOTEA participate in the collaborative planning and may participate in DT execution in coordination with the PMT. Contractors may be used to operate and maintain the system under test. Use of production-representative articles is not required. An Assessment may be conducted using technology demonstrators, prototypes, mock-ups, engineering development models, or simulations. After the event, MCOTEA documents what was observed in the form of an Assessment Report (AR). Assessments represent an excellent opportunity for MCOTEA to collect early RAM data that may be used to augment OT phase RAM results for the MCOTEA authored system evaluation. MCOTEA also uses an Assessment when conducting a QRA or examining an AAP or ACAT IV (M) program.

2.5.4 Operational Assessment (OA)

An OA is an assessment phase that demonstrates selected system performance, with user support as required, and is conducted by MCOTEA. Thus an OA may range from a "paper assessment" or a modeling and simulation effort to a physical operational test. The type of OA to be run shall be spelled out in the TEMP.

Any program on the OSD T&E Oversight List must attain acceptable performance in an OA to enter LRIP. However, it is highly encouraged to conduct an OA for all ACAT programs. An OA provides early information to the PM and/or decision maker about how the system is progressing toward satisfying its current capabilities documentation, satisfying the defined attributes including KPPs and KSAs, and readiness to enter the Initial Operational Test.

The OA may also be used to support program reviews or milestones. Use of production-representative articles is not required for an OA. An OA may be conducted using technology demonstrators, prototypes, mock-ups, engineering development models, or simulations. The OA may also use typical users (Marines) as operators and the OA may be conducted under actual operational conditions. The OA will not substitute for the independent OT&E necessary to support FRP decisions.

An OA can be conducted at any time, but is normally done during the EMD phase to assess selected COIs, KPPs, other system attributes and assess other Issues of interest to report on the potential of the system to meet the required operational capabilities. An OA will typically focus on significant trends noted in developmental efforts, programmatic voids, areas of risk, testability of capabilities, and the ability of the program to support adequate operational testing. An OA shall not make any determination of Operational Effectiveness, Suitability, or Survivability. Operational Assessments are executed when requested by a PM or MDA. At the end of an OA, MCOTEA's assessment is documented in an OTA Milestone Assessment Report (OMAR) if the assessment supports a milestone decision or an OTA Assessment Report (OAR) if it does not support a milestone decision.

2.5.5 Early Operational Assessment (EOA)

An EOA is similar to an OA, but is conducted during the Technology Development phase, prior to Milestone B, and is typically used as an input to determine whether a system should continue

development and proceed to the EMD phase of the acquisition cycle. In this case, MCOTEA's assessment is documented in an OMAR if the assessment supports a milestone decision or an OAR if it does not support a milestone decision.

2.5.6 Initial Operational Test (IOT)

IOT&E consists of the IOT and the evaluation. IOT is an event or series of events. The overall evaluation is the result of a process. This process includes a thorough review of IOT results along with other relevant information obtained from prior tests, assessments, observations, and analyses. IOT is normally conducted during the Production and Deployment Phase on production or production-representative articles and using representative forces (both friendly and opposing) employing realistic tactics and targets whenever possible. The system under test shall be installed and used, as closely as possible to actual operational conditions.

The IOT shall be executed in realistic operational and environmental conditions in operationally representative terrain, using typical system users (Marines) to operate and maintain the system under test. No person employed by a contractor developing the system under test may be involved in the operation or maintenance of the system during IOT, unless that contractor is to be involved in those same functions when the system is deployed in combat (e.g. contractor logistics support). If the system will use contractors when it is deployed, contractor performance during IOT shall be subject to review, analysis, and evaluation as part of the overall system evaluation.

The IOT is a critical test event of any evaluation strategy with an objective of determining whether systems are operationally effective, operationally suitable, and operationally survivable. It may also support the decision to proceed beyond LRIP to FRP. In some cases when the Milestone C decision and the FRP decision are planned concurrently, IOT may be performed during the EMD acquisition phase, prior to Milestone C.

After the IOT, MCOTEA evaluates IOT results along with other relevant information obtained in prior tests, assessments, observations, and analyses. MCOTEA's evaluation, the IOT&E, is documented in an OTA Evaluation Report (OER) and the results are forwarded to the ACMC. The official IOT&E report is released to the MDA and the PM after ACMC approval and within 90 calendar days of IOT completion, assuming timely receipt of all required DT&E reports needed to complete the OER.

2.5.7 Follow-on Operational Test

Follow-on Operational Test and Evaluation (FOT&E) consists of the Follow-on Operational Test (FOT) and the process of evaluation described under IOT&E. FOT is the operational test that may be necessary after a successful Milestone C or FRP decision. The need for an FOT may be determined early by the MDA and if it is, it shall be documented in the TEMP. FOT may also be needed to address a deficiency that is identified during system DT or OT, and is also used to ensure changes to the system since IOT have remedied the previously recorded deficiencies and not decreased system capability. FOT is also performed to refine the estimates, evaluate changes, and reevaluate the system to ensure that it continues to meet operational needs in a new environment or against a new threat.

If requested by the MDA, FOT and its associated evaluation is conducted using production or production-representative articles and using representative forces (both friendly and opposing) employing realistic tactics and targets whenever possible. The system under test shall be installed and used, as closely as possible, as it is expected to be under actual operational conditions. The FOT shall be executed in realistic operational and environmental conditions in operationally representative terrain, using typical system users (Marines) to operate and maintain the system under test. No person employed by a contractor developing the system under test may be involved in the operation or maintenance of the system during FOT, unless that contractor is to be involved in these same functions when the system is deployed in combat. If the system will use contractors when it is deployed, contractor performance during FOT shall be subject to review, analysis, and evaluation as part of the overall system evaluation.

MCOTEA evaluates the results of the FOT along with other relevant information. MCOTEA's evaluation, the FOT&E, is documented in an OER.

2.5.8 Multiservice Operational Test

Multiservice Operational Test and Evaluation (MOT&E) is the equivalent of an IOT&E, but is conducted jointly by two or more services. When designated the lead service, MCOTEA shall prepare a single TEMP and single test plan in coordination with all interested services and defense agencies in accordance with the latest MOT&E Memorandum of Agreement. MOT&E consists of the Multiservice Operational Test (MOT) and the evaluation. MOT is a single, but critical, event while the overall evaluation is the result of a thorough review of MOT results along with other relevant information obtained from prior tests, assessments, observations and analyses.

2.5.8.1 Marine Corps Lead Service

As the Lead Service OTA, MCOTEA shall accomplish the following (not necessarily in this order):

- Conduct test planning, execution, and system evaluation in accordance with the MCOTEA OT&E Manual;
- Form the appropriate multi-service T&E WIPT;
- Form a Test Management Council composed of one senior representative from each supporting service to arbitrate disagreements that cannot be solved at the T&E WIPT level;
- Participate in early acquisition activities including developmental testing, and invite other service participation as required;
- Issue a call to the other interested service OT&E agencies for COIs and their service-unique resource requirements and coordinate action on the TEMP to account for other service issues and inputs;
- Call a meeting of participating OTA test managers to assign responsibility for the evaluation of COIs and the accomplishment of test objectives;
- Formulate the T&E strategy and portions of the TEMP in coordination with interested OTAs, the T&E WIPT, and the cognizant Joint Program Office;

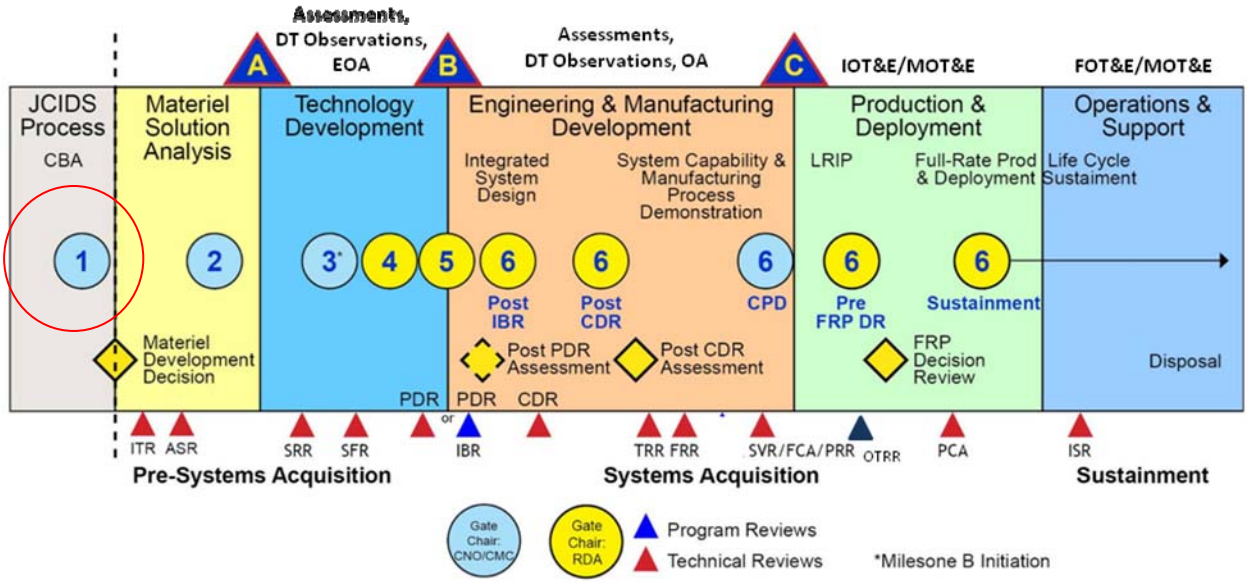
- Report deficiencies identified in the system under test in accordance with the MCOTEA OT&E Manual; and
- Coordinate Failure Definition and Scoring Criteria Charter development

MCOTEA evaluates the results of the MOT along with other relevant information obtained in prior tests, assessments, observations, and analyses. MCOTEA's evaluation, the MOT&E, is coordinated with the other services involved and is documented in an OER.

2.5.8.2 Other Service OTA Lead

When another service OTA leads the MOT&E, Marine Corps inputs are either fully integrated within the TEMP or as a Marine Corps appendix is included in the TEMP. In either case, the MCOTEA input shall clearly address unique Marine Corps issues, requirements, and concerns with the planned test program. This input shall provide the basis for any USMC-unique testing that might be required. MCOTEA leads any USMC-unique testing that is required and participates in other parts of the evaluation as appropriate. MCOTEA shall conduct a Marine Corps-only OTRB prior to Marine participation in an MOT led by another service. MCOTEA shall approve and sign both the TEMP and the final test report for any MOT&E that involves Marine Corps issues or resources.

3 Activities Supporting the Requirements Development Support and Transition Process, and the Materiel Development Decision



3.1 Overview

A capability is the ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks. It is defined by an operational user and expressed in broad operational terms in the format of an ICD or joint DOTMLPF Change Recommendation (DCR). In the case of materiel solutions, the definition will progressively evolve to DOTMLPF performance attributes identified in the CDD and the CPD.

Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01, *Joint Capabilities Integration and Development System*, establishes the policies to develop capabilities using JCIDS within DOD. MARADMIN 621/05 assigns DC, CD&I the authority and responsibility to conduct CBP for the Marine Corps. Marine Corps Order (MCO) 3900.15, *Marine Corps Expeditionary Force Development System (EFDS)*, establishes the policies to conduct CBP consistent with JCIDS within the USMC.

EFDS is a collaborative process led by MCCDC and involving stakeholders from Headquarters Marine Corps, the Operating Forces and the Supporting Establishment. MCSC/PEO-LS and MCOTEA support EFDS by providing subject matter experts.

3.2 EFDS

EFDS is a deliberate, four-phased process that is executed cyclically and is synchronized with the Planning, Programming, Budgeting, and Execution System and the Defense Acquisition System.

Phase I (Capabilities Analysis) includes the first two activities of the CBA. The first of these activities identifies current and future required capabilities and tasks to execute Marine Corps operating and enabling concepts, the conditions under which these tasks shall be performed, and the performance standards that must be achieved. MAGTF capabilities will be published in the MAGTF Capabilities List. The second activity identifies capability gaps and excesses in current Marine Corps capabilities and naval capabilities required to provide them.

Phase II (Solutions Analysis) identifies strategies for eliminating capability gaps; publication of a SPD detailing how the Marine Corps will implement the preferred solutions; and a MAGTF Requirements List prioritizing existing programs and new initiatives for consideration during the next program objective memorandum (POM) cycle.

Phase III (Program Development) includes the preparation and submission of the Warfighting Investment Program Evaluation Board (WIPEB) and Training Program Evaluation Board inputs to the Marine Corps POM.

Phase IV (Capabilities Implementation and Transition) includes all aspects of delivering coherent and fully integrated warfighting capabilities to the operating forces. Materiel and non-material initiatives that were recommended for funding by the WIPEB and approved in the POM are developed in Phase IV. Initiatives may also be executed if they can be funded using current year funding resources.

3.3 Requirements Development Support and Transition (RDST) Process

Recommended materiel solutions, once approved, lead to acquisition programs. Marine Corps materiel acquisitions are managed using the Defense Acquisition System as outlined in DOD Instruction (DODI) 5000.02 and SECNAVINST 5000.2E. For such programs, at each acquisition milestone, JCIDS documents are provided that will guide the subsequent development, production and testing of the program.

Transitioning user requirements into an acquisition program is a coordinated MCCDC and the Acquisition Leads effort conducted via the RDST Process. Representatives of the DT community and MCOTEA are members on the RDST Team to provide T&E expertise and advice during the requirements development process. Additionally, they advise the MDA on the T&E aspects of proceeding with a materiel solution.

MCCDC will determine if SMEs, to include the T&E WIPT, are required to support EFDS events and will provide task information to the Acquisition Leads and MCOTEA via the Marine Corps Automated Tasker System. EFDS events supported may include the Capability Analysis, Solutions Analysis, Initial Technical Review, Alternative Systems Review and Gate Reviews.

The MCSC RDST Process Handbook describes how MCSC will support MCCDC in CBP and how approved JCIDS requirements are formally transitioned to MCSC for implementation.

The MCSC focal point for the RDST Process is the Requirements Transition Officer (RTO), who assigns support requests to a Product Group and Program Manager through the Command Automated Tasker System. The Program Management Office will provide SMEs to support EFDS process events.

3.4 Identification of Required Combat Capabilities

3.4.1 Capabilities Documentation IPT

The purpose of holding IPTs during the capabilities development process is to pull key players together to obtain a mutual understanding of capabilities and requirements that are needed to address identified shortfalls. These meetings will provide a structured approach to gathering information and supporting documentation essential to developing capabilities documents. The permanent members of the Capabilities Documentation IPT shall include representation from each member of the Triad. A template for the Capabilities Documentation IPT charter is located in the CDD Handbook.

3.4.2 ICD for ACAT Programs

The ICD defines the capability gap(s) in terms of the functional area, the relevant range of military operations, desired effects, time, DOTMLPF, and constraints. It supports the work required to refine the initial concept, and should help shape the end-state objectives for the initial T&E strategy development documented in the TES. A CBA uses relevant parameters and associated metrics to quantify the key characteristics (attributes) of systems and/or forces to determine how capable they are of performing those critical tasks needed to accomplish future military objectives.

Before the ICD is finalized by MCCDC, it is staffed through the Capabilities Documentation IPT for review and comment.

3.4.3 Draft DODAF Architectures

The current EFDS order (MCO 3900.15B) references DODAF 1.5 architecture requirements by phase and is still applicable until the new "DODAF 2.0 architecture viewpoints" are mapped to the appropriate EFDS phase in the next update of MCO 3900.15B.

In EFDS Phase I, the High-level Operational Concept Graphic (OV-1), the Organizational Relationships Chart (OV-4) and the Operational Activity Model (OV-5) are developed to: illustrate the operational concept being developed during the first activity of Phase I (required capabilities); depict the operational nodes, commands and organizations; and explain the activities that occur between organizations in an operational context.

During the second activity of Phase I (capability gaps), a comparison of the existing OV-5 to the OV-5 developed during the first activity of Phase I will identify activities no longer required. By cross referencing those deleted activities to the Operational Activity to Systems Function

Traceability Matrix (SV-5), the second activity of Phase I will assist in the identification of systems that would be candidates for deletion as being in excess. Prioritized warfighting gaps and shortfalls identified in the second activity of Phase I will serve as the baseline for the Solutions Analysis Phase in Phase II.

Phase II creates the Operational Resource Flow Description (OV-2), the Operational Information Exchange Matrix (OV-3), and the Operational Event-Trace Description (OV-6c) products. A new SV-5 will be created to identify the relationships between new operational activities and existing systems, and the difference will lead to the identification of new systems requirements not already in the inventory. These products will support the selection of the desired course of action leading to the development of the SPD. In the creation of the SPD, one or more Systems Interface Description (SV-1) and Systems Functionality Description (SV-4) shall be developed to identify the interfaces and functionality desired in the new system.

No specific architecture products are identified during Phase III, Program Development, which is primarily a prioritization and resourcing phase. However, products already created may be useful in assisting in the selection and justification of selection of priorities. During this Phase, capabilities and material developers will be able to begin development of products required in Phase IV, Capabilities Implementation and Transition.

3.4.4 Draft CONOPS and/or COE

The draft CONOPS (if required) and COE are developed in conjunction with, and summarized in, the ICD. Before these are finalized by MCCDC, they are staffed through the Capabilities Documentation IPT for review and comment.

For smaller programs that are defined by a SON, the COE is developed and approved by MCCDC in conjunction with the SON. These concepts are critical to the PM to ensure the system design will meet the intended operational capabilities required by the USMC. The Acquisition Leads and MCOTEA shall use these documents to help scope the DT and OT test programs, respectively, to incorporate realistic operational environments.

3.5 Gate 1 Review

The Gate 1 Review will grant authority for an ICD to be submitted for joint review, validate proposed AOA Guidance and authorize a program to proceed to the MDD.

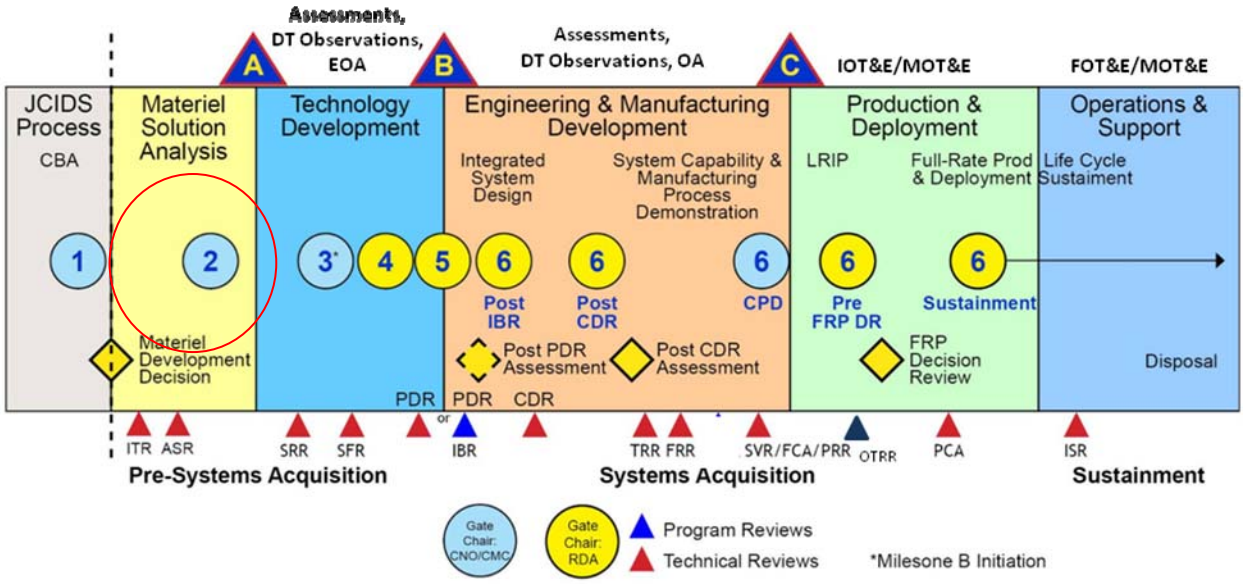
The Naval Probability of Program Success (PoPS) T&E criterion for the Gate 1 Review is that the AOA alternatives can be evaluated.

3.6 Materiel Development Decision (MDD) Review

The MDD Review is the formal entry point into the acquisition process and shall be mandatory for all programs. At the MDD Review, the Joint Staff shall present the JROC recommendations and MCCDC (or the DOD Component) shall present the ICD. MCCDC (or the DOD Component equivalent) shall also propose study guidance for the AOA.

The MDA shall approve the AOA study guidance, determine the acquisition phase of entry, identify the initial review milestone, and designate the lead DOD Component. MDA decisions shall be documented in an ADM. Following the MDD, the MDA may authorize entry into the acquisition management system at any point consistent with phase-specific entry criteria and statutory requirements.

4 Activities Supporting the Materiel Solution Analysis Phase and Milestone A



4.1 Overview

The purpose of the Materiel Solutions Analysis phase is to assess potential materiel solutions and to satisfy the phase-specific entrance criteria for the next program milestone designated by the MDA. Although the program may conduct some testing during this phase, the main thrusts are to establish the T&E WIPT, evaluate existing test data, support the AOA and prepare the TES for Milestone A.

The Materiel Solution Analysis Phase begins with the MDD Review. The Materiel Solution Analysis Phase ends when the AOA has been completed, materiel solution options for the capability need identified in the approved ICD have been recommended by the AOA IPT, and the phase-specific entrance criteria for the initial review milestone have been satisfied.

4.2 Identification of Required Combat Capabilities

For materiel approaches, the ICD guides the Materiel Solution Analysis and the Technology Development phases of the acquisition process and supports the MDD and Milestone A acquisition decision.

4.2.1 Draft CDD for ACAT Programs

Once the MDD is made, work on the draft CDD should commence. The draft CDD is the sponsor's primary means of defining authoritative, measurable, and testable capabilities needed by the warfighters to support the EMD phase of an acquisition program. Development of the

CDD shall be guided by applicable Joint Capabilities Documents (JCDs), the ICD, integrated architecture products, the AOA, and the Technology Development Strategy (TDS). The CDD captures the information necessary to deliver an affordable and supportable capability using mature technology within one or more increments of an acquisition strategy. The CDD shall include a description of the DOTMLPF and policy impacts and constraints.

The CDD (when approved) shall provide the operational performance attributes necessary for the acquisition community to design a proposed system(s) and establish a program baseline. It identifies the performance attributes, including KPPs, to guide the development and demonstration of the proposed increment(s). The performance attributes and KPPs shall apply only to the designated increment(s). If the plan requires a single step to deliver the full capability, the KPPs shall apply to the entire system(s). Each increment shall provide a safe, operationally effective, suitable, and useful capability in the intended mission environment that is commensurate with the investment and independent of any subsequent increment. Before the CDD is finalized by MCCDC, it is staffed through the Capabilities Documentation IPT for review and comment.

4.2.2 CONOPS and COE

The CONOPS (if required) and COE are refined and updated in the draft CDD. Before these three documents are finalized by MCCDC, they are staffed through the Capabilities Documentation IPT for review and comment.

4.2.3 Draft DODAF Architectures

MCSC Acquisition Policy Letter 11-02 established the Deputy Commander, C4I as the responsible authority for the Information Support Plan (ISP) Completion Process. The Director, MAGTF and Joint Integration and Certification (M&JIC) should have a representative on the T&E WIPT as a stakeholder for interoperability requirements and certification and to develop the required Integrated Architecture Products.

The current EFDS order, MCO 3900.15B, references DODAF 1.5 architecture requirements by phase and is still applicable until the new "DODAF 2.0 architecture viewpoints mapped to the appropriate EFDS phase in the next update of MCO 3900.15B.

In the EFDS Phase IV, the SVs shall be developed to aid acquisition planners and program managers in development of acquisition strategies, JCIDS documentation, and T&E plans. A Logical Data Model (OV-7) shall be required in order to assist in the alignment of the specific program to the overarching data strategy and to address interoperability concerns. A System-to-System Matrix (SV-3) shall also assist in the evaluation of interoperability. Technical Views and a Systems Evolution Description (SV-8) shall also be developed during this Phase in order to complete the document array for Milestone Decision purposes.

4.3 Formation/Standup of the T&E WIPT

A T&E WIPT shall be established for all USMC acquisition programs (to include AAPs) to develop the T&E strategy and guide the T&E program. T&E WIPT shall be formed as soon as

the MDD decision is made to acquire a materiel solution to fill a gap in warfighting capability. The PM charters the T&E WIPT.

The T&E WIPT is responsible for defining the scope and concept of the test program, establishing the overall program test objectives, and managing test program funds and coordination. In addition, the T&E WIPT shall be responsible for creating and managing the TEMP and planning and managing any special test requirements for the program.

The T&E WIPT shall also review, evaluate, approve, and release for distribution contractor-prepared test plans and reports, and review and coordinate all appropriate government test plans. After the system is produced, the T&E WIPT shall be responsible for supporting production acceptance testing and the test portions of later increments, and modifications or enhancements to the weapon system.

4.3.1 Organization

The T&E WIPT membership will vary depending on program requirements. The PMT shall take the lead in forming the T&E WIPT with the appropriate representatives that have a stake in the program. The team should consist of members with expertise from the PMT, MCOTEA, ASN (RD&A), MCCDC, the Acquisition Lead, MCTSSA, Joint Interoperability Test Command (JITC), OSD (if on oversight), contractor, developer, and other stakeholders as required. There is no cookie cutter organizational structure that will apply to all programs; however, representatives from the "Triad" shall make up the core of the team. The T&E WIPT shall be chaired by the Acquisition Lead.

4.3.2 Charter

A formal T&E WIPT charter shall be developed soon after the MDD is made. The charter identifies the T&E WIPT membership; outlines responsibilities of the group, as well as individual members; and defines the products the T&E WIPT shall produce (e.g., TES, TEMP or STES). The charter should also outline the processes the group shall use to resolve T&E issues. A template for a T&E WIPT charter is provided in the MCSC Annex.

4.3.3 Responsibilities

One of the primary responsibilities of the T&E WIPT is to develop the T&E strategy and draft the TES and TEMP for the program. However, the group's responsibilities go beyond just T&E documentation. The T&E WIPT guides and provides oversight of the entire T&E effort. The T&E WIPT should meet on a regular schedule to discuss and resolve planning and resource issues, review T&E progress, and amend test strategies when there are programmatic changes. During test execution, the T&E WIPT should meet more frequently to ensure the test strategy is being properly implemented, monitor test progress, and react to unforeseen issues as they arise.

4.4 Integrated T&E Planning

A collaborative planning and evaluation approach is formulated very early on, with MCCDC involving the Acquisition Lead and MCOTEA during the draft phases of the capabilities documentation, as depicted in Figure 4.1.

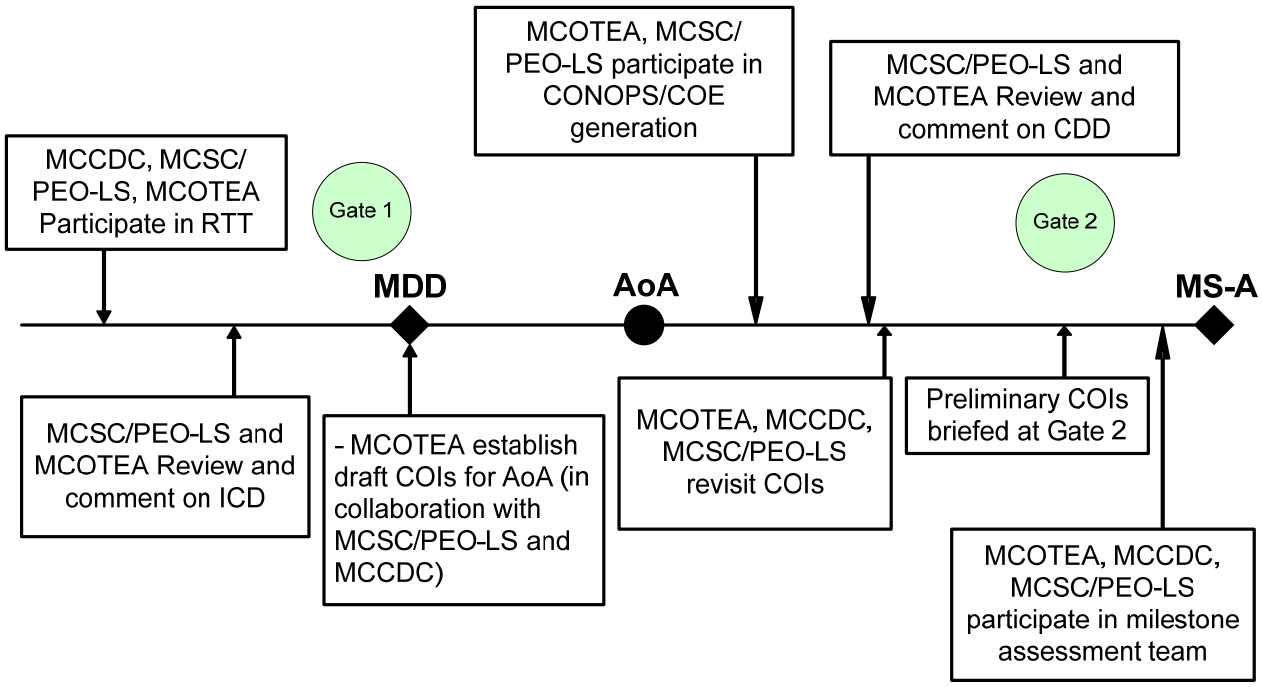


Figure 4.1 - Triad interaction prior to Milestone A

As shown in Figure 4. 1, The Acquisition Lead and MCOTEA involvement (the MCOTEA S-2 coordinates early MCOTEA involvement) begins with the standup of the Requirements Transition Team and T&E WIPT prior to Milestone A. MCOTEA, in collaboration with the T&E WIPT, provides a draft version of the COIs for use by the AOA as described below. After the AOA, the COIs are revisited and the preliminary COIs are briefed at the Gate 2 review.

In general, the Acquisition Lead, MCOTEA, and MCCDC shall participate in one another's SME panels throughout the life of a program. At this stage in the acquisition cycle, the Acquisition Lead and MCOTEA shall be involved in any SME panels used by MCCDC to help generate required capabilities, and shall review and comment on the draft program documentation (ICD, CDD, CPD, DODAF Architectures, COE, and CONOPS). Although the ICD, CDD, and CPD are individual documents, the others may be either individual documents or they may be included as appendices in the capabilities documentation. MCCDC oversees the generation and maintenance of these documents.

Involving the Acquisition Lead and MCOTEA early in the concept development stage provides several advantages to the Marine Corps acquisition process:

- It allows the Acquisition Lead to comment on the readiness of technology being considered to support the requirements and capabilities under consideration;
- It allows both MCOTEA and the Acquisition Lead to comment on the testability of requirements and capabilities under consideration;
- It allows MCOTEA to investigate, and in some cases initiate, programs to address appropriate testing capabilities, technology, and venues to test the new system; and

- It provides both the Acquisition Lead and MCOTEA with important contextual information so that both commands have a deeper understanding of the genesis and intent of the program capabilities and operational concept documentation.

Finally, to accomplish the desired level of collaboration, it is expected that MCCDC, the Acquisition Lead, and MCOTEA shall participate in all milestone assessment teams, including those associated with Milestone A, and any SME panels convened by any one of the commands in support of the program under development.

4.5 Evaluation Framework Objectives

The Acquisition Lead and MCOTEA assist MCCDC in developing the CDD in order to ensure the requirements will be attainable as well as testable. As the requirements become more defined, testers shall use them to develop the draft COIs and identify technological risks or CTPs that are essential to the system design. These will be used as the basis for establishing the initial evaluation framework.

4.5.1 Definition of Program Success

MCOTEA uses mission-based testing when executing operational testing. Evaluations are based on a determination of Mission Capability Level (MCL) for each mission. MCOTEA defines a system to be fully mission capable for a mission if it equals or exceeds the MCL corresponding to the threshold values in the capabilities documentation. This point corresponds to 80 on the vertical scale in Figure 4.2. The system is partially mission capable if its MCL is lower than that established by the threshold values, but greater than the mission capability corresponding to existing capabilities (50 on the vertical scale of Figure 4.2). If the system has a mission capability lower than the existing mission capabilities, the system is not an improvement over current capabilities, but may still be justified by other aspects of the system, such as lower cost or overcoming technological obsolescence. Systems should achieve the Fully Mission Capable level, defined as the level that equals or exceeds the established threshold values.

The determination of Operational Effectiveness (OE), Operational Suitability (OS), and Operational Survivability (OSur) is based on a determination of the average of the MCLs corresponding to each COI and are determined by answering the following questions:

- Is the OE of the XXX system adequate to achieve an average MCL score of at least 80 out of 100?
- Is the OS of the XXX system adequate to achieve an average MCL score of at least 80 out of 100 when OE and OSur are held constant at threshold levels?
- Is the OSur of the XXX system adequate to achieve an average MCL score of at least 80 out of 100 when OE and OS are held constant at threshold levels?

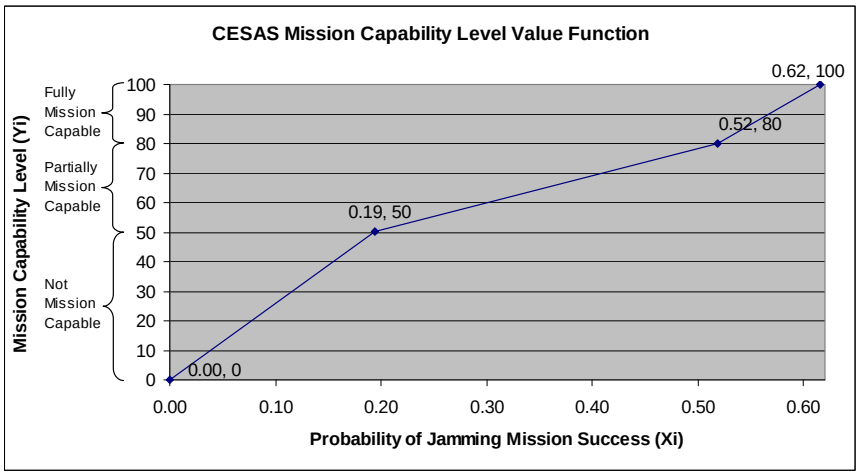


Figure 4.2 - Example Mission Capability Level Value Function.

4.5.2 Critical Operational Issues (COIs)

The COIs are high-level questions derived from the missions the system is expected to accomplish. Generating the evaluation framework involves determining the tasks that support the COIs (each task is associated with a COI, although a single COI may be associated with more than one task), determining the subtasks that support the tasks, and tracing system attributes to the subtasks and tasks. Lower level evaluation questions (Issues) are then posed based on the tasks and subtasks under associated test conditions. The conditions can be the result of the anticipated physical environment (e.g. sea state, terrain, weather), the military environment (e.g. forces assigned, threat, command relationships), or the civil environment (e.g. political, cultural, economic factors).

Each COI and Issue shall have MOEs, MOSs and MOPs associated with them, as appropriate. Wherever possible, the evaluation questions shall be associated with a quantifiable standard derived from the capabilities documentation. This exercise also allows the T&E WIPT to understand the testing that needs to be accomplished in order to properly evaluate the system for operational effectiveness, suitability, and survivability as well as the system's impact on combat operations.

In addition, as part of the system evaluation, MCOTEA is required to report on the system satisfaction of thresholds in the capabilities documentation. The goal is to examine these thresholds before IOT, although it is possible some thresholds will have to be specifically examined under the operational conditions of IOT.

4.5.3 Key Performance Parameters (KPPs)

KPPs are those capabilities that leadership considers of such significance that, if not demonstrated, are reason for program reassessment or possible termination. KPPs are identified in JCIDS documentation. Some KPPs have been mandated for all applicable programs by DoD, such as "Net Ready" KPP, "Survivability" KPP, "Force Protection" KPP, and "Sustainment"

KPP. CJCSI Manual 3071.10 addresses mandatory KPPs. Note that required or mandatory KPPs may not be applicable to every system.

4.5.4 Key System Attributes (KSAs)

KSAs are system or subsystem capabilities with priority to leadership for cost, schedule or performance insight but do not meet criteria for KPPs.

4.5.5 Critical Technical Parameters (CTPs)

Chapter 9 of the DAG defines CTPs as "measurable critical system characteristics that, when achieved, enable the attainment of desired operational performance capabilities. They are not simply a restatement of the KPPs and/or KSAs."

T&E programs may have thousands of technical parameters that must be assessed to support specification compliance and system evaluations; however, not every technical parameter is a CTP. CTPs shall link to operational requirements and ultimately the COIs. CTPs should highlight risk areas or critical design features (e.g., RAM issues, technical maturity, etc.) that if not met or resolved during system development, will prevent the achievement of required operational capabilities. Chapter 9 of the DAG provides further guidance on developing CTPs.

4.5.6 Measures of Effectiveness (MOEs)

MOEs are metrics of the overall degree of a system's capability to achieve mission success considering the total operational environment. A meaningful MOE must be quantifiable and measure the degree to which a real objective is achieved.

4.5.7 Measures of Supportability (MOSs)

MOSs are metrics to measure the extent to which the system integrates well into the operational environment and considers such issues as supportability, Human Systems Integration and maintainability.

4.5.8 Measures of Performance (MOPs)

MOPs are metrics characterizing physical or functional attributes relating to the execution of the mission or function. They quantify a technical or performance requirement directly derived from MOEs and MOSs.

4.6 Analysis of Alternatives (AOA)

The purpose of the AOA is to assess potential materiel solutions to satisfy the capability needs documented in the approved ICD. The AOA focuses on identification and analysis of alternatives, measures of effectiveness, cost, schedule, concepts of operations, and overall risk. The AOA assesses the critical technology elements (CTEs) associated with each proposed materiel solution, including technology maturity, integration risk, manufacturing feasibility, and where necessary, technology maturation and demonstration needs and impact to training and manning levels. To achieve the best possible system solution, emphasis is placed on innovation and competition. Existing commercial off the shelf (COTS) functionality and solutions drawn from a diversified range of large and small businesses shall be considered.

4.6.1 AOA Guidance and Planning

As part of the MDD Review, MCCDC (or the DOD Component equivalent) proposes study guidance for the AOA. At the MDD, the MDA approves the study guidance and documents the decision in an ADM. Following approval of the study guidance, MCSC (AC PROG) for programs within MCSC portfolio, prepares an AOA study plan to assess preliminary materiel solutions, identify key technologies, and estimate life-cycle costs. MCSC (AC PROG) may also provide that service to PEO LS upon request.

4.6.2 AOA Development

MCOTEA, in consultation with the T&E WIPT, uses the draft capabilities, system threat assessment, COE, and CONOPS documentation to construct a draft set of COIs. These COIs shall be used by the AOA IPT to help construct the categories for effectiveness comparisons in the study. After the AOA, the COIs may be adjusted based on the analysis conducted in the AOA as well as updated information in the latest versions of the draft capabilities, COE, and CONOPS documentation.

Incorporating the draft COIs into the AOA study provides the advantage of using the same basic critical operational issues to evaluate system alternatives in the AOA that are eventually used in the operational test and evaluation of the system. However, this draft set of COIs, briefed at the Gate 2 review, may need to be updated based on the updated capabilities documentation, concept of employment, and concept of operation. Therefore, prior to the Gate 3 review, the COIs are revisited and updated based on the most recent information available. These COIs are then briefed as "initial" COIs at the Gate 3 review. Prior to the Gate 4 review, the COIs are again updated with the most recent and final information and the "final" COIs are briefed at the Gate 4 review.

4.7 Determining Program Requirements for OT&E

The level of OT&E required for a program is mandated by law (Title 10 USC 2399) and DODI 5000.02, and is dependent on its acquisition category as described below. This section describes the level of operational testing required for the different program designations.

4.7.1 ACAT Programs

The ACAT of a program is designated based on cost and/or MDA designation as special interest. A program's ACAT level determines both the level of review required by law and the level at which the MDA resides in DOD. In fact, all ACAT programs require OT&E with the exception of those programs designated either ACAT IV (M) or an AAP.

4.7.2 ACAT IV (M) Programs and AAPs

In some cases, a program does not require formal OT&E and is designated either an ACAT IV (M) or AAP. If MCOTEA concurs that a program does not need formal operational testing, MCOTEA is required to explicitly, and in writing, state the reasons that a program does not require IOT&E. MCOTEA may decide that, while formal, independent IOT&E is not required, MCOTEA participation is still warranted. In these cases, the endorsement shall be contingent on a level of MCOTEA participation specified in the endorsement.

4.7.3 Quick Reaction Programs

When a system must be fielded quickly, MCOTEA uses an abbreviated process to expedite its system evaluation and a QRA is executed. The execution of a QRA does not replace the scheduled operational testing as approved in the TEMP for programs of record. Systems in Rapid Deployment Capability status, as approved by ASN (RDA), will normally undergo formal OT&E if they transition to program status.

4.8 Test and Evaluation Strategy (TES)

The PM, utilizing the T&E WIPT, shall develop a TES to support the Milestone A decision. The TES describes the overall test approach for integrating developmental, operational, and live-fire T&E and addresses test resource planning. The TES satisfies the statutory requirement for a test plan in the Technology Development Strategy (TDS). It also provides a road map for evaluations, integrated test plans, and resource requirements necessary to accomplish the Technology Development phase objectives.

The TES shall include the identification and management of technology risk and the evaluation of system design concepts against the preliminary mission requirements resulting from the AOA. Test planning shall address the T&E aspects of competitive prototyping, early demonstration of technologies in relevant environments, and the development of an integrated test approach.

The TES shall describe anticipated T&E concepts to be used in all phases of the integrated testing program with an emphasis on the Technology Development phase. This is intended to support the resolution of issues with the draft capabilities documentation, COE, and/or CONOPS by ensuring inputs from the operational perspective are included in resolving those issues. For both DT and OT events prior to Milestone B, the TES shall identify objectives, scope, and funding, as well as overall evaluation strategy.

The TES shall establish the strategy for collecting, validating, and sharing test data throughout program testing. It is important to anticipate how DT data will be used in support of operational testing objectives and to ensure that the DT data will be usable in accomplishing those objectives. This shall generally be addressed in the RFP and included as a contract deliverable. To the extent that reliability growth is anticipated and measured, the process and required data shall be described in the TES.

The TES shall take advantage of existing DOD test ranges and facilities to the maximum extent practical. To the extent that the system testing concept contains special requirements, the TES shall describe the special requirements that may include large test ranges, supporting forces, threat simulators or systems, new instrumentation, non-standard operating hours, environmental testing, maintenance demonstrations, testing profiles, or anything else unique or unusual.

The TES shall describe the anticipated Modeling and Simulation strategy in support of DT & OT and shall describe the verification and validation concepts to be used. The method of accreditation shall also be described along with the accrediting agency.

The format template for the TES can be found in the Defense Acquisition Guidebook Chapter 9.

4.8.1 Early T&E Resource Requirements Identification

The process of identifying resources required to execute T&E begins during the EFDS process and program submission into the POM. T&E resource requirements are refined through the AOA and identified in the TES. As the T&E WIPT further refines the T&E program, estimated resource requirements are continually updated in the TEMP to ensure successful implementation.

The TES shall describe all key test and evaluation resources needed while planning to take full advantage of existing DOD investments in ranges, facilities, and other relevant resources whenever practical. If new technology is needed to provide an adequate test, the TES should identify these needs and action should be initiated to address these needs in time for the required test. Care should be taken to identify and arrange for any long-lead-time items early on, if known.

The following shall be addressed in the TES:

- Required prototypes and other test articles;
- Test ranges and other required facilities;
- Any new required test range technology development;
- Test support personnel, special test equipment, analysis equipment, other types of test support;
- Threat representation, type, number, availability;
- Test targets and expendables;
- Required support from Marine operating forces;
- Models, Simulations, and Test beds;
- Live, virtual, and constructive components of the test environment;
- Any special requirements; and
- Initial estimates of DT&E, OT&E, and LFT&E funding requirements.

4.8.2 Prototyping and Competition

The Weapon Systems Acquisition Reform Act of 2009 requires that "the acquisition strategy for each major defense acquisition program provides for two or more competing teams to produce prototypes before Milestone B approval" unless waived by the MDA. Additionally, the Under Secretary of Defense for Acquisition Technology and Logistics memorandum of 19 September 2007 requires all ACAT programs to consider acquisition strategies and funding requirements to provide for two or more competing teams to produce technically mature prototypes through Milestone B. Competing teams producing prototypes of key system elements will reduce technical risk, validate designs, validate cost estimates, evaluate manufacturing processes and refine requirements.

4.9 Technology Development Strategy (TDS)

The TDS is the precursor to the Acquisition Strategy and documents the rationale for adopting an evolutionary strategy (the preferred approach) or using a single-step-to-full-capability strategy (e.g., for common supply items or COTS items). For an evolutionary acquisition, the TDS shall include a preliminary description of how the materiel solution will be divided into acquisition increments based on mature technology and an appropriate limitation on the number of prototype

units or engineering development models that may be produced in support of a Technology Development Phase. Refer to DODI 5000.02 and the MCSC Annex for more information on the TDS.

4.10 Gate 2 Review

The Gate 2 Review will occur after completion of the AOA and prior to a program submitting Milestone A documentation. It will review AOA cost estimates, conclusions and recommendations; approve preferred alternatives; provide approval to develop a CDD and COE/CONOPS; and authorize a program to proceed to the next event (i.e., to Gate 3 when program initiation at Milestone A, or to Milestone A when program initiation will be at Milestone B).

The Naval PoPS T&E criteria for the Gate 2 Review are:

- Key stakeholders for the T&E WIPT have been identified;
- Plan of Actions and Milestones in place to develop the TES;
- Pre-Milestone B test schedule is integrated into the program master schedule;
- T&E resources have been identified and are available;
- T&E costs have been identified; and
- KPPs, KSAs and CTPs are measurable and testable

4.11 Gate 3 Review

The Gate 3 Review may occur before or after Milestone A, depending on the program initiation milestone entry point. It will grant authority for a CDD to be submitted for joint review, approve a COE/CONOPS, validate the SDS Development Plan, and review program health for satisfactory costs, risks and budget adequacy.

The Naval PoPS T&E criteria for the Gate 3 Review are:

- T&E WIPT has been formed;
- TES is approved and aligned with the Systems Engineering Plan (SEP) and acquisition strategy;
- T&E schedule is integrated into the program master schedule;
- T&E execution is on or ahead of schedule;
- T&E resources have been assessed and mitigation plans established; and
- T&E costs have been identified.

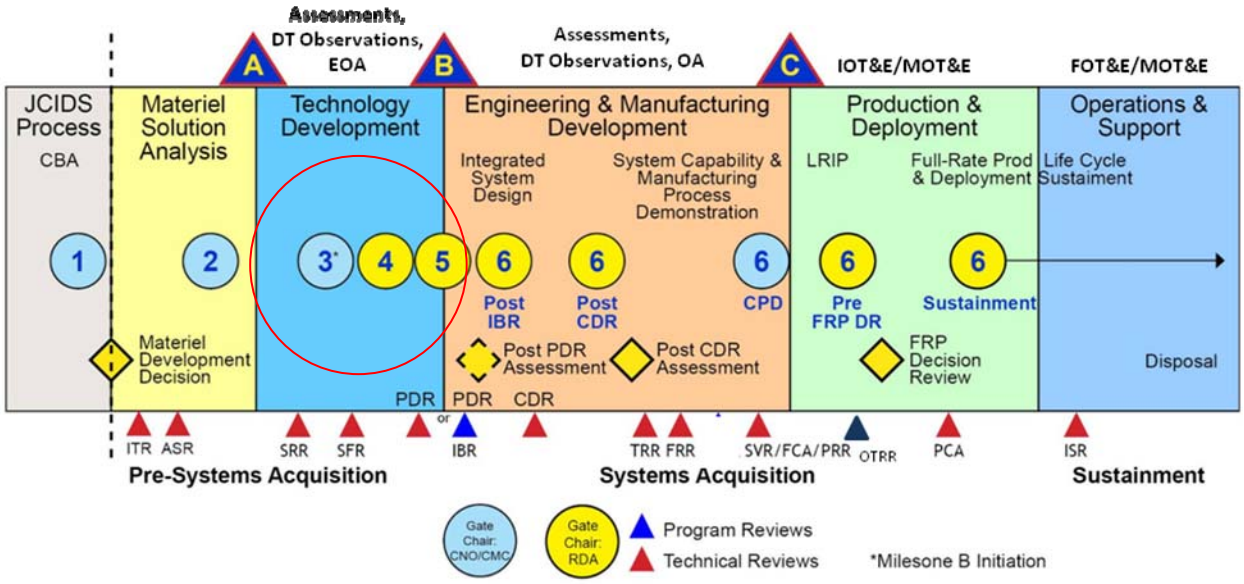
4.12 Milestone A Decision Review

The Materiel Solution Analysis Phase ends when the AOA has been completed, materiel solution options for the capability need identified in the approved ICD have been recommended by the lead DOD Component conducting the AOA, and the phase-specific entrance criteria for the initial milestone review have been satisfied.

At Milestone A, the MDA shall review the results of the AOA, the proposed materiel solution, the TES and the draft TDS. The Technology Development Phase begins when the MDA has

approved a materiel solution, the TES and the TDS, and has documented the decision in an ADM.

5 Activities Supporting the Technology Development Phase and Milestone B



5.1 Overview

The purpose of the Technology Development phase is to reduce technology risk, determine and mature the appropriate set of technologies to be integrated into a full system, and to demonstrate CTEs on prototypes. Developmental testing during this period is most often conducted on components, subsystems, brass board configurations or advanced development prototypes to evaluate the potential application of technology and related design approaches before EMD.

During this phase, the program becomes defined as the PMT pursues one or more concepts or design approaches. The PMT uses testing to refine assessments of the advantages and disadvantages of alternative concepts. Prototype testing, an FUE or an EOA , to include the use of modeling and simulation, may be conducted to reduce risk so that technology, manufacturing, and support risks are well in hand before the next decision point.

A Milestone B decision follows the completion of Technology Development.

5.2 Identification of Required Combat Capabilities

Integrated architectures, the ICD, the AOA, and technology development strategies provide the required capabilities and guide the development of the CDD.

5.2.1 CDD – ACAT Programs

The draft CDD shall be validated and approved before Milestone B. The CDD specifies the attributes of a system in development. These shall provide or contribute to the operational capabilities that are inserted into the performance section of the acquisition strategy and the APB. All CDD KPPs and KSAs are inserted verbatim into the APB. MOEs and MOSs, developed for the initial TEMP, are based on the performance attributes and KPPs identified in the CDD. Before the CDD is finalized by MCCDC, it is staffed through the Capabilities Documentation IPT for review and comment.

5.2.2 CONOPS and COE

The CONOPS (if required) and COE are refined and updated in the draft CDD. Before these are finalized by MCCDC, they are staffed through the appropriate Capabilities Documentation IPT for review and comment.

5.2.3 DODAF Architectures

System technical views (DODAF 1.5) or viewpoints (DODAF 2.0) shall be refined as the system matures and the ISP is developed.

5.3 Integrated T&E Planning

The collaborative approach involving the stakeholders continues between Milestone A and Milestone B as depicted in Figure 5.1. The biggest hurdles facing the T&E WIPT during the Technology Development Phase are participation in prototype demonstrations to support source selection and to obtain approval of the TEMP.

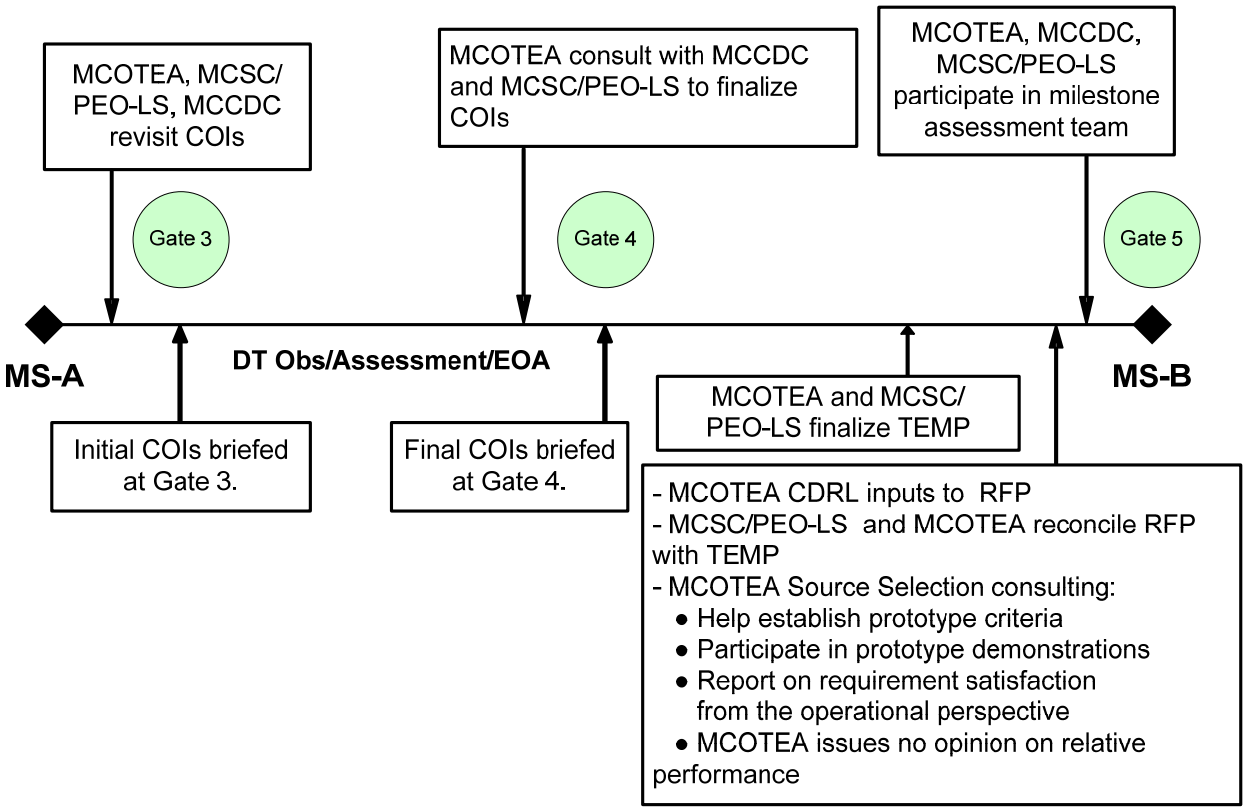


Figure 5.1 - Triad interaction between Milestone A and Milestone B

At milestone A (and each subsequent milestone), the PM shall distribute copies of the ADM to MCCDC and MCOTEA ensuring all parties continue to be informed of program progress.

The Acquisition Lead and MCOTEA work together to complete the evaluation framework for incorporation into the TEMP by efficiently assigning attributes and issues associated with subtasks and tasks for examination in relevant DT and OT tests and assessments. The goal is to examine all thresholds in the capabilities documentation, including those requiring certifications, in a way that meets OT requirements prior to IOT, as well as build a database to support the suitability determination. This will allow the test teams to focus on testing the system design and assessing mission performance under operational conditions. In addition to examining thresholds in the capabilities documentation, the test data gathered prior to IOT, including contractor-led DT, government-led DT, MCOTEA assessments and operational assessments and testing, may also be used to support the determination of COI satisfaction; determination of operational effectiveness, suitability and survivability; and to assess the new program's impact to combat operations.

The T&E WIPT shall ensure the RFP is consistent with the TEMP, the capabilities documentation, the System Threat Assessment, and the COE, and shall provide inputs to the CDRLs of the RFP before it is released. In particular, the RFP shall ensure any contractor developmental test data and reports shall be available for inspection and possible inclusion in the

overall system evaluation. The Acquisition Lead shall consult with MCOTEA when determining the source selection criteria. MCOTEA may observe any prototype demonstrations associated with source selection after which MCOTEA shall provide input to the Acquisition Lead from the operational test perspective; no MCOTEA opinion as to relative candidate system performance is expected or shall be given.

5.3.1 Incorporation of operational relevance into DT&E planning

There will be test data that must be collected during developmental testing that will not be useable to all stakeholders. However, in order to be more efficient in the T&E process, it is essential for the scope of the developmental tests to include as much operational realism as possible. This will allow all testers to leverage early testing opportunities during DT for use in overall system evaluation. This also maximizes the amount of information available to all stakeholders, while minimizing risk and the cost of the entire testing program to facilitate the integrated testing approach.

The T&E WIPT shall review COIs, tasks, subtasks, issues, attributes, and measures with the system PM. It is useful to compare the MCOTEA Requirements Traceability Report/Test Framework with the PM's RTM to ensure consistency between the two documents. This will enable the development of robust, accurate, and relevant documentation in support of integrated testing. To this end, the RTM shall be included in the TEMP as an annex.

The end result is an integrated plan of testing for DT and OT that will result in accumulating the data necessary to: determine if thresholds in the approved CPD and critical operational issues have been satisfied; determine the operational effectiveness, suitability, and survivability of the system under realistic operational conditions, including joint combat operations; assess the impact of the system to combat operations; and provide additional information on the system's operational capabilities.

5.3.2 Guidelines for MCOTEA use of DT results

Generally speaking, MCOTEA shall attend any test event where the DT data generated by the event may be used by MCOTEA. There may be instances when MCOTEA is unable to attend a given DT event. MCOTEA can still use test data from the DT event under the following circumstances:

- MCOTEA has a copy of the test plan;
- The test is witnessed by a government representative (can be a contractor representing the government) familiar with the program being tested;
- The government representative records detailed observations of the test;
- All deviations from the test plan are noted by the government representative;
- The government representative is available to answer MCOTEA questions after the test;
- MCOTEA has access to all recorded test data, the configuration of the test asset, and the actual test conditions under which each element of test data was obtained; and
- MCOTEA receives copies of all reports generated by the DT test team.

Whether the test is witnessed by MCOTEA personnel or not, the DT data may still be used to determine the extent to which thresholds in the capabilities documentation are met, and the DT data may also be used to help determine OS and Osur. In any case, MCOTEA and the T&E WIPT shall use DT data to indicate a system's progression toward overall readiness for OT.

5.3.3 Integration of Developmental and Operational Testing

Most program testing activity prior to milestone B is associated with contractor and government developmental testing. As part of the integrated testing paradigm, MCOTEA shall be involved in the planning of these DT events. In addition, MCOTEA performs DT Observations, Assessments, and EOAs during this time period in order to gain a better understanding of the evolving system, to take advantage of opportunities to aggregate early RAM data, to enable the use of DT data in MCOTEA's system evaluation, and as program risk mitigation by highlighting potential issues with system operational testing early in the program.

5.3.3.1 DT Observations

DT Observations are described in section 2.5.2 and the resulting report is a MCOTEA OR. The OR is completed within 30 days of the DT event and provided to the PM. The OR may be further distributed at the discretion of the Director of MCOTEA. ORs will be limited to commenting on test conduct rather than assessing the system. Assessments of the system will be reported using ARs after receipt of one or more DT Report(s).

5.3.3.2 Assessments

Assessments are described in section 2.5.3 and the associated report is a MCOTEA AR. An AR shall be used to formally report on the conduct and assessment effectiveness of a DT event or to report on MCOTEA testing associated with an AAP, ACAT IV (M) or QRA. The AR is provided to the PM and the MDA within 30 days of Assessment completion. The AR may be further distributed at the discretion of the Director of MCOTEA. The Assessment represents an excellent opportunity for MCOTEA to collect early RAM data that may be used to augment OT phase RAM results.

5.3.3.3 MCOTEA Assessments of Developmental Testing

Assessments between MS A and MS B will most likely involve developmental testing results that satisfy Issues at the lowest levels of indenture in the evaluation framework. The process of assessing these early results begins with a review of the test plan. Test plans shall be reviewed by MCOTEA to ensure that the test procedures, methods of measurement, and test exposure are adequate to satisfy the data requirements for the MOP/MOS that will be used to address the Issue.

After review and concurrence of the test plan, MCOTEA prepares an Observation Plan which identifies the portions of the test plan MCOTEA intends to use in the independent assessment. The Observation Plan is an internal MCOTEA document to ensure the MCOTEA test team focuses their efforts on the portions of the test being observed that will feed the overall evaluation of the system.

After developing the Observation Plan, the MCOTEA test team attends the portions of the test that will contribute to the system assessment. Upon conclusion of the test event the MCOTEA test team prepares an OR. This report is initially an internal report that documents the observations from the testing that was witnessed. Ultimately the OR may be used by the test team to provide a recommendation to the Director, MCOTEA as to the usefulness of the associated Test Report. The observation report may become an external document with the Director's endorsement. Any report, including a developmental Test Report, included for use as a source of data for the overall system evaluation should have an unqualified endorsement from the Director to gain approval for its use in the system evaluation. If the Director, MCOTEA provides a qualified endorsement of a developmental Test Report, that means that the results may have limited, or no use in the system evaluation depending upon the qualifications.

The process of assessment can take place once the results of a Test Report are approved for use. Because the standards for performance were developed in the evaluation framework the assessment is relatively straightforward. The process, regardless of the testing source (developmental or operational), begins with a comparison of the tested results with the established standards.

At this early stage of assessment contributing to the overall evaluation, aggregation at the lower levels (subtasks and possibly tasks) up to mission accomplishment is not necessary. These early tests can be used to gain confidence that the system is capable of performing the lower level subtasks, even if the test has not yet been accomplished in an operational environment. If shortfalls are identified at this stage, it is appropriate to identify the potential ramifications to the next level of subtask or task.

5.3.3.4 Early Operational Assessments (EOAs)

EOAs are described in section 2.5.5 and the results are reported in an OMAR if the assessment supports a milestone decision or an OAR if it does not support a milestone decision. An EOA is an assessment that demonstrates selected system performance, with user support as required. Thus an EOA may range from a "paper assessment" or a modeling and simulation effort to a physical operational test, depending on the nature of the issues to be examined. The results of the EOA are forwarded to the MDA and the PM within 90 days after completion of the EOA. The OMAR or OAR documenting the EOA may be further distributed at the discretion of the Director of MCOTEA.

5.3.4 T&E WIPT Oversight of Test Scope and Methodologies

The T&E WIPT is the nexus of collaborative test planning and evaluation. It shall ensure a comprehensive DT&E phase that will allow the achievement of a successful OT&E outcome. The T&E WIPT develops a robust and detailed T&E strategy for use in generating the TEMP, covering both DT and OT events. One of the goals of this strategy is the examination of all thresholds in the capabilities documentation in a way that meets OT requirements prior to IOT, as well as building a database to support the suitability determination. This will allow the IOT to focus on mission performance under realistic operational conditions. Although the initial expectations for each test event are included in the TEMP, the WIPT may need to make interim adjustments to the overall test plan based on the results and discoveries made in individual tests,

to include additional testing. If the WIPT makes interim adjustments to the test plan, the allocation of attributes and issues associated with subtasks, and tasks to specific tests may have to be updated or modified.

The T&E WIPT shall establish procedures necessary to ensure the integrity of the data collected during testing to include establishing agreements describing the methods of collecting, validating, securing, and accessing the data.

The T&E WIPT also reviews all individual test configurations and strategies, methods for capturing data, methodologies for analyzing the data, and any methods using virtualization or modeling and simulation to supplement the data resulting from individual tests.

5.4 Test and Evaluation Master Plan (TEMP)

The TEMP documents the overall structure and objectives of the T&E program. It provides a framework within which to generate detailed T&E plans and it documents schedule and resource implications associated with the T&E program. The TEMP identifies the necessary DT&E, OT&E and LFT&E activities. It relates program schedule, test management strategy and structure, and required resources to: COIs; CTPs; objectives and thresholds documented in the CDD; evaluation criteria; and milestone decision points. Joint programs require a single integrated TEMP. Components may express their unique content, particularly evaluation criteria associated with COIs, in a component-unique annex to the basic TEMP. Refer to the DAG, Chapter 9 for further detail.

5.4.1 Format

All USMC ACAT Programs shall implement a TEMP using the format found in Chapter 9 of the DAG.

5.4.2 Coordination

The PM is ultimately responsible for the TEMP. However, the T&E WIPT is charged with the task of writing the document and ensuring the test strategies for both DT&E and OT&E are defined and the resources required to execute the test program are identified.

The Acquisition Lead is responsible for distribution of an approved TEMP to all agencies involved in testing, providing support or resources, oversight, or that have a relevant and official need to access testing information.

5.4.3 Approval

The PMs for MDAPs, Major Automated Information Systems (MAIS) and programs on the OSD T&E Oversight List shall submit the TEMP via concurrence of primary stakeholders and ASN (RDA) to the USD (ATL) and the DOT&E sufficiently early. TEMPS for ACAT II programs shall be approved by ASN (RDA). The MDA for all other ACAT TEMPs shall have final approval authority. DC SIAT shall review all TEMPs and provide a written recommendation to the MDA.

5.4.4 Test Strategy Documentation for AAPs and Minor Modifications

Regardless of whether or not OT&E is required, a documented T&E strategy is required for all programs. The MCSC annex to this Handbook contains a template for a STES that can be used to fulfill this requirement. The template can and should be tailored to fit the level of testing depending on the size of the program.

However, all programs shall at least provide the following information:

- A description of the system and the capability it will provide to the USMC;
- The reason for the tests;
- Identification of organizations involved and their responsibilities;
- An evaluation framework that traces test events to operational capabilities;
- A test schedule depicting T&E events in support of the program acquisition strategy; and
- A description of material, manpower, and fiscal resources needed to execute the test program.

5.5 Acquisition Documentation

The required acquisition documentation to support Milestone B is developed concurrently with the test strategy and TEMP. However, the TEMP must reflect the Acquisition Strategy developed by the PM.

5.5.1 Acquisition Strategy

The PM shall prepare and the MDA shall approve an Acquisition Strategy to guide activity during EMD. An evolutionary Acquisition Strategy is the preferred approach to satisfy incremental CDDs; however, a single step to a full capabilities acquisition strategy may be used whether or not CDDs are incremental.

Programs for which the Commander, MCSC serves as MDA, the PM shall use the Marine Corps Single Acquisition Master Plan (MC-SAMP) approach for the development of acquisition strategies/plans. Product Group Directors (PGDs) who serve as MDAs shall likewise require a MC-SAMP approach. Per DoDI 5000.02, the Acquisition Strategy must be approved prior to releasing the RFP to industry. This usually occurs well prior to Milestone B in order for the program office to conduct source selection activities and be prepared to award the contract upon a successful Milestone B decision.

The MC-SAMP provides a streamlined approach for tailoring the Acquisition Strategy/Plan and provides the PM the opportunity to minimize documentation redundancy. The MDA will identify by ADM the standard milestone documents to be combined within a MC-SAMP for presentation at a subsequent milestone.

Consult the MC-SAMP Guide for further information.

5.5.2 Systems Engineering Plan (SEP)

In accordance with MCSC Order 3911, all programs responding to a capabilities or requirements document, to include AAPs, shall develop a SEP in conjunction with each Milestone review, and integrated with the acquisition strategy. The SEP will enable the PMT to manage a fully

integrated technical effort necessary to satisfy the systems requirements throughout its life cycle, tailored to the specific project.

The SEP is a living document that captures a program's current and evolving systems engineering strategy and its relationship with the overall program management effort. The SEP purpose is to guide all technical aspects of the program. It should be established early in the Concept Refinement phase and updated continually.

The SEP shall be a separate appendix to the MC-SAMP if a MC-SAMP is required. The program lead engineer, in conjunction with the Competency Lead Engineer, shall tailor the SEP content as appropriate for the program's scope and technical complexity.

PMs shall prepare a SEP for each milestone review, beginning with Milestone A. At Milestone A, the SEP shall support the TDS; at Milestone B or later, the SEP shall support the Acquisition Strategy. The SEP shall describe the program's overall technical approach, including key technical risks, processes, resources, metrics, and applicable performance incentives. It shall also detail the timing, conduct, and success criteria of technical reviews. Consult the SEP Preparation Guide for additional information and MCSC Order 3911 for staffing and approval requirements.

5.5.3 System Design Specification (SDS)

The SDS defines to a granular level of detail what the Marine Corps intends to procure, identifies the standards and specifications being used to develop and build the system, and provides confidence that the system can be produced, operated, maintained, and supported to the degree necessary to begin system development and design. The SDS shall translate CDD performance parameters and system attributes into technical requirements that characterize the performance specifications as clearly as practical for developing the preliminary system design.

The SDS contains derived system requirements appropriate to the preliminary system design level and lists the family of specifications that define the system. This derivation must be conducted utilizing a systems engineering approach and recorded in such a way that traceability of requirements at every level can be linked to operational capabilities in the CDD or a statutory requirement.

The SDS Guidebook is the desk reference for satisfactorily developing a comprehensive SDS document. The guidebook, along with its system specific appendices, provides a high level look at what is expected to be addressed within the SDS.

5.5.4 Requirements Traceability Matrix (RTM)

A key building block of a comprehensive and useful SDS document will be traceability of the technical requirements developed from the operational capabilities outlined in the CDD and COE/CONOPS. This traceability is the result of a disciplined systems engineering process that not only decomposes the operational capabilities into technical requirements, but ensures that all operational capabilities are accounted for with a corresponding set of technical requirements.

The PM shall develop a RTM that demonstrates the completeness and depth of the system development by ensuring the evaluation framework technical performance measures (KPPs,

KSAs, and CTPs) are translated into the SDS and linked to an operational capability. An RTM documents how each requirement will be assessed/verified. Prior to OT, the RTM should include all test results.

5.5.5 Failure Reporting Analysis and Corrective Action System (FRACAS)

A FRACAS is used to record all failures and problems related to a product or process and their associated root causes and failure analyses in order to assist in identifying and implementing corrective actions. The basic measure of FRACAS effectiveness is its ability to function as a closed-loop coordinated system in the identification and repair of product and process failures, and the identification, implementation, and verification of a corrective action to preclude recurrence of the failure. As a result, early elimination of failure causes or trends is a major contributor to reliability growth and continuous process improvement.

5.6 Gate 4 Review

The Gate 4 Review approves the SDS and authorizes a program to proceed to Gate 5 or Milestone B.

Entry criteria for the Gate 4 review include an approved CDD and a service approved COE and/or CONOPS. These documents establish the KPPs and the KSAs for the system and encompass the highest level of desired operational capabilities. The application of a disciplined systems engineering process begins the progression of deriving technical requirements to support the SDS. Lower tier specifications should be included to the lowest level of detail feasible and at a minimum meet the PDR level of detail.

The Naval PoPS T&E criteria for the Gate 4 Review are:

- TEMP is approved and aligned with the SEP and acquisition strategy;
- T&E execution is on or ahead of schedule;
- T&E resources have been assessed and mitigation plans established;
- T&E costs have been identified;
- EOA or preliminary DT results have not identified significant operational performance issues;
- T&E requirements for the RFP are finalized; and
- FRACAS system has been established.

5.7 Gate 5 Review

The Gate 5 Review approves of the release of the EMD RFP to industry. It may occur before, concurrent with, or after Milestone B depending upon the chosen acquisition strategy and the related program risk.

The Naval PoPS T&E criteria for the Gate 5 Review are:

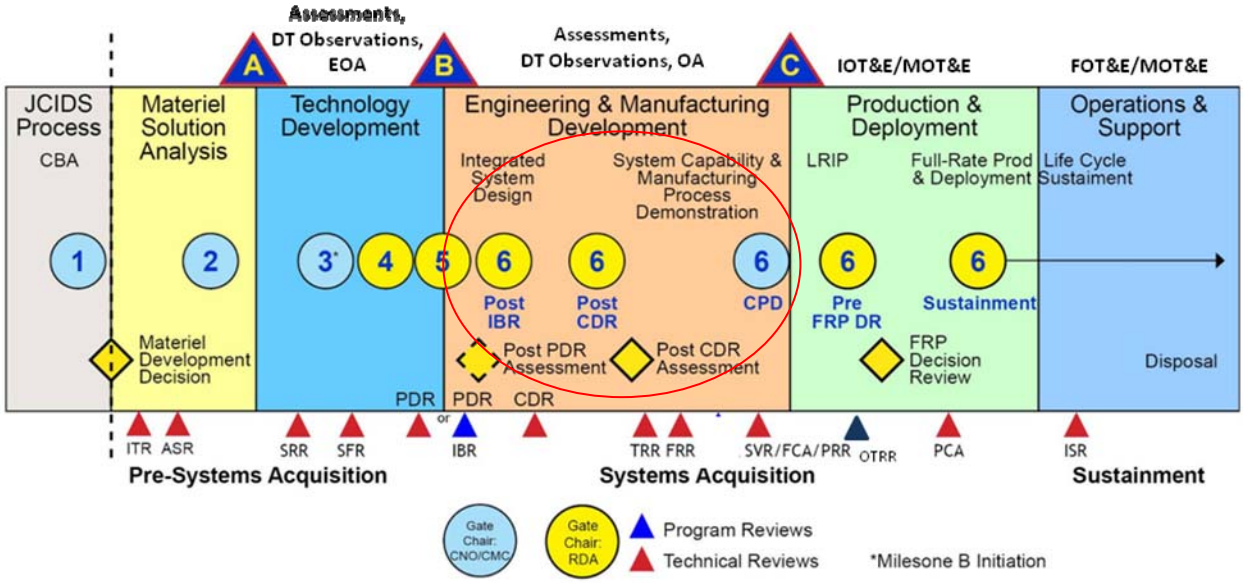
- TEMP is approved and aligned with the SEP and acquisition strategy;
- T&E execution is on or ahead of schedule;
- T&E resources have been assessed and mitigation plans established;
- T&E costs have been identified;

- EOA or preliminary DT results have not identified significant operational performance issues;
- RFP contains T&E requirements; and
- FRACAS system has been established.

5.8 Milestone B Decision Review

At Milestone B, an MDA review shall be held to assess technology maturity and technical risk for entry into EMD. At Milestone B, the MDA normally approves program initiation, the LRIP strategy, and initial LRIP quantities for which LRIP will be requested at Milestone C.

6 Activities Supporting the Engineering and Manufacturing Development Phase and Milestone C



6.1 Overview

The purpose of T&E related activities during the EMD phase is to demonstrate how well the system meets its technical and operational requirements.

During this phase, the focus of T&E is on providing the final technical data to determine the readiness to enter Production and Deployment. Testing establishes whether engineering is reasonably complete and if solutions to all significant problems are in hand.

6.2 Identification of Required Combat Capabilities

Since a CPD is finalized after the majority of capability development, it is normally not appropriate to introduce new requirements at this point. "Requirements creep" is a significant factor of unsuccessful acquisition programs. New requirements to an existing program shall be fully vetted through the Acquisition Lead, MCCDC and MCOTEA and those impacts fully assessed before implementation into the current increment or are deferred to the next increment in an evolutionary program or in a future modification if no additional increments are planned.

6.2.1 CPD – ACAT Programs

MCCDC shall refine the CDD and draft the CPD for approval to support the Milestone C decision. Prior to being finalized by MCCDC, they are staffed through the appropriate Capabilities Documentation IPT for review and comment. The CPD is the sponsor's primary means of providing authoritative, testable capabilities for the Production and Deployment phase of an acquisition program. A CPD is validated and approved before the Milestone C acquisition decision. The development of the CPD is guided by the integrated architectures; applicable

JCDs, ICDs, and CDD; AOA and/or supporting analytical results; and developmental and operational test results. The CPD must include a description of the DOTMLPF and policy impacts and constraints.

The CPD captures the information necessary to support production, testing, and deployment of an affordable and supportable increment within an acquisition strategy. The CPD provides the operational performance attributes necessary for the acquisition community to produce a single increment of a specific system.

6.2.2 CONOPS and COE

The CONOPS (if required) and COE are again refined and updated in the CPD. Before these are finalized by MCCDC, they are staffed through the appropriate Capabilities Documentation IPT for review and comment.

6.2.3 DODAF Architectures

System technical views (DODAF 1.5) or viewpoints (DODAF 2.0) shall be refined as program matures.

6.3 Integrated Testing

6.3.1 Test Event Planning

All test events shall be planned in accordance with the TEMP and constructed in coordination with the T&E WIPT. This plan assigns attributes and issues associated with subtasks, and tasks for examination in relevant DT and OT assessments and tests. The goal is to infuse as much operational realism as possible during DT while simultaneously ensuring the DT objectives are being met. This will allow MCOTEA to examine all thresholds in the capabilities documents in a way that meets OT requirements prior to IOT, as well as build a database to support the suitability and survivability determination. The TEMP shall include the tasks, subtasks, and attributes examined as well as the conditions under which the tests will take place.

Planned DT events shall be an integral part of the TEMP. MCOTEA shall be notified of pending DT events and invited to participate before they are executed. In order for MCOTEA to participate in a DT event at any level, the draft DT test plan should be provided to MCOTEA 45 days prior to the DT event but shall be made available for review at least 15 working days before the test. MCOTEA shall review the draft test plan and make suggestions based on updated MCOTEA data needs for system evaluation. These suggestions may or may not be accepted by the DT test team, based on time and cost constraints. If the suggestions for updated data needs for a particular developmental test are rejected, the necessary data will have to be obtained during a later developmental test or during operational testing.

6.3.2 Integrated Test Execution

Since most of the detailed test planning has been accomplished, the biggest factors facing the test team to ensure the test is executed smoothly is the coordination and collaboration between those involved. Each detailed test event will be unique so there is no "cookie cutter" process to follow.

However, before any test can be executed, the DT Test Director must coordinate with the MCOTEA counterpart to ensure:

- All participants understand the objectives (both DT and OT) of the test;
- The resources (to include operational forces) for the event are available;
- A common understanding on how the test will be executed; and
- Who is responsible for each event (there can only be one person in charge of the overall test)

One way to accomplish this is to hold test team meetings with all participants to brief the upcoming test. The outcome of the meeting should be a common understanding on how the test will be executed and the roles and responsibilities of all involved.

Generally speaking, MCOTEA personnel should attend DT events as observers whenever possible. MCOTEA shall use the draft DT test plan as the basis for designing a MCOTEA DT Observation plan. If MCOTEA attends the DT event as an observer, a DT Observation shall be conducted. If MCOTEA plans and executes the plan for the DT event, an Assessment shall be conducted. In either case, MCOTEA personnel shall be present during the DT event. After the event, MCOTEA shall write its own report (OR or AR, as appropriate) and provide a copy to the PM and the MDA along with any other feedback useful to the PM/MDA. MCOTEA shall also receive a copy of any reports written by the DT test team. MCOTEA shall also be allowed access to all data generated during the developmental test.

6.3.2.1 MCOTEA Assessments of Developmental Testing

A typical Assessment between MS B and MS C would address an Issue at the Task level or a suitability Issue at the major component or system level. Assessments at this stage fall short of evaluating missions. While the testing may have some, or even most of the elements of a real mission, the tests are not full-up Initial Operational Tests (IOT) or Follow-on Operational Tests (FOT). Assessments, Early Operational Assessments, Operational Assessments, and contributions to the overall evaluation of test results from developmental testing that satisfy suitability and survivability Issues qualify as intermediate contributions to the evaluation.

There is no limit to the number of assessments that may take place as the system progresses throughout its lifecycle, aside from constraints imposed by resources allocated to T&E. What is important is the timely assessment and reporting of the results to equip decision makers with facts regarding system design and performance. The process for Assessments at this stage is the same as for Assessments between MS A and MS B, but the source of testing may have changed depending upon the evaluation issue.

Another critical element of Assessments at this stage of the acquisition cycle is the emphasis on threshold conditions for task performance, not just the threshold parameters. Focusing solely on the threshold parameter for the measure can lead to a myopic view of the system. For example, the attribute “hit probability” for a sniper rifle would map to the operational task “engage targets” and form the basis for a threshold parameter (e.g. probability of hit shall be 90%). The attribute “System Operating Conditions” would also map to that same task, but would serve as a threshold condition for achieving hit probability (e.g. system shall successfully engage targets in rainy conditions).

Aggregation of Issues to COIs, and aggregation of COIs to determine OE, OS, and OSur is still not necessary or advisable at this stage, in a formal report from MCOTEA for the reasons that follow.

One reason for not reporting OE, OS, and OSur prior to the planned reporting relates to the satisfaction of entrance criteria. Reporting of OE, OS, and OSur should not occur until after the appropriately scheduled IOT/FOT. Premature reporting of OE, OS, and OSur could give the false impression that the system is sufficiently mature, stable, and ready for full rate production. Conversely, premature reporting could also have a detrimental impact on program success by unfairly labeling the program as deficient when in reality it simply has not had sufficient time to satisfy all requirements and achieve stability.

The previous explanation does not imply that risks to successful determination of OE, OS, and OSur should not be identified informally. On the contrary, given a well established and transparent evaluation process, the PM should be able to gauge progress at any time. This stage of the acquisition cycle represents the first and perhaps best opportunity to identify risks to successful determination of OE, OS and OSur. This should enable the PM to assess readiness for operational testing and overall maturity of the system. Transparency in the assessment process is particularly important because it allows all parties involved the ability to estimate their progress towards achievement of a system that will be effective, suitable, and survivable. The closer the system is to the IOT, the better the estimate of progress toward OE, OS, and OSur will be.

6.3.2.2 Operational Assessment

Any program on the OSD T&E Oversight List must attain acceptable performance in an Operational Assessment (OA) prior to entering the Production and Deployment phase (see DODI 5000.02). In addition, OAs can be executed for any program when requested by a Program Manager (PM) or MDA.

The Operational Assessment is described in detail in section 2.5.4. An OA provides early information to the PM and/or decision maker about how the system is progressing toward satisfying its current capabilities documentation, satisfying the defined thresholds in the capabilities documentation, readiness for LRIP, and readiness for entry into IOT. The OA may also be used to support program reviews or milestones.

At the end of an OA, MCOTEA's assessment is documented in an OMAR if the assessment supports a milestone decision or an OAR if it does not support a milestone decision. The results of the OA are forwarded to the MDA and the PM within 90 days after completion of the OA, in accordance with the MCOTEA process. An OAR in support of an oversight program is also forwarded to DOT&E. The OMAR or OAR documenting the OA may be further distributed at the discretion of the Director of MCOTEA.

6.3.3 Reporting

6.3.3.1 Developmental Test Reporting

In addition to the DT data guidelines established in paragraph 5.3.2, DT&E reports will be used to support the programmatic System Engineering technical reviews (i.e., PDR, CDR, and

milestone decisions). During PDRs and CDRs, DT&E results will provide decision-makers information on the system maturity during development as well as progress on resolving the CTPs that have been established for the system. In addition, during milestone reviews, DT&E results will provide information to the MDA on the potential of the system to attain operational capabilities. Finally, DT&E results and an assessment on the system's readiness to enter IOT&E will be briefed at the OTRR.

DT reports shall be completed by the time agreed to in the TEMP for each developmental test. If no time was noted in the TEMP for a particular DT event, the report for that event shall be completed not more than 30 days after the DT event has concluded. Copies of the DT report and relevant data shall be forwarded to the PM, the T&E WIPT and MCOTEA for inclusion in the system evaluation process.

6.3.3.2 Assessment Reports

MCOTEA shall periodically report on a system's progress toward meeting system evaluation objectives in an AR. The AR will be based on one or more developmental testing events. The AR shall report on the extent to which the Director of MCOTEA has endorsed the DT report, the extent to which MCOTEA can use the data generated during the DT event, and the extent to which the DT event satisfied the system evaluation objectives (including satisfaction of thresholds in the capabilities documentation) assigned to that event by the TEMP. The DT event(s) to be included in each AR will be determined by the T&E WIPT and documented in the TEMP.

ARs are also the vehicle used by MCOTEA to report on any test results for AAP, ACAT IV (M), and QRA programs.

6.4 Gate 6 Review

The Gate 6 Review occurs following award of the EMD contract and satisfactory completion of the Integrated Baseline Review (IBR). It will assess overall program health, the sufficiency of the SDS and the IBR. Follow-on Gate 6 Reviews will be conducted to endorse or approve the CPD and to review program health prior to and post Milestone C and the FRP DR.

The Naval PoPS T&E criteria for the Gate 6 Review are:

- TEMP is approved;
- T&E execution is on or ahead of schedule;
- T&E resources have been assessed and mitigation plans established;
- T&E costs have been identified;
- DT results have not identified significant operational performance issues; and
- FRACAS system is current and deficiencies resolved prior to IOT&E.

6.5 Post-PDR Assessment

If a PDR has not been conducted prior to Milestone B, the PM shall plan for a PDR as soon as feasible after program initiation. Following PDR, the PM shall plan and the MDA shall conduct a formal Post-PDR Assessment. The PDR report shall be provided to the MDA prior to the assessment and reflect any requirements trades based upon the PM's assessment of cost,

schedule, and performance risk. The MDA shall consider the results of the PDR and the PM's assessment, and determine whether remedial action is necessary to achieve APB objectives. The results of the MDA's Post-PDR Assessment shall be documented in an ADM.

6.6 Post-CDR Assessment

The MDA shall conduct a formal program assessment following system-level Critical Design Review (CDR). The system-level CDR provides an opportunity to assess design maturity as evidenced by measures such as: adequate developmental testing; planned corrective actions to hardware/software deficiencies; successful completion of subsystem CDRs; the percentage of hardware and software product build-to specifications and drawings completed and under configuration management; an assessment of environment, safety and occupational health risks; a completed failure modes and effects analysis; the identification of key system characteristics; the maturity of critical manufacturing processes; and an estimate of system reliability based on demonstrated reliability rates.

The MDA shall review the Post-CDR Report and the PM's resolution/mitigation plans and determine whether additional action is necessary to satisfy EMD Phase exit criteria and to achieve the program outcomes specified in the APB. The results of the MDA's Post-CDR Assessment shall be documented in an ADM.

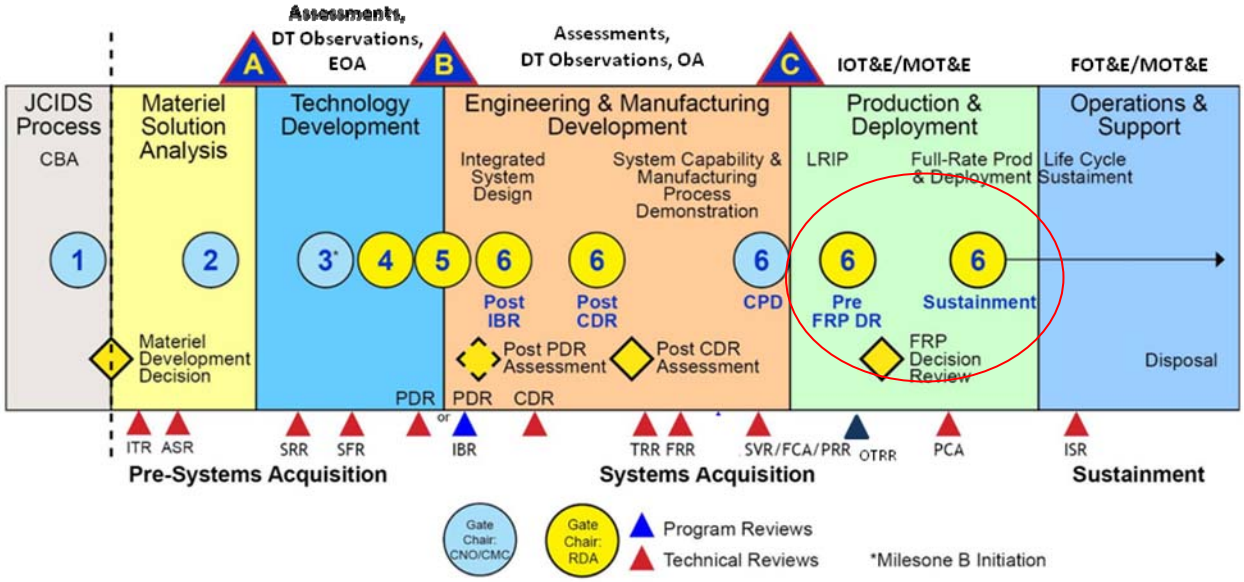
6.7 Milestone C Decision Review

Milestone C occurs at the completion of the EMD phase. At Milestone C, an MDA review shall be held to evaluate program status, risk, and readiness to enter the Production and Deployment phase. At Milestone C, the MDA approves one of the following:

- LRIP for those programs that require LRIP;
- FRP or procurement for those programs that do not require LRIP and have completed required IOT&E; or
- Limited deployment for those IT programs or software-intensive programs with no production components, but that require completion of IOT&E.

For those programs that do not require LRIP and have completed required IOT&E, Milestone C and the FRP DR may be combined into a single program decision point as long as all of the required program information for both Milestone C and FRP DR are satisfied.

7 Activities Supporting the Production and Deployment Phase and the Full-Rate Production Decision



7.1 Overview

The purposes of T&E related activities during the Production and Deployment Phase are to determine whether the system meets performance specifications and deficiencies identified during IOT&E have been corrected.

7.2 System Readiness for IOT

Reference (c), provides criteria for certification of readiness that apply to all IOT&E for all DON programs. For all OT other than IOT&E, the PM with the support of the T&E WIPT and concurrence of the OTA may tailor the reference (c) criteria. The MDA may add criteria as necessary to determine readiness for OT.

The OTRR process includes a review of DT&E results, an assessment of the system's progress against CTPs documented in the TEMP, an analysis of identified technical risks to verify those risks have been mitigated or eliminated during DT and a review of the IOT&E entrance criteria specified in the TEMP.

7.2.1 T&E WIPT Assessment of DT

The T&E WIPT shall review the results of DT Reports, MCOTEA DT Observations, Assessments, and Operational Assessments. The purpose of this review is three fold. First, the review shall examine how the system has progressed toward IOT as a function of time. This

examination shall include an examination of suitability factors, including reliability growth. The results of this portion of the review will contribute to determining how suitability factors are examined during IOT.

This review shall also examine the extent to which DT has determined if the thresholds established in the capabilities documentation have been satisfied. The goal is to complete this requirement for all thresholds before IOT; however, there may be thresholds associated with conditions that can only be examined in IOT.

Finally, this review shall be used to identify or re-affirm system deficiencies or areas of risk. These deficiencies and risk areas will be of particular interest during IOT.

7.2.2 Capabilities Document Revisions/Changes

Any changes to approved capabilities documents shall be staffed through the Capabilities Documentation IPT and approved through the original approval authority.

There may be circumstances where it is necessary to change previously approved KPPs. These include cost, technology, production, development, or other issues that prevent meeting the threshold of the KPP. For KPPs of JROC interest, the procedures as outlined in the CJCSM 3170.01 series will be utilized. Requested changes for MROC approved CPDs will be staffed and briefed through the chain to the MROC for approval.

7.2.3 Operational Test Readiness Review (OTRR) Process Overview

The Acquisition Lead shall initiate the OTRR process at least 130 days prior to the planned IOT execution. Refer to Figure 7.1 for a notional timeline. The PM shall provide all technical documentation to include test plans, RTMs, and DT test results to the formal T&E WIPT not less than 120 days prior to IOT. The T&E WIPT shall conduct a review of the technical documentation per the OTRR checklist. Known shortfalls in the ability of the system to meet required capabilities should be adjudicated with MCCDC prior to the Pre-OTRR. The Pre-OTRR includes members from SYSCOM/PEO, MCCDC and MCOTEA and is chaired by the Acquisition Lead or their designated representative. Upon completion of the Pre-OTRR, the Acquisition Lead will issue a Pre OTRR Memorandum no later than 91 days prior to IOT. This memorandum documents the findings of the Pre-OTRR in terms of the system's readiness for operational test. It may identify items of risk that require resolution prior to OTRR System Certification. The Pre OTRR Memorandum is required to support MCOTEA's OTRB and shall serve as the formal request for MCOTEA to begin execution of their OTRB process.

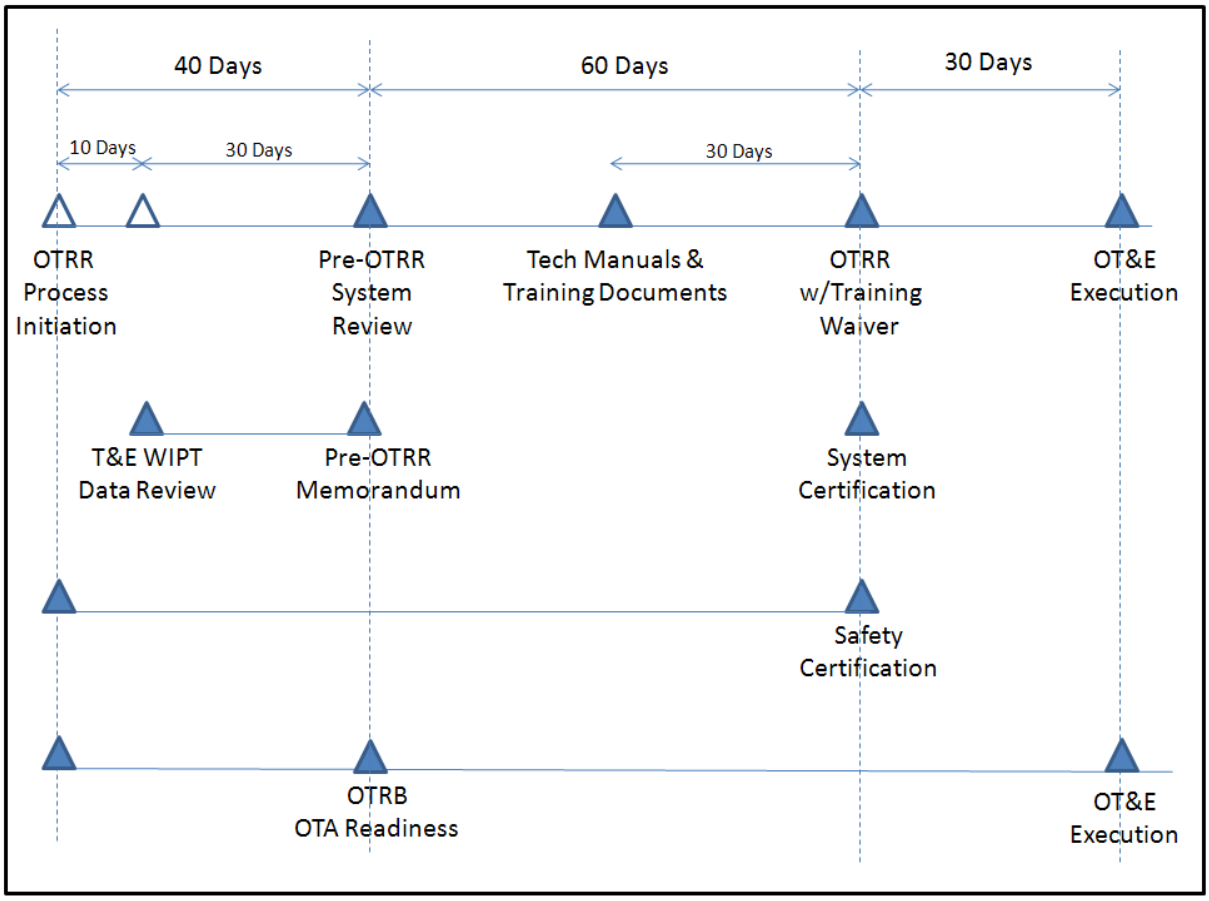


Figure 7.1 – Notional OTRR and OTRB Process Timeline

Additional information on OTRR processes and data package requirements can be found in the MCSC Annex.

7.2.4 Operational Test Readiness Board (OTRB)

Participants in operational testing (IOT, FOT, and MOT) must be "typical users". Generally speaking, this means these participants must be from the Marine operating forces. Given the operating tempo of Marines in operational units, it is essential to ensure that risks to the scheduled operational test are identified, addressed, and mitigated before committing Marines from the operating forces to support it. To this end, an OTRB shall be held in support of every IOT, FOT, and MOT at least 90 days prior to IOT, FOT, and MOT. The purpose of the OTRB is to assess any known risks to successful completion of the operational test as scheduled. Risks are identified along with their likelihood and potential severity (impact on the test) during the OTRB and a mitigation plan is presented for each risk. All risks must be addressed/resolved or mitigation plans in place by the OTRR. The OTRB is informal, but all the requirements for meeting the scheduled operational test are covered. The OTRB is co-chaired by the cognizant MCOTEA Division Head and the cognizant PGD or (PEO LS) PM. Attendees include the PM,

the MCOTEA Test Branch Head, the Operational Test Project Officer (OTPO), the operational test manager, and the MCCDC Action Officer.

7.2.5 OTRR

The Acquisition Lead shall evaluate and make a determination that the System is ready for OT&E per paragraph 5.6.2 of SECNAV 5000.2E. Representation at the OTRR shall include all members from the T&E WIPT and associated stakeholder personnel as necessary. *

7.3 IOT Execution

An IOT is required for any program on the OSD T&E Oversight List to continue beyond low-rate initial production to full-rate production. In addition, in accordance with the SECNAVINST 5000.2E, all ACAT I, II, III, and IV (T) designated programs shall undergo IOT&E prior to a full rate production decision. For programs on the OSD T&E Oversight list, DOT&E shall determine the number of production representative articles for IOT. MCOTEA shall determine the number of required production representative articles for IOT in all other cases.

The IOT shall be executed in realistic operational and environmental conditions in operationally representative terrain, using typical system users (Marines) to operate and maintain the production representative system under test. MCOTEA shall coordinate the participation of operating forces in IOT. The MCOTEA Operational Test Project Officer (OTPO) shall be in charge of activity at the operational testing site.

Just before any testing, and typically at the test site, the PM shall conduct New Equipment Training (NET) in order to teach typical users from the operational forces how to properly use and maintain the system under test.

MCOTEA shall conduct a pilot test after NET and prior to the record test. The purpose of the pilot test is to act as a rehearsal for the record test, to validate the adequacy of NET, and to exercise the system and validate the test plan in the testing venue. The pilot test should be conducted using the same data collection systems and media as will be used in the record test. The pilot test allows for the discovery and correction of any last-minute issues with the test. The pilot test ends when the OTPO is confident the test unit and data collection team are fully prepared to execute their responsibilities during the record test. Assuming no insurmountable problems during the pilot test, MCOTEA can use data from the pilot test during the system evaluation. The record test is executed after the pilot test with the test team completing the planned test scenarios and collecting test data in accordance with the detailed test plan.

MCOTEA executes IOT using mission-based testing scenarios in conjunction with Design of Experiments. The results of the IOT shall be used to determine the operational effectiveness of the system and shall be used in concert with the results of earlier integrated testing and LFT&E to determine operational suitability and survivability.

MCOTEA also uses the process just described for IOT in FOT execution and MOT execution in accordance with the MCOTEA OT&E Manual.

7.4 MCOTEA System Evaluation

The purpose of the system evaluation is to answer the evaluation questions (i.e. Issues, COIs, and OE/OS/OSur). The necessary input for system evaluation is one or more test reports. The test reports should naturally flow from the test events conducted as specified in the TEMP.

Evaluation should naturally begin at the lowest levels of indenture in the evaluation framework (generally the sub-tasks) at the early stages of system development. There is little benefit to delaying the evaluation and reporting of results. The purpose of evaluation is to inform decision makers and engineers to affect system design and tradeoff decisions. As the system matures the evaluations should progress to higher levels of indenture, that is, the evaluations progress from lower level subtasks to higher level subtasks, then to tasks. Ultimately, the final evaluation should be at the top level of the hierarchy answering COIs and concluding OE/OS/OSur.

7.4.1 Assessments

The MCOTEA evaluation of the system shall include relevant data from Assessments of Developmental Testing that have already taken place. These assessments will generally address Issues at the sub-task and task level, as well as suitability and survivability issues at the major component or system level. These Assessments shall also include data on the satisfaction of thresholds in the capabilities documentation. All of this information is included in the system evaluation and included in the final system OER.

7.4.2 OE, OS and OSur Evaluations

7.4.2.1 Screening Criteria

The determination of OE, OS, and OSur is based on the system performance in addressing the COIs. That said, there is an assumption that all of the screening criteria have been satisfied. Operational Suitability presents a unique challenge to the evaluation because the topics contained within OS are numerous and diverse. The use of screening criteria can simplify the process of evaluation. Screening criteria reduce the number of evaluation criteria to only those essential for determining worth or value (a system that fails to meet minimum screening criteria should not proceed to evaluation). Screening criteria can be thought of as gates that force evaluations to occur in steps as the system matures or information becomes available, rather than allowing information to pool together for a one time, massive evaluation that would be cumbersome and unwieldy.

Another way to think of screening criteria is as a binding constraint to the evaluation. As the following examples will illustrate, screening criteria influence the outcome of OE, OS, and OSur. A requirement under OE, OS, or OSur which is considered to be a binding constraint to the evaluation will force an answer, regardless of the other characteristics considered in the evaluation. Binding constraints to the evaluation can be mitigated prior to the evaluation in one of two ways. First, the system can be retested and re-evaluated after appropriate fixes have been put in place to mitigate the shortfalls. Second, the owner of the requirement can relieve the PM of the requirement by modifying the requirement or abandoning the requirement altogether.

Only those factors that are essential for mission accomplishment, or could significantly impact mission accomplishment should be identified as binding constraints to the evaluation model. Systems under development typically have a large number of requirements of varying levels of importance to mission accomplishment. KPPs and KSAs can serve as a good guide to binding constraints to the evaluation. As with most evaluation models absolutisms to the model should be limited and a healthy dose of common sense should be applied in the use of binding constraints. Assuming all the binding constraints on to the evaluation have been satisfied, the last and final step in the evaluation process is to determine OE, OS, and OSur.

7.4.2.2 Determining OE, OS and OSur

The conclusions for OE/OS/OSur are a direct result of determining Mission Capability Level (MCL). The purpose of determining the MCL is three fold. First, equating COIs to MCL provides a systematic methodology for arriving at OE, OS, and OSur conclusions. Second, it provides a framework for aggregation when multiple COIs (missions) are a facet of the evaluation. Third, it normalizes evaluation results to a common scale (MCL score between 0 – 100) with respect to existing, threshold and objective capabilities.

MCL is a score that is used to assess how well Marine operators using a system can be expected to fulfill their intended mission in a realistic environment. Accomplishment of the mission is much broader than just system performance. MCL is a function of the effectiveness in a mission inclusive of its suitability and survivability characteristics. MCL is not a direct measurement of system performance; rather it is a score arrived at through an analytic model developed as part of the evaluation process. The analytic model includes system effectiveness, suitability and survivability in the mission context less any screening criteria previously established. For standardization purposes, MCL is further defined as a score on a continuous scale from 0 to 100. A score of 0 is the lowest possible score while a score of 100 is the highest.

Using a system's MCL score as a point of reference, OE, OS, and OSur can be found using the analytic model. The process is sufficiently transparent to allow outsiders to examine results and replicate the results in an independent setting. It is also a useful tool for decision makers and engineers when deciding on fixes to the system under test. The transparency of the process and analytic nature also lend itself to another advantage. If future data is collected, like operational availability from fielded systems, a subsequent evaluation could take place to see where the system scores in relation to expectation, present performance, and future capability.

7.5 Deficiencies

7.5.1.1 Identifying System Deficiencies

System Deficiencies are those associated directly with the system under test. They can be traced to capabilities and requirements in the ICD/CDD/CPD. Under normal developmental circumstances, a system can be expected to be deficient in various ways at various points in the development cycle. System Deficiencies are best identified early, either by the developer, MCOTEA or the Acquisition Lead, so that they can be corrected with the minimum of time and expense.

7.5.1.2 Identifying Operational Deficiencies

During integrated and operational testing, test personnel may identify Operational Deficiencies that impact the performance of the system under test, even though those deficiencies cannot be associated with a specific capability of the system under test. Integrated testing may identify some Operational Deficiencies. However, due to testing constraints, operational testing may be the first opportunity to discover some Operational Deficiencies.

An Operational Deficiency represents a problem with employing the system under test in the expected operational environment, or a problem employing the system operationally as an element of the larger Marine Corps or Joint warfighting capability. Operational Deficiencies tend to pertain to interfaces with other systems or to interactions with the operating forces and can inhibit the overall effectiveness of a system. In some cases, Operational Deficiencies may actually represent material gaps in operational capability and in other cases, they may illuminate the need to create or modify tactics, techniques, and procedures (TTPs).

For example, a radar system under test may accomplish all its objectives pertaining to tracking targets, but the infrastructure required to convey the target information to the appropriate command and control nodes may not have the capacity required to handle the volume of information from the system under test. In this case, the support infrastructure would hinder the operational effectiveness of the system under test and this should be identified as an Operational Deficiency. When the Operational Deficiency indicates a gap in capability, the issue shall be relayed to the appropriate Integration Division within MCCDC for consideration and gap analysis.

As another example, the same radar system might employ new technology to help it track high-speed, low-altitude, low-observable targets. If this were an entirely new capability, the TTPs required for optimal use may not have been developed. It may also become clear during integrated and operational testing that using TTPs based on the old technology does not optimize the capabilities of the new technology. When an Operational Deficiency indicates the need for new TTP development, the issue shall be relayed to the appropriate Integration Division within MCCDC for collaboration with the appropriate school house, center of excellence, or Operational Advisory Group to develop the required TTPs.

7.5.1.3 Tracking and Reporting Deficiencies

The PM is responsible for tracking all System Deficiencies identified for their system. The PM shall make every reasonable effort to correct/resolve all identified System Deficiencies. The PM is not expected to resolve Operational Deficiencies identified by MCOTEA and these shall not be used in determining system OE, OS, or OSur.

The PM shall report all Major System Deficiencies at relevant Gate Reviews, in accordance with SECNAV guidance. A Major System Deficiency is defined as a deficiency that adversely affects the accomplishment of an operational or mission essential capability and no known workaround is available.

MCOTEA is responsible for identifying all Major System Deficiencies during operational testing. The PM shall track all Major System Deficiencies until they are resolved or accepted by

either the MDA, or Gate Review action. Notably, all Major System Deficiencies must be briefed at the Pre-FRP DR Gate 6 Review (and subsequent Gate 6 reviews), along with the action associated with resolving or mitigating each one.

MCOTEA shall identify all Operational Deficiencies and refer them to MCCDC for possible resolution in a new program or to be addressed by TTPs. Although Operational Deficiencies shall not be used in determining a system's OE, OS, or OSur, if the Operational Deficiency is severe enough, MCOTEA may recommend the system under test not be fielded until the Operational Deficiency is addressed.

7.6 Reporting

The system evaluation culminates in an OER written by MCOTEA. This report uses the results of all previous applicable government and contractor developmental testing (subject to limitations described in section 5.3.2), MCOTEA DT Observations, Assessments, Operational Assessments, and the Initial Operational Test.

This information is used to:

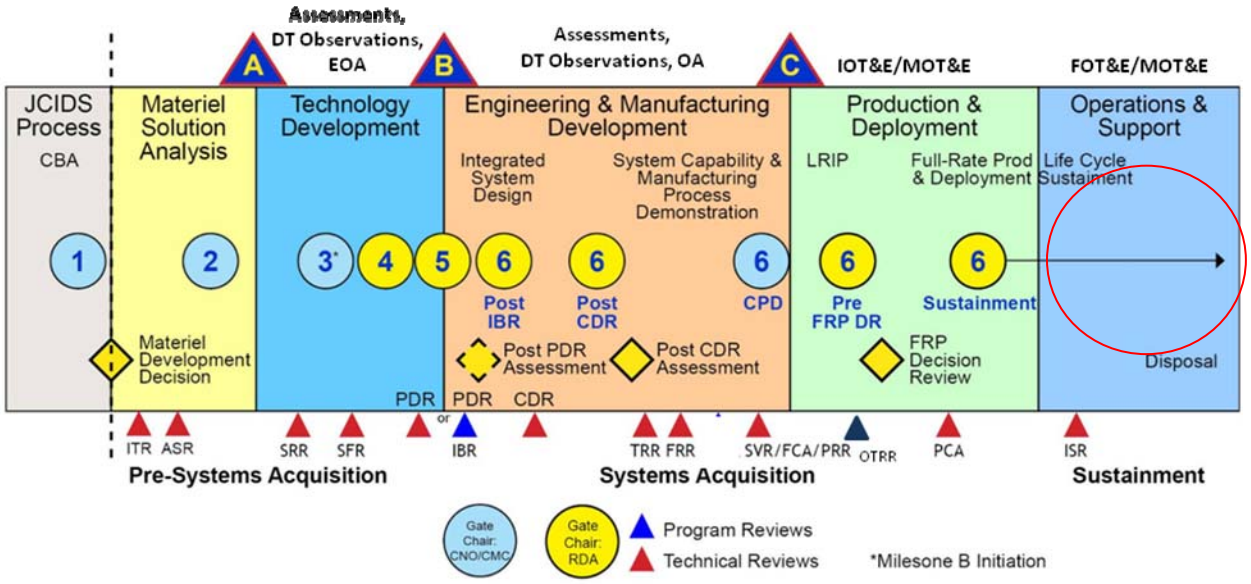
- Determine if thresholds in the approved capabilities documents and critical operational issues have been satisfied;
- Determine operational effectiveness, suitability, and survivability of the system under realistic operational conditions, including joint combat operations;
- Assess the impact to combat operations; and
- Provide additional information on the system's operational capabilities and limitations.

The OER shall also list any Major System Deficiencies and Operational Deficiencies that were identified during operational testing. The official report is released to the MDA and the PM after ACMC approval and within 90 calendar days of IOT completion, assuming timely receipt of all required DT&E reports needed to complete the OER. The OER may be further distributed at the discretion of the Director of MCOTEA.

7.7 Full-Rate Production Decision Review (FRP DR)

An FRP DR is conducted prior to a program entering into FRP and deployment. At the FRP DR, the MDA shall evaluate program status, risk, and readiness to enter full rate production/procurement and deployment, or to authorize deployment for IT programs or software-intensive programs after completion of IOT&E.

8 Activities Supporting the Operations and Support Phase and the Materiel Fielding Decision



8.1 Overview

After the FRP DR, the emphasis shifts towards procuring production quantities, repairing System Deficiencies, managing changes, and phasing in full logistics support. During initial deployment of the system, MCOTEA may perform Follow-on Operational Test and Evaluation (FOT&E) to refine the effectiveness and suitability estimates made during earlier OT&E, assess performance not evaluated during IOT&E, evaluate new tactics and doctrine, and assess the impacts of system modifications or upgrades.

8.2 Follow-on DT&E (Regression Testing)

In general, developmental testing is conducted on modification programs per Table 3. The purpose of such testing is to verify that the modified system performs as intended and the baseline configuration is updated.

8.3 FOT&E

The need for a Follow-on Operational Test (FOT) may be determined early by the MDA and if it is, it shall be documented in the TEMP. FOT may also be used to ensure changes made to the system since IOT have remedied the previously recorded deficiencies and not decreased system capability. In fact, except as specifically approved by the MDA, corrections to deficiencies shall be verified in FOT&E, see DODI 5000.02. FOT is also performed to refine the estimates, evaluate changes, and reevaluate the system to ensure that it continues to meet operational needs in a new environment or against a new threat.

MCOTEA conducts an FOT in the same way as an IOT to include coordination with the operating forces, inclusion of the applicable New Equipment Training, a pilot test, and the record test. After the FOT, MCOTEA evaluates and reports on system performance in accordance with the MCOTEA OT&E Manual.

8.4 Materiel Fielding Decision Review

Each program which the Acquisition Lead manages or participates in, shall undergo a formal fielding decision by the MDA prior to systems being fielded to the operating forces. The preferred fielding concept is total package fielding. The total package consists of the system, training and technical manuals, training for operators and maintainers, initial issue provisioning, contractor logistics support, and any tools or test equipment. This process will ensure that an operationally and logistically supportable system is received.

MCSC Policy Letter 6-04 established the Materiel Fielding Decision Process. Additional information on Materiel Fielding Decision Process procedures and data package requirements can be found in the MCSC Annex.

The fielding decision is documented in a Fielding Decision Memorandum, which then becomes the authority for all subsequent fielding actions.

8.5 Sustainment

Sustainment metrics should be included as part of the evaluation framework; Performance Based Agreements are established between the Acquisition Lead and the Marine operating forces based on these metrics. MCO 4081.2 established policy for implementing Performance Based Logistics strategies for Marine Corps systems. The Acquisition Lead responsibilities include developing quantifiable metrics and conduct assessments to ensure cost and performance thresholds and objectives are being satisfied.

Performance and cost objectives are measured in terms of Total Life Cycle Management metrics: Operational Availability, Mission Reliability, Total Life Cycle Cost per Unit of Usage, Cost per Unit Usage, Logistical Footprint and Logistics Response Time. Under Secretary for Defense (Acquisition and Technology) memorandum of 22 Nov 2005 provides definitions of those metrics.

In July 2006, the JROC established a mandatory warfighter Material Availability KPP and identified Material Reliability and Ownership Cost as KSAs for new acquisitions. Deputy Under Secretary for Defense for Logistics and Materiel Readiness memorandum of 10 Mar 2007 provides definitions of these Life Cycle Outcome metrics.

Proactive in-service management provides the PMT awareness of the status and condition of assigned systems as well as indicators of problems. MCSC Acquisition Policy Letter 3-07 established the policy for In-Service Management, Planning and Execution to include ongoing assessments of sustainment metrics.

8.6 Warfighter Feedback

8.6.1 Purpose of Warfighter Feedback

Obtaining Warfighter feedback is a valuable exercise designed to help all phases of the acquisition process deliver the capabilities most needed by Marines. It provides a cumulative evaluation of the entire acquisition cycle and allows the Triad to use the feedback to improve the operational usefulness and viability of future systems delivered to Marines around the world. Warfighter feedback helps the Triad by identifying any gaps in the capabilities of the fielded system of interest. The system of interest is the system for which Warfighter feedback is being collected.

MCCDC shall use this feedback to identify potential shortfalls in the current Capabilities Analysis Process. If there are capability gaps in the fielded system, it is possible the MCCDC processes for identifying gaps need modification or improvement. Warfighter feedback also provides a unique opportunity to identify new or emerging gaps in existing warfighting capabilities.

Warfighter feedback benefits the Acquisition Leads by allowing the evaluation of developmental processes and development contractor performance. For example, the feedback might indicate the failure of a part or element of the system of interest after limited use. This might indicate the need for additional testing during system development to detect failures related to fatigue, or it may indicate the use of substandard materials or procedures by the development contractor. In either case, the information would help the Acquisition Leads deliver a better product next time.

Warfighter feedback allows MCOTEA to examine the effectiveness of its processes. For example, if the feedback indicates a System or Operational Deficiency that MCOTEA failed to recognize, there may be a need to modify the test and/or evaluation processes in use. However, if MCOTEA correctly identified the deficiency and it was not addressed, no MCOTEA process modification is indicated.

Warfighter feedback is also useful in obtaining SME input regarding the ability of the system to aid the user in performing tasks. This can provide data points on evaluating the quality of the graphical user interface (e.g., computer screen, information and data display) and the human machine interfaces (e.g., knobs, switches, control devices, component access, etc.) used for operations and maintenance tasks. The warfighter can identify missing operator functionality, information, or data that can lead to changes in design or additional screens and interfaces.

8.6.2 Selecting Systems for Warfighter Feedback

The best candidates for feedback are systems that have been deployed for a long enough period of time to allow operators to become familiar with them, but are still recent products so the results of the feedback will impact current processes. Therefore, in order to be eligible for selection as a system of interest, the system shall be at least one year past its initial deployment date, but not more than two years past initial deployment. At least two different systems (from two different product groups or programs) shall be examined for feedback each year.

Systems are selected for feedback by the Warfighter Feedback IPT. This IPT consists of representatives from all the Acquisition Leads that oversee a system eligible for Warfighter feedback, PEO LS, MCSC (DC SIAT, AC PROG, AC Life Cycle Logistics), MCOTEA Chief of Test, MCOTEA S-2, MCOTEA Scientific Advisor, and representatives from the appropriate Integration Divisions within the Capabilities Development Directorate of CD&I. The Warfighter Feedback IPT is chaired by the MCOTEA Chief of Test and meets in the third quarter of each fiscal year to select the systems of interest for the next fiscal year. The lead members of the field team from each organization in the Triad shall be designated at the IPT meeting.

8.6.3 Obtaining Warfighter Feedback

For each system of interest, feedback shall be obtained from Warfighters actually using the system in the field. The feedback shall be obtained after the start of the fiscal year, but before the Warfighter Feedback IPT meets to select the systems of interest for the next fiscal year. This will give the Warfighter Feedback IPT the benefit of the most recent feedback prior to selecting the next year's systems of interest.

A team consisting of at least one individual from each organization in the Triad shall use a structured interview process to obtain feedback on the system of interest from a variety of system users at various levels in the command structure. A structured interview starts with set of general questions covering a wide range of topics and is intended to allow the interviewer to ask follow-on questions based on the interviewee's responses. The interviewer is expected to "drill down" on each question to discover the important issues and obtain the required information. The interviewers should be aware that deployed operators will have other tasks for which they are responsible. Data on the system of interest shall be gathered in a way that does not interfere with the Warfighter's primary job.

8.6.4 Documenting Warfighter Feedback

The lead representative from each organization on the interview team shall oversee the generation of a report for that organization's use (one report each for MCCDC, the Acquisition Lead, and MCOTEA). All reports shall be finished within 30 days of the interview team's return from the field. It is incumbent on each organization to use the information in its report to improve its portion of the acquisition cycle.

9 Special T&E Considerations

9.1 COTS, GOTS and NDI Equipment

COTS, Government off the Shelf (GOTS) or a Non-Developmental Item (NDI) items does not negate the need for a T&E program. The T&E WIPT shall plan to conduct sufficient testing on COTS, GOTS, and NDI to ensure proper operation in the environment in which the system/item will operate. In general, the T&E WIPT shall not reduce developmental and/or operational testing unless the T&E WIPT has identified specific commercial or other test data that meets the needs of the DT and OT program. The T&E WIPT should not demand test data in rigid formats, but should be flexible in accepting data that answers essential performance questions. The T&E WIPT should also consider the risks associated with hardware/software modifications and integration of components when defining the DT effort. In addition, the T&E WIPT must appropriately tailor testing on COTS, GOTS, and NDI systems.

Typically the COTS, GOTS, and NDI equipment solution will not already have been tested under expected operational conditions by typical users in the configuration under test. Therefore, the COTS, GOTS, or NDI status of individual components shall not negate the need for testing, if it is otherwise required by the program.

9.2 Early RAM Data

Early planning for RAM evaluation should include any special needs for the number of operating hours, environmental testing, maintenance demonstrations, testing profiles, usability of DT data, or other unique test requirements. RAM reviews may occur as early as the Technology Development phase. The T&E WIPT is responsible for determining how RAM data will be collected and evaluated throughout DT and OT.

The RAM database should be initiated early in the design phase and RAM data should be collected every time the system, including individual components, is tested. Early RAM evaluation might be achieved through eliciting and applying expert judgment, comparative analysis, and system modeling. Later, as real test data comes in, the evaluation should be modified to reflect the new information. The RAM database can be used to assess the degree to which the program is progressing toward RAM goals. Under appropriate circumstances, RAM data collected during DT can be aggregated with operational testing and used to help determine system operational suitability.

One goal of obtaining early RAM data is to identify failure modes very early in the program. Every failure is an opportunity to gain a better understanding of the system. Conducting EOAs or OAs may be a good way to stress the system in a realistic environment, and may help facilitate the discovery of failure modes early in the program.

9.2.1 Reliability Growth Testing

Reliability growth testing supports improvements in system and component reliability over time through a systematic process of stressing the system to identify failure modes and design

weaknesses. The emphasis in reliability growth testing is in finding failure modes. The reliability growth testing approach is sometimes referred to as Test-Analyze-Fix-Test. The reliability of the system is improved, or experiences growth, as the design is modified to eliminate failure modes. When defective components fail early, research is done to determine why the component failed. An improved component replaces the defective item, and the overall reliability of the system increases.

A successful reliability growth program depends on a clear understanding of the intended mission(s) for the system, including the stresses associated with each mission, mission durations, and configuration control. Reliability growth testing should be a part of every development program and used to provide input in predicting the satisfaction of the Sustainment KPP and the Reliability KSA. In addition, the results should be used in developing a realistic and affordable system support package. The PMT is responsible for establishing the plan for reliability growth.

9.3 Software T&E

The majority of the guidelines for hardware testing and software testing are the same regardless of the amounts of embedded software. The major difference for a software intensive system is that the T&E WIPT must plan for the capabilities to identify whether failures are caused by hardware, software or systems integration problems. The T&E WIPT should bear in mind that best practices for software development now emphasize that software testing has evolved into an integrated set of software quality activities covering the entire life cycle.

Software testing consists of unit testing, integration testing and systems testing. In most cases software integration utilizes a testing process consistent with the hardware "bottom up" approach. The smallest controlled software modules are tested individually and subsequently combined or integrated and tested in a larger aggregate or builds. As errors are uncovered in later stages of the test program, an attempt to fix errors must be undertaken by returning to earlier portions of the developmental process. DT and OT testing shall be rigorous and portray realistic environmental stress and mission profiles consistent with what may be encountered once the system is deployed.

Due to the unique challenges associated with software intensive programs the T&E WIPT for such programs should include a software engineer in addition to, or in place of, the system engineer as a core member of the T&E WIPT. Testers should recognize that software is a pacing item and provisions should be made for including software T&E during each phase of the program.

9.4 Interoperability Testing and Information Assurance

Interoperability is the ability of systems, units or forces to provide data, information, materiel and services to and accept the same from other systems, units or forces and to use the data, information, materiel and services so exchanged to enable them to operate effectively together. Information Technology (IT) and National Security System (NSS) interoperability includes both the technical exchange of information and the end-to-end operational effectiveness of that exchanged information as required for mission accomplishment. Interoperability is more than

just information exchange. It includes systems, processes, procedures, organizations, and missions over the lifecycle and must be balanced with information assurance (IA).

IA is defined as measures that protect and defend information and information systems by ensuring their confidentiality, integrity, availability, authentication, and non-repudiation. This includes providing for restoration of information systems by incorporating protection, detection, and reaction capabilities. IA must be addressed for all weapon systems; command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) systems. Any Information Technology programs that depend on external information sources or provide information to other DOD systems also fall into this category.

9.4.1 Joint Interoperability Test Command (JITC)

All DOD IT and NSS systems must be certified for interoperability before they are fielded. Fielded systems must be re-certified every four years or after any changes that may affect interoperability.

JITC has responsibility for certifying joint and combined interoperability of all DOD IT and NSS. JITC follows the processes outlined in CJCSI 6212.01, *Interoperability and Supportability of Information Technology and National Security Systems*, to perform their joint interoperability test and certification mission.

The main component of this approach to interoperability testing is the Net-Ready Key Performance Parameter (NR-KPP). The NR-KPP consists of measurable, testable, or calculable characteristics and/or performance metrics required for the timely, accurate, and complete exchange and use of information. The NR-KPP consists of the following five elements:

(1) Compliant solution architecture;
(2) Compliance with net-centric data and services strategies;
(3) Compliance with applicable GIG Technical Guidance (GTG);
(4) Compliance with DOD Information Assurance (IA) requirements; and,
(5) Compliance with supportability requirements to include spectrum utilization and information bandwidth requirements, Selective Availability Anti-Spoofing Module (SAASM) and the Joint Tactical Radio System (JTRS), as applicable.

9.4.2 MCSC

Marine Corps Order 5239.2, *Marine Corps Information Assurance Program (MCIAP)*, established Commander, MCSC as principal Designated Approving Authority and technical lead for MCIAP execution for applications and systems developed or fielded by MCSC. The Director, IA should have a representative on the T&E WIPT as a stakeholder for IA requirements and certification. The Director, M&JIC is also responsible for issuing the "Interim Certification to Operate" and to connect to live networks for testing.

Marine Corps Systems Command Order 3093.1, *Joint Interoperability Certification Testing of Marine Corps C4ISR Systems Policy*, designates MCTSSA as the Participating Test Unit

Coordinator and single agency within the Marine Corps responsible for the conduct and coordination of joint procedural interoperability certification testing. Certification testing is conducted at MCTSSA's Systems Integration Environment except when requirements for system certification are the responsibility of another service or agency, or when requirements exceed the capability of MCTSSA test facilities. MCTSSA should be a member of the T&E WIPT as a stakeholder for interoperability requirements and as a liaison with JITC for test coordination.

9.4.3 MCOTEA Marine Corps Information Assurance Assessment Team (MCIAAT)

MCIAAT is chartered to assess the IA and interoperability posture of Combatant Command (COCOM) and supporting service-fielded systems. MCIAAT should be a member of the T&E WIPT as a stakeholder for IA requirements and MOEs and to provide IA assessments that support the development and sustainment of acquisition programs.

9.4.3.1 Blue Team Assessments of COCOM

The primary mission is to ensure COCOM and MARFORCOM tactical and garrison computer networks are fully capable of supporting any mission assigned by raising IA awareness and readiness across the Marine Corps and the DOD IA community.

As part of the process for providing an assessment, MCIAAT uses MOEs to measure compliancy with DODI 8500.2 IA Controls. Each MOE provides a validation of an IA Control. Based on the Mission Assurance Category and Confidentiality level of the COCOM or MARFORCOM under test, a set of these MOEs are combined into one of nine MCOTEA worksheets (derived from the DIACAP Knowledge Service "validation procedures") which are used to validate the IA Controls in the MOEs.

IA Controls are categorized as either Technical or Non-Technical. The Technical controls are validated by performing various forms of test using the Blue Team IA Assessment Toolkit, a collection of programs that were selected based on ease of use and effectiveness. The Non-Technical controls are verified through interviews of users, review of IA documentation and select demonstrations. The MOEs are written to provide the tester guidance on what documentation to review and who to interview.

9.4.3.2 Interoperability Support for USMC and Joint Networks

MCIAAT can assess interoperability by witnessing dynamic operational events, system interfaces, personnel, and performance in a mission environment. Therefore, the goal of an interoperability assessment is to evaluate the operational effectiveness of information exchanged during the performance of a mission.

9.4.3.3 IA Assessments

Every system requires an IA assessment to determine its profile prior to being fielded. The primary assessment is to determine compliance with the IA requirements of DODI 8500.2, Information Assurance Controls. This is normally scheduled in unison with the Initial Operational Test and Evaluation (IOT&E) of the system by MCOTEA. However, MCIAAT can also perform early assessment of an operational representative system prior to IOT&E. This can

be accomplished by witnessing formal Developmental Testing (DT), or by MCIAAT performing an early assessment of the system.

Within the assigned IA Controls there are both Technical and Non-Technical controls to evaluate. Many of the Technical controls can be evaluated prior to IOT&E, depending on the maturity of the system. Many of the Non-Technical controls involve interviews of the users and administrators, and review of system documentation. This is best accomplished after the program is staffed and the users trained.

MCIAAT will, upon request, provide training on tools and methodology for programs of record to perform self-assessment after IOC.

9.5 Human Performance

Human Performance has an essential role in the testing and evaluation of systems because it has a direct link to mission success. Powerful state-of-the-art system capabilities are rendered useless and the mission will fail if the Marine is unable to properly operate and control the system in order to harness the power of the system. This can be the result of deficient training and operator error; but it can also be a function of a bad or poorly conceptualized design from the operator perspective. Human performance testing plays a central role in assessing the usability of the system and the suitability of the system to support mission tasks.

Predominately, human performance testing is used to assess graphical user interfaces, human machine interfaces, operator workstation configuration, and work area layout (e.g., emergency egress, optimized functional and informational flow lines). For systems with embedded training or simulation capabilities, human performance is essential for testing and assessing training and associated training aides.

Human performance testing can take on several forms, examples of which include subjective surveys, passive observation, and highly structured, scenario driven, objective performance tests. Particular metrics will vary according to the type of system and mission task, but objective metrics may include; time on task, accuracy, error counts, error rates, error recovery time, and motion times. More subjective metrics may include situation awareness, personal preferences, ratings of goodness or appropriateness to task, et cetera.

As a goal human performance testing should employ realistic scenarios, using representative systems operated by representative users. This increases the validity of the test procedures to ensure an unbiased assessment of the system. Human performance assessments can also be very easily inserted or even "piggyback" on other test events. Any time a full or even partial system is in place with a representative interface human performance testing can take place.

9.6 Verification, Validation and Accreditation

The Director, MCOTEA must certify any Modeling and Simulation (M&S) or Special Test Equipment through Verification, Validation and Accreditation (VV&A). Evidence of previous test use, independent verification and validation, or use of a fielded system or component will assist MCOTEA in accrediting appropriate uses for OT&E.

9.7 Ethics

The T&E WIPT shall maintain the highest standards of scientific and engineering ethics and reflect personal and professional integrity in test and evaluation. The T&E WIPT shall:

- Place a premium on the safety of people and property during T&E;
- Accurately present adverse conditions and expected consequences, even if such concerns have been waived or are expected to be waived;
- Ensure T&E is reported accurately, including the methods of analysis, limitations of scope, references to other work, and conclusions drawn; and
- Work to the mutual benefit of the USMC by openly exchanging information and sharing the lessons of study and experience with fellow professionals.

9.8 Transportability and Naval Integration

Marine Corps assets must be capable of movement on all modes of transport with a special emphasis on amphibious shipping. Some assets will be limited to outsized conveyances because of physical dimensions or weight while others may pose safety or compatibility problems with intended modes of transportation. MCSC is the designated transportability agent for the Marine Corps per MCO 4610.14.

Whenever detailed study or transportability testing is required on a system, the MCSC Director, Systems Engineering and Technology (SE&T) should be included on the T&E WIPT as a stakeholder to provide up to date references and guidance to expedite the process keeping safety and adherence with DoD directives in mind. Specific transportability capabilities should be addressed in the capabilities documentation. More information can be found in the MCSC Transportability and Naval Integration Handbook.

9.9 Marine Expeditionary Rifle Squad

MCSC Acquisition Policy Letter 3-05 established the PM for the Marine Expeditionary Rifle Squad (MERS) to ensure the Marine rifle squad is treated as a system and that all items to be consumed or carried by the rifle squad are integrated early and in accordance with a single, consistent and unifying configuration. PM, MERS should have a representative on the T&E WIPT as a stakeholder for programs to be consumed or carried by a Marine rifle squad.

Appendix A - List of Acronyms

AAP	Abbreviated Acquisition Program
AC, PROG	Assistant Commander for Programs
ACAT	Acquisition Category
ACMC	Assistant Commandant of the Marine Corps
ADM	Acquisition Decision Memorandum
AIS	Automated Information System
AOA	Analysis of Alternatives
APB	Acquisition Program Baseline
AR	Assessment Report
ASN (RDA)	Assistant Secretary of the Navy (Research, Development and Acquisition
CBA	Capabilities Based Assessment
CBP	Capabilities Based Planning
CDD	Capability Development Document
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CIO	Capabilities Integration Officer
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CMC	Commandant of the Marine Corps
COCOM	Combatant Command
COE	Concept of Employment
COI	Critical Operational Issue
CONOPS	Concept of Operations
COTS	Commercial Off The Shelf
CPD	Capability Production Document
CTE	Critical Technology Element
CTP	Critical Technical Parameter
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
DC, CD&I	Deputy Commandant, Capabilities Development and Integration
DC, SIAT	Deputy Commander for Systems Engineering, Interoperability, Architectures and Technology
DCR	DOTMLPF Change Recommendation
DOD	Department of Defense
DODAF	Department of Defense Architecture Framework
DODD	Department of Defense Directive

DODI	Department of Defense Instruction
DOT&E	Director, Operational Test and Evaluation
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and education, Personnel and Facilities
DR	Decision Review
DRPM	Direct Reporting Program Manager
DT	Development Test
DT&E	Developmental Test and Evaluation
EFDS	Expeditionary Force Development System
EMD	Engineering and Manufacturing Development
EOA	Early Operational Assessment
FOT	Follow-on Test
FOT&E	Follow-on Test and Evaluation
FRACAS	Failure Reporting, Analysis and Corrective Action System
FRP	Full-Rate Production
FUE	Field User Evaluation
GOTS	Government Off The Shelf
IA	Information Assurance
IBR	Integrated Baseline Review
ICD	Initial Capabilities Document
IOT	Initial Operational Test
IOT&E	Initial Operational Test and Evaluation
IPT	Integrated Product Team
ISP	Information Support Plan
IT	Information Technology
JCIDS	Joint Capabilities Integration and Development System
JITC	Joint Integrated Test Command
JROC	Joint Requirements Oversight Council
KPP	Key Performance Parameter
KSA	Key System Attribute
LFT&E	Live Fire Test and Evaluation
LRIP	Low-Rate Initial Production
M&JIC	MAGTF and Joint Integration and Certification
MAGTF	Marine Air-Ground Task Force
MARFORCOM	Marine Forces Command
MCCDC	Marine Corps Combat Development Command
MCIAAT	Marine Corps Information Assurance Assessment Team
MCIAP	Marine Corps Information Assurance Program
MCL	Mission Capability Level
MCO	Marine Corps Order

MCOTEA	Marine Corps Operational Test and Evaluation Activity
MC-SAMP	Marine Corps Single Acquisition Master Plan
MCTSSA	Marine Corps Tactical Systems Support Activity
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Materiel Development Decision
MERS	Marine Expeditionary Rifle Squad
MOE	Measure of Effectiveness
MOP	Measure of Performance
MOS	Measure of Suitability
MOT	Multiservice Operational Test
MOT&E	Multiservice Operational Test and Evaluation
MROC	Marine Requirements Oversight Council
NDI	Non-developmental Item
NET	New Equipment Training
NR-KPP	Net Ready Key Performance Parameter
NSS	National Security System
OA	Operational Assessment
OAR	Operational Test Agency Assessment Report
ODUSD (AT&L)	Office of the Deputy Under Secretary of Defense (Acquisition, Technology and Logistics)
OE	Operational Effectiveness
OER	Operational Test Agency Evaluation Report
OIPT	Overarching Integrated Product Team
OMAR	Operational Test Agency Milestone Assessment Report
OR	Observation Report
OS	Operational Suitability
OSD	Office of the Secretary of Defense
OSur	Operational Survivability
OTA	Operational Test Agency
OTPO	Operational Test Project Officer
OTRB	Operational Test Readiness Board
OTRR	Operational Test Readiness Review
OV	Operational View
PDR	Preliminary Design Review
PEO	Program Executive Officer
PEO-LS	Program Executive Officer for Land Systems
PGD	Product Group Director
PM	Program Manager
PMT	Program Management Team

POM	Program Objective Memorandum
PoPS	Probability of Program Success
QRA	Quick Reaction Assessment
RAM	Reliability, Availability and Maintainability
RDC	Rapid Deployable Capability
RDST	Requirements Development Support and Transition
RFP	Request for Proposal
RTM	Requirements Traceability Matrix
RTO	Requirements Transition Officer
SDS	System Design Specification
SECNAV	Secretary of the Navy
SECNAVINST	Secretary of the Navy Instruction
SEP	Systems Engineering Plan
SME	Subject Matter Expert
SON	Statement of Need
SPD	Solution Planning Directive
SQT	System Qualification Test
STES	System Test and Evaluation Strategy
SV	System View
T&E	Test and Evaluation
TCM	Technical Certification Memorandum
TDS	Technical Development Strategy
TEMP	Test and Evaluation Master Plan
TES	Test and Evaluation Strategy
TTP	Tactics, Techniques and Procedures
TV	Technical View
TYMTP	Two Year Master Test Plan
USC	United States Code
USD (A&T)	Under Secretary of Defense (Acquisition and Technology)
USMC	United States Marine Corps
WIPEB	Warfighting Investment Program Evaluation Board
WIPT	Working Integrated Product Team

Appendix B - References

CJCSI 3170.01, *Joint Capabilities Integration and Development System*

CJCSI 6212.01, *Interoperability and Supportability of Information Technology and National Security Systems*

CJCSM 3170.01, *Operation of the Joint Capabilities Integration and Development System*

DAU Defense Acquisition Guidebook

DODD 5000.01, *The Defense Acquisition System*

DODI 5000.02, *Operation of the Defense Acquisition System*

DODI 8500.2, *Information Assurance (IA) Implementation*

DON (RD&A) System Design Specification Guidebook

MIL-STD-1472, *Human Engineering Design Criteria for Military systems, Equipment and Facilities*

MCO 3900.15, "Marine Corps Expeditionary Development System"

MCO 4081.2, "Marine Corps Performance Based Logistics"

MCO 4610.14, "Department of Defense Engineering for Transportability"

MCO 5239.2, "Marine Corps Information Assurance Program"

MCSC Acquisition Policy Letter 3-05, "Marine Expeditionary Rifle Squad Inter-Program Acquisition and Integration Management"

MCSC Acquisition Policy Letter 3-07, "In-Service Management Planning and Execution"

MCSC Acquisition Policy Letter 6-04, "Materiel Fielding Decision Process"

MCSC Acquisition Policy Letter 11-02, "Command, Control, Communications, Computers and Intelligence Support Plan (C4ISP) Completion Process for Marine Corps Systems Command Programs"

MCSC Marine Corps Single Acquisition Master Plan Guide

MCSC Order 3093.1, “Joint Interoperability Certification Testing of Marine Corps Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Systems Policy”

MCSC Order 3900.10, “Operational Test Certification Process”

MCSC Order 3911, “MARCORSYSCOM Implementation of DoD and DoN System Engineering Plan (SEP) Policy”

MCSC Requirements Transition Process Guide

MCSC Transportability and Naval Integration Handbook

ODUSD (A&T) Guidebook, *Incorporating Test and Evaluation into Department of Defense Acquisition Contracts*

ODUSD (A&T) System Engineering Plan (SEP) Preparation Guide

SECNAVINST 5000.2, *Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System*

USD (AT&L) Memo of 19 Sep 07, “Prototyping and Competition”

USD (AT&L) Memo of 22 Nov 05, “Total Life Cycle Systems Management (TLCSM) Metrics”