MCOTEA Guidebook for Capabilities-Based Testing

V. 1.1

MARINE CORPS OPERATIONAL TEST AND EVALUATION ACTIVITY

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UNITED STATES MARINE CORPS
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From: Director, Marine Corps Operational Test and Evaluation Activity (MCOTEA)

Subj: MCOTEA GUIDEBOOK FOR CAPABILITIES-BASED TESTING (CBT)

1. The MCOTEA Guidebook for CBT lays the foundation for the transition of MCOTEA to a CBT methodology. It provides a conceptual framework for the understanding and execution of CBT and is the first in a series of new or updated Activity publications/directives that will provide further details of the process.

2. The MCOTEA Guidebook for CBT does not supersede current directives but rather it provides the authoritative basis for subsequent development of CBT policy, procedures, and guidelines. Specifically, the current MCOTEA SOP is still relevant and should used in conjunction with this Guidebook for depth of knowledge. There are marked differences between the two documents and significant changes in terminology; but the depth of information available in the SOP will take time to transition into the CBT framework. Where this Guidebook lays out clear direction that is contrary to the SOP this Guidebook should be considered directive, in many cases knowledge and understanding will be enhanced by the judicious application of information contained in the current SOP.

3. This is a living document and will be updated as we gain knowledge from experiences during implementation. All hands are encouraged to submit comments or recommendations for the improvement of this Guidebook. A comment/recommendation matrix is located on the R drive: (R:\CBT Guidebook). The CBT Working Group (CBTWG) will review this matrix quarterly and submit recommendations to the Director as to disposition of each comment/recommendation received. Updates and revisions will be published as required.

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Distribution: A
Approved for public release

Contents

Acronyms iii
References vii
Introduction 1

Test Concept Development

1. Program Definition 16
2. Test Concept Development 19
3. Test Concept Validation Conference 25
4. Test and Evaluation Master Plan Input Development 27

Detailed Test Plan Development

5. Failure Definition/Scoring Criteria Charter Development 30
6a. Detailed Test Plan Development 32
6b. Detailed Test Plan Content Review Board 36

Integrated Developmental Test Planning

7a. Integrated Developmental Test Planning 40
7b. Integrated Developmental Test Execution/Monitoring 42
7c. Integrated Developmental Test Reduction/Analysis 43

Operational Test Readiness Review/Pretest Activities

8a. Operational Test Readiness Review Preparation 46
8b. Operational Test Readiness Review 48
9. Pretest Activities 50

Test Execution

10. Pilot Test 54
11. Record Test 56
12. Operational Test Data Analysis/Resolution 58
13. Failure Definition/Scoring Criteria Scoring Conference 59

Test Reporting

14. In-Process Review 62
15. Independent Evaluation Report Development..... 64
16. Independent Evaluation Report Content Review Board..... 69
17. Milestone Decision Brief 72

Lessons Learned/Archive

18. Lessons Learned Analysis..... 74
19. Archive 75

Figures

1. Requirements and Evolutionary Acquisition Process..... 4
2. Joint Capabilities Integration Development System (JCIDS) Analysis Process..... 8
3. MCOTEA Test Process, Time-Phased 12
4. MCOTEA Test Process, Sequential 13
5. Attribute Resolution 65
6. Attribute Resolution Method 66
7. Operational Effectiveness/Operational Suitability Evaluation.. 67

Acronyms

ACAT	Acquisition Category
ACMC	Assistant Commandant of the Marine Corps
BH	Branch Head
CBT	Capabilities-Based Testing
CDD	Capabilities Development Document
CDR	Critical Design Review
COE	Concept of Employment
COI	Critical Operational Issue
COT	Chief of Test
CPD	Capabilities Production Document
CRB	Content Review Board
DOT&E	Director, Operational Test and Evaluation
DRMP	Design Reference Mission Profile
DT	Developmental Test
DTP	Detailed Test Plan
EA	Evolutionary Acquisition
FAA	Functional Area Analysis
FD/SC	Failure Definition/Scoring Criteria
FEP	For Evaluation Purposes
FNA	Functional Needs Analysis
FOT&E	Follow-on Operational Test and Evaluation
FRP	Full-Rate Production
FSA	Functional Solutions Analysis
ICD	Initial Capabilities Document

IDT	Integrated Developmental Test
IER	Independent Evaluation Report
IOT&E	Initial Operational Test and Evaluation
IPR	In-Process Review
ISP	Information Support Plan
IT	Information Technology
JCIDS	Joint Capabilities Integration Development System
KDT	Contractor Developmental Test
LFT&E	Live Fire Test and Evaluation
LRIP	Low-Rate Initial Production
MCCDC	Marine Corps Combat Development Command
MCOTEA	Marine Corps Operational Test and Evaluation Activity
MCSC	Marine Corps Systems Command
MCTL	Marine Corps Task List
MCWP	Marine Corps Warfighting Publication
MDA	Milestone Decision Authority
mef	Mission Essential Function
MS	Milestone
OA	Operational Assessment
OA	Operations Analyst
OAG	Operations Advisory Group
OE	Operational Effectiveness
OMF	Operational Mission Failure
OMS/MP	Operational Mode Summary/Mission Profile
OS	Operational Suitability

OSD	Office of the Secretary of Defense
OT	Operational Test
OT&E	Operational Test and Evaluation
OT/DT	Operational Test/Developmental Test
OTA	Operational Test Activity
OTPO	Operational Test Project Officer
OTRR	Operational Test Readiness Review
PA	Program Analyst
PDR	Preliminary Design Review
PGD	Product Group Director
PM	Program Manager
POA&M	Plan of Action and Milestones
POM	Program Objective Memorandum
RAM	Reliability, Availability, and Maintainability
ROI	Relevant Operational Issue
ROM	Rough Order of Magnitude
RTM	Requirements Traceability Matrix
RTR	Requirements Traceability Report
SA	Scientific Advisor
SBT	Strategic Business Team
SC	Scoring Conference
SE&I	Systems Engineering and Integration
SME	Subject Matter Expert
SOT	Scope of Test

SSAA	System Security Authorization Agreement
STA	System Threat Assessment
STE	Special Test Event
SUT	System Under Test
TD	Test Director
TDCT	Test Directorate
TEMP	Test and Evaluation Master Plan
TIR	Test Incident Report
TPD	Test Planning Document
TT	Test Team
UNS	Universal Need Statement
USD(AT&L)	Under Secretary of Defense (Acquisition, Technology, and Logistics)

References

(a) CJCS Instruction 3170.01E, Joint Capabilities Integration and Development System, of 11 May 05

(b) CJCS Instruction 6212.01C, Interoperability and Supportability of Information Technology and National Security Systems, of 20 Nov 03

(c) DASN(RD&A) (ACQ), Enclosure 3, Statutory, Regulatory, and Contract Reporting Information and Milestone Requirements, of May 03

(d) DOD Directive 5000.1, The Defense Acquisition System, of 12 May 03

(e) DOD Instruction, 5000.2, Operation of the Defense Acquisition System, of 12 May 03

(f) DON Office of the Assistant Secretary, Research, Development, and Acquisition. Memorandum for Distribution, Promulgation of DOD 5000 Directive and Instruction, of 9 Jun 03

(g) Marine Corps Operational Test and Evaluation Activity Operational Test Standard Operating Procedures (MCOTEA OT SOP), of Sep 00

(h) Marine Corps Operational Test and Evaluation Activity Administrative Standard Operating Procedures, in production

(i) SECNAV Instruction 5000.2C, Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System, of 19 Nov 04

Introduction

Marine Corps Operational Test and Evaluation Activity

The Marine Corps Operational Test and Evaluation Activity (MCOTEA) is the independent Operational Test Activity (OTA) for the USMC. MCOTEA provides information to the Milestone Decision Authority (MDA) as part of the decision-making process for the acquisition of materiel solutions to satisfy validated user needs. MCOTEA serves the MDA and the USMC by objectively evaluating how well the materiel solution meets the operational requirements. MCOTEA's role is to help ensure that a "bad" system does not make its way to the field because of a poor test or that a "good" system is not rejected because of a poor test. MCOTEA plans, conducts, and reports all Early Operational Assessments (EOA), Operational Assessments (OA), Initial Operational Test and Evaluation (IOT&E), and Follow-on Operational Test and Evaluation (FOT&E). MCOTEA also provides the MDA with test recommendations and concurrence on program Acquisition Category (ACAT) designations that will not have dedicated Operational Test and Evaluation (OT&E) conducted, such as ACAT IV Monitor (M) and Abbreviated Acquisition Programs (AAP).

MCOTEA Mission

In accordance with USC Title 10, MCOTEA is the authority for Operational Test and Evaluation for the USMC.

MCOTEA independently plans, executes, and evaluates testing of material solutions against Warfighter capabilities, under prescribed realistic conditions and doctrine, to determine operational effectiveness and suitability.

MCOTEA Vision

We are the USMC's leading authority for Operational Test and Evaluation and DOD's premier Operational Test Activity (OTA), providing objectivity and value to our customers. We are a

Professional team-based organization providing a variety of value-added products and services tailored to satisfy the specific needs of our customers.

Goals and Requirements of Operational Testing

MCOTEA strives to ensure that the Marines in the Operating Forces receive the very best equipment and support possible. To achieve this goal, MCOTEA ensures that each system proposed for acquisition is tested adequately, evaluated objectively, and reported independently.

The goals of operational testing are as follows:

- to employ the system under test as it will be used in the realistic operational environment
- to collect data that accurately describe the test conditions and the performance results

Each test has its own evaluation requirements. MCOTEA and other OTAs are moving their test design philosophy to a Capabilities-Based Test (CBT) approach based on two primary objectives. The first objective is an Integrated Test philosophy that encourages the early involvement of the OTA in the Acquisition process and the Developmental Test (DT) planning. The second and more fundamental objective of CBT is to focus the planning for Operational Test (OT) around the mission of the system. Evaluation of the system's Operational Effectiveness (OE) and Operational Suitability (OS) should be based on the system's mission (relates to OE) and on those factors that affect mission accomplishment (relates to OS).

Although Issues and Attributes are tailored from an analysis of the Marine Corps Combat Development Command (MCCDC) Capabilities Documentation, they must be put in the perspective of mission accomplishment. In order to gather data that accurately answer the Critical Operational Issues (COI) and illustrate capabilities and limitations of the system, the test process must begin and end with a paradigm that ties system Attributes to operational tasks or missions at the unit level.

MCOTEA Functions

Following are the responsibilities of the MCOTEA Director:

- Ensure that the OT of all ACAT I, IA, II, III, and IV T programs is effectively planned, conducted, evaluated, and reported.
- Coordinate the scheduling of resources for OT requiring Operating Force support through the Two-Year Master Test Plan published annually with quarterly updates.
- Host and chair a conference for determining Failure Definition/ Scoring Criteria (FD/SC) for each program.
- Prepare Part IV and provide input to Parts III and V of the Test and Evaluation Master Plan (TEMP) with the exception of Live Fire Test and Evaluation (LFT&E).
- Prepare and provide directly to the Assistant Commandant of the Marine Corps (ACMC), within 120 days after completion of OT&E, an Independent Evaluation Report (IER) for all OT&E.
- Coordinate Marine Corps support for other military services' operational tests.
- Chair an annual OT&E planning conference to include representation from the Marine Operating Forces, appropriate HQMC staff offices, MCCDC, MCSC, and others as appropriate.

Support to the Department of Defense Acquisition Process

Planning for Evolutionary Acquisition: Incremental and Spiral Development

Evolutionary Acquisition (EA) is a strategy whereby a basic capability is fielded with the intent to procure and field additional capabilities in the form of modifications to that basic capability. Figure 1 depicts the Requirements and Evolutionary Acquisition Process. Within EA are two developmental approaches, Incremental and Spiral. In the Incremental development process, a desired capability is identified, an end-state requirement is known, and that requirement is met over time by

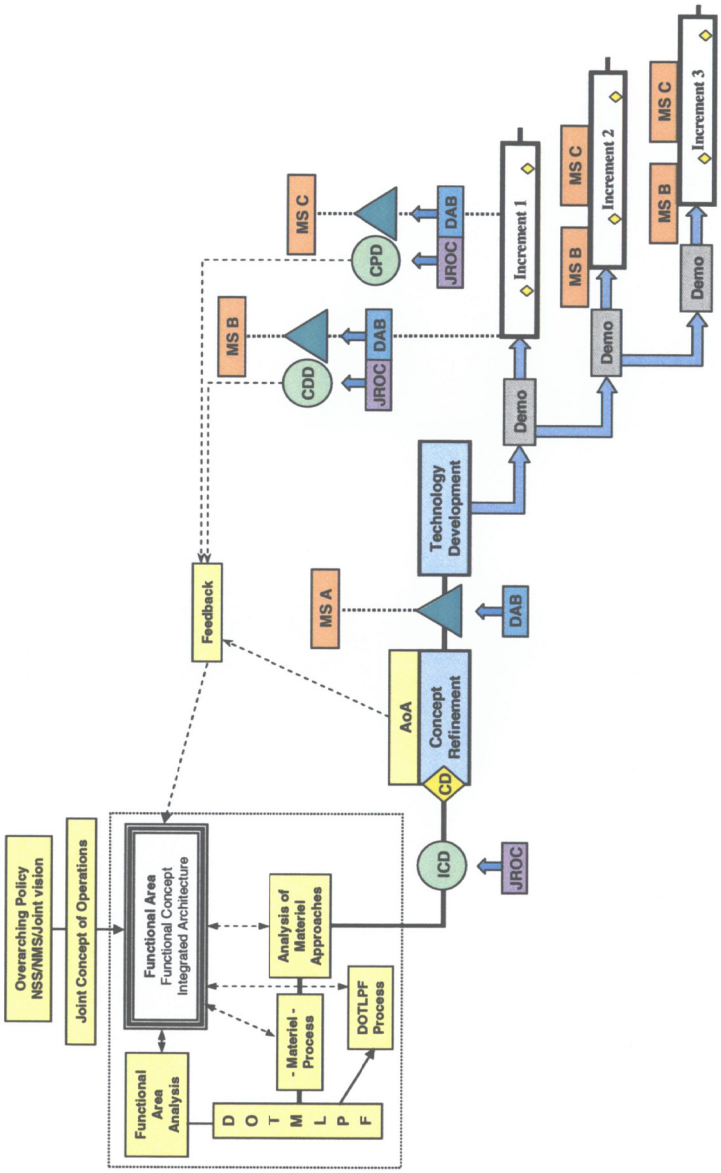


Figure 1. Requirements and Evolutionary Acquisition Process

Source: DOD Instruction 5000.2.

developing several increments, each dependent on available mature technology. In the Spiral development process, a desired capability is identified, but the end-state requirements are not known at program initiation. Incremental and Spiral development are designed to field an initial, well-defined, significant core operational capability quickly in response to validated requirements, while planning incremental upgrades to enhance the system at predetermined intervals. These increments are treated individually, with their content and scope resulting from new technology applications combined with continuous feedback from multiple test organizations, users, and support agencies. All of these factors are balanced against the constraints of time, evolving threats, time-phased requirements, and affordable cost.

Testing in Support of Evolutionary Acquisition: Incremental and Spiral Development

The EA strategy should be described in the individual Program Acquisition Strategy documentation. The Test and Evaluation strategy should support this strategy and be explained in the TEMP. Development and testing for the second and follow-on increments, or spirals, of capability should start concurrently with the first increment. The presence of time-phased requirements may require multiple increments, each in various stages of development, testing, and fielding. The presence of multiple increments, or spirals, under concurrent development adds more complexity to test planning and is a major characteristic of Command and Control systems development. Multiple configurations must be carefully tracked and may need regression testing. Some tests normally done in series must be run more or less concurrently.

Relationship to OSD Director, Operational Test and Evaluation

The Director, Operational Test and Evaluation (DOT&E) reports directly to the Secretary of Defense (SECDEF) and Congress. The Director is the principal advisor to the SECDEF and Under Secretary of Defense (Acquisition, Technology, and Logistics) (USD(AT&L)) on OT&E and is

the principal OT&E official within the DOD. Although DOT&E is not in the MCOTEA chain of command and very few MCOTEA programs are on the DOT&E Oversight List, DOT&E does have significant oversight of several programs in which MCOTEA is the lead or supporting service OTA.

DOT&E's primary responsibility for Oversight List programs is to provide final approval for the TEMP before milestone decision reviews and to approve OT&E plans before those tests may commence. DOT&E's primary interest is to ensure that OT&E and LFT&E are adequate before Full-Rate Production (FRP) or deployment, and that the tests and evaluations were properly executed according to statute and DOD policy. DOT&E's job is to help ensure that systems are operationally effective and operationally suitable before these systems go beyond Low-Rate Initial Production (LRIP).

DOT&E looks at the operational mission impacts of deploying a system from an "end-to-end" perspective with all of the interoperability and supportability considerations thrown into the mix. Operational Assessments should consider these mission impacts early in order to address the issues, questions, and problems that will arise later with deployment and employment.

DOT&E is very sensitive to system contractor involvement in operational tests in any way that could compromise the integrity of the Test and Evaluation (T&E) data or the analysis.

Early involvement of DOT&E personnel in drafting the T&E strategy, TEMP, and operational test plans saves time and trouble in the long run. TEMPs and test plans developed with the early involvement of a DOT&E action officer stand a much better chance of smooth approval from the Office of the Secretary of Defense (OSD).

Office of the Secretary of Defense Test and Evaluation Oversight

DOT&E and USD(AT&L) jointly publish an annual list of acquisition and sustainment programs requiring OSD T&E oversight and approval. The list contains sections for DT&E, LFT&E, and OT&E, with some programs

appearing in more than one section. All "oversight" programs require additional briefings, reports, and supporting documentation, and often require additional testing. See the DOT&E Web site at <http://www.dote.osd.mil> for the Annual T&E Oversight List. Additional details are found in the Defense Acquisition Guidebook at <http://asks.dau.mil/DAG>.

DOT&E chooses programs based on congressional or high-level OSD interest. Programs acquired jointly (i.e., Joint or multi-Service) having a high-dollar expenditure (i.e., ACAT I) or posing special risks are put on the Oversight list annually.

Capabilities-Based Test Process and Methodology

The CBT design process is structured on four basic elements:

- mission analysis (test scenario definition)
- system performance measures (attribute traceability)
- operating conditions (test environment description)
- test variables (controlled and uncontrolled)

These items form the basis for the Scope of Test and resource requirement estimates that are included in the TEMP.

The CBT methodology begins with a top-down, functional analysis of the mission area, similar to the approach described in CJCSI 3170.01E. Figure 2 depicts the Joint Capabilities Integration Development System (JCIDS) analysis process. The Capabilities-Based Assessments documented in this process provide the foundation for mission analysis from an Operational Test point of view. An understanding of the system and its intended Marine Corps Task List (MCTL) application is a crucial first step in evaluating Operational Effectiveness. This understanding is obtained from considering the system description and requirements and often requires Subject Matter Expert (SME) reviews and insight. To achieve this understanding, the methodology involves a decomposition of an

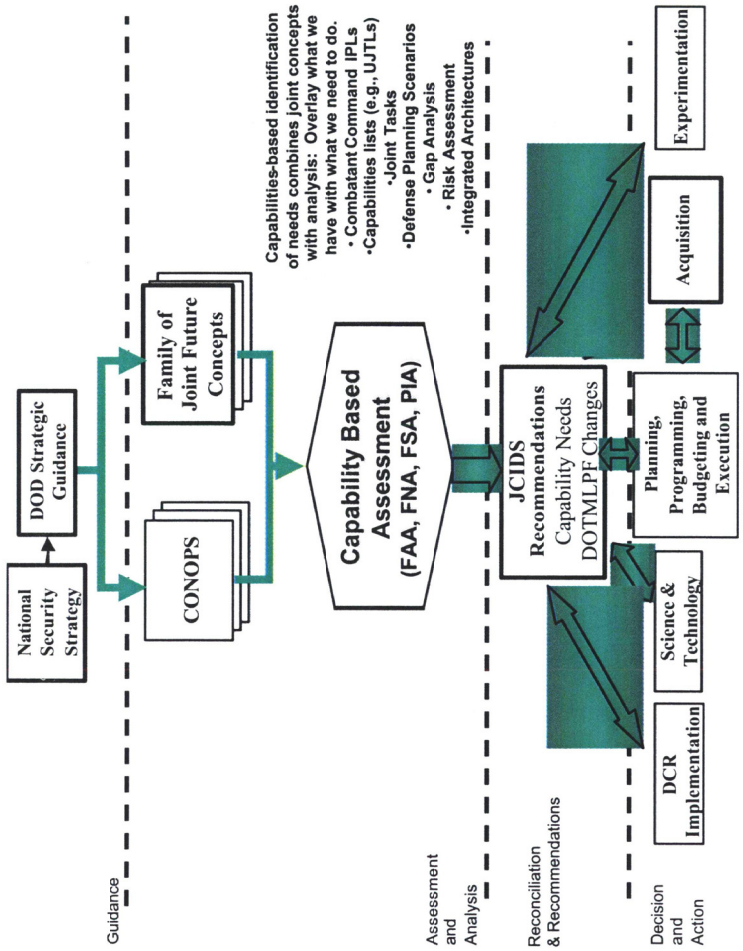


Figure 2. Joint Capabilities Integration Development System (JCIDS) Analysis Process

Source: CJCS Instruction 3170.01E.

operational task, or mission, into the action steps needed to achieve the mission.

The key to successful CBT implementation is the Integrated Test approach. Under the CBT methodology, Special Test Events (STE) are reduced during the OT period and replaced whenever possible by DT events. These DT events are expected to assemble the requisite data, taking into account the associated caveats that come from the use of DT in OT evaluation.

Note: The MCCDC Capabilities Development Document (CDD) and Capabilities Production Document (CPD) are now the standards for requirements documentation; however, the Operational Requirements Document (ORD) and Operational & Organizational Concepts (O&O) remain in use for many acquisition programs while the transition to the JCIDS process and CBT continues.

Types of Operational Test and Evaluation

Operational Assessment

An Operational Assessment (OA) demonstrates system performance, with user support as required, on other than production systems and is conducted by an independent OTA. The focus of an OA is on significant trends noted in development efforts, programmatic voids, areas of risk, adequacy of requirements, and the ability of the program to support adequate OT. An OA may be conducted using technology demonstrators, prototypes, mock-ups, engineering development models, or simulations, but will not substitute for the independent OT&E necessary to support full-rate production decisions. Operational Assessments are executed when requested by a Program Manager (PM) and are tailored to meet the PM's requirements.

Initial Operational Test and Evaluation

Initial Operational Test and Evaluation (IOT&E) is normally conducted during the Production and Deployment acquisition phase on production

or production-representative articles to determine whether systems are OE and OS. It may also support the decision to proceed beyond LRIP to FRP. In some cases when the Milestone (MS) C decision and the production decision are planned concurrently, IOT&E may be performed during the System Development and Demonstration acquisition phase, prior to MS C. In general, IOT&E is the only operational test phase required by Department of the Navy policy (SECNAVINST 5000, November 2004).

Follow-on Operational Test and Evaluation

Follow-on Operational Test and Evaluation (FOT&E) is the OT&E that may be necessary after a successful MS C or FRP Decision. FOT&E is 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.

Information Assurance Considerations

Interoperability Watch List

OSD places Information Technology (IT) programs and systems with significant interoperability deficiencies and issues on an Interoperability Watch List. PMs and test organizations (either developmental or operational), in conjunction with the Joint Interoperability Test Command, may be called upon to provide quarterly updates on these IT programs and systems in support of OSD-level interoperability assessments. IT programs and systems with persistent interoperability problems are selected for the OSD T&E Oversight List. More details about the Interoperability Watch List are contained in an OSD memo, “Promulgation of DOD Policy for Assessment, Test, and Evaluation of Information Technology System Interoperability.”

Information Support Plan

Formerly called the C4ISP, the Information Support Plan (ISP) is a master plan for identifying and resolving implementation issues related

to an acquisition program's C4I, surveillance, and reconnaissance (C4ISR) infrastructure support. The ISP identifies C4ISR needs, dependencies, interfaces, and certifications for programs in all ACATs, focusing on interoperability and supportability concerns. The ISP describes how all testers will collaborate to ensure that interoperability and information assurance issues are resolved. T&E information in the ISP must be harmonized with the TEMP. Test organizations must review the ISP for test-related requirements, responsibilities, and issues. MCSC Systems Engineering & Integration (SE&I) is the Office of Primary Responsibility for coordinating ISPs within the USMC before they are forwarded to OSD/C3I for review and/or final approval depending on ACAT. See CJCSI 6212.01 for more guidance.

About This Guidebook

The purpose of this guidebook is to provide top-level guidance on the MCOTEA Test Process and to explain the core philosophy behind Capabilities-Based Testing. The information needed to successfully plan and execute an Operational Test is not solely contained in this guidebook. The reader will often be referred to a series of more complete reference publications for more detailed explanations and sample documents. Figures 3 and 4 show the MCOTEA Test Process in a time-phased view and a sequential view, respectively. The time-phased view is also presented in the poster that accompanies this guidebook. The MCOTEA test process continues to be a methodical, iterative test design approach that relies on the combined efforts of the Operational Test Project Officer (OTPO), Operations Analyst (OA), Program Analyst (PA), Branch Head (BH), Scientific Advisor (SA), and the Chief of Test (COT). The focus of the CBT process is the mission of the System under Test (SUT). The integrated testing methodology enables the OT to maintain that focus by the discretionary use of DT data.

Metrics

The collection of metrics is an evolving practice. For now, Branch Heads should collect the metrics called for during various test phases,

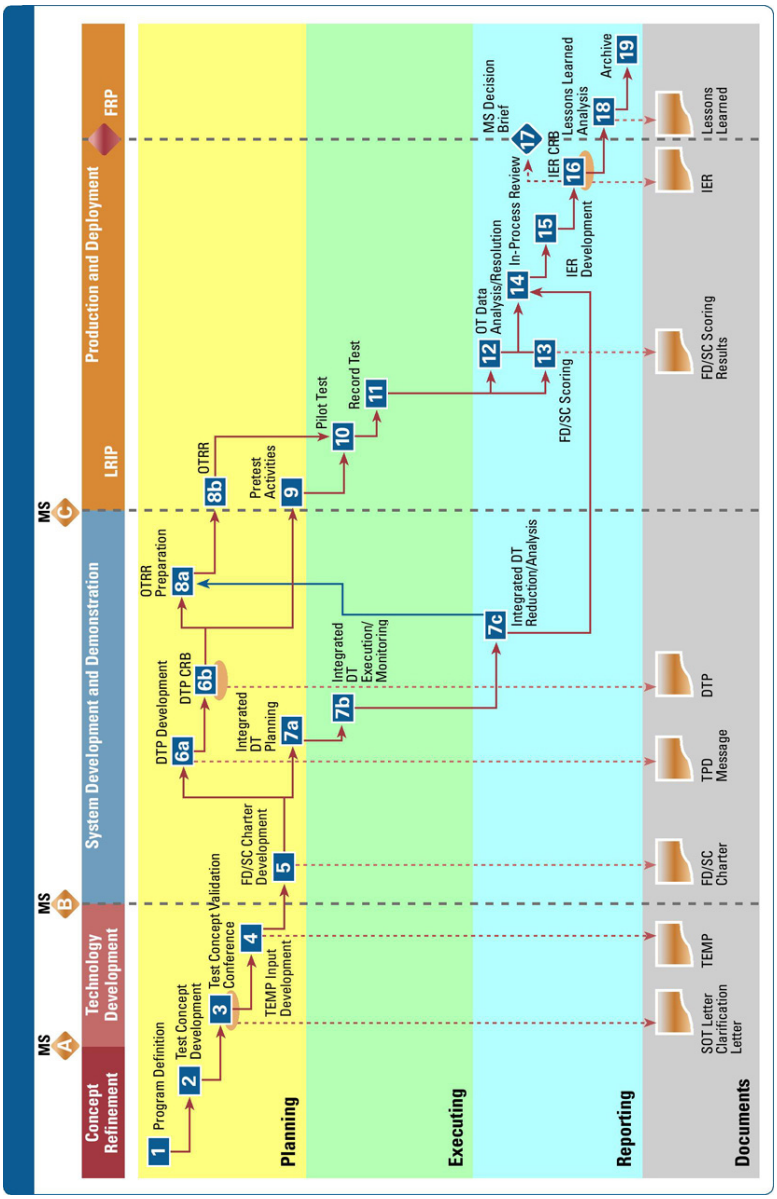


Figure 3. MCOTEA Test Process, Time-Phased

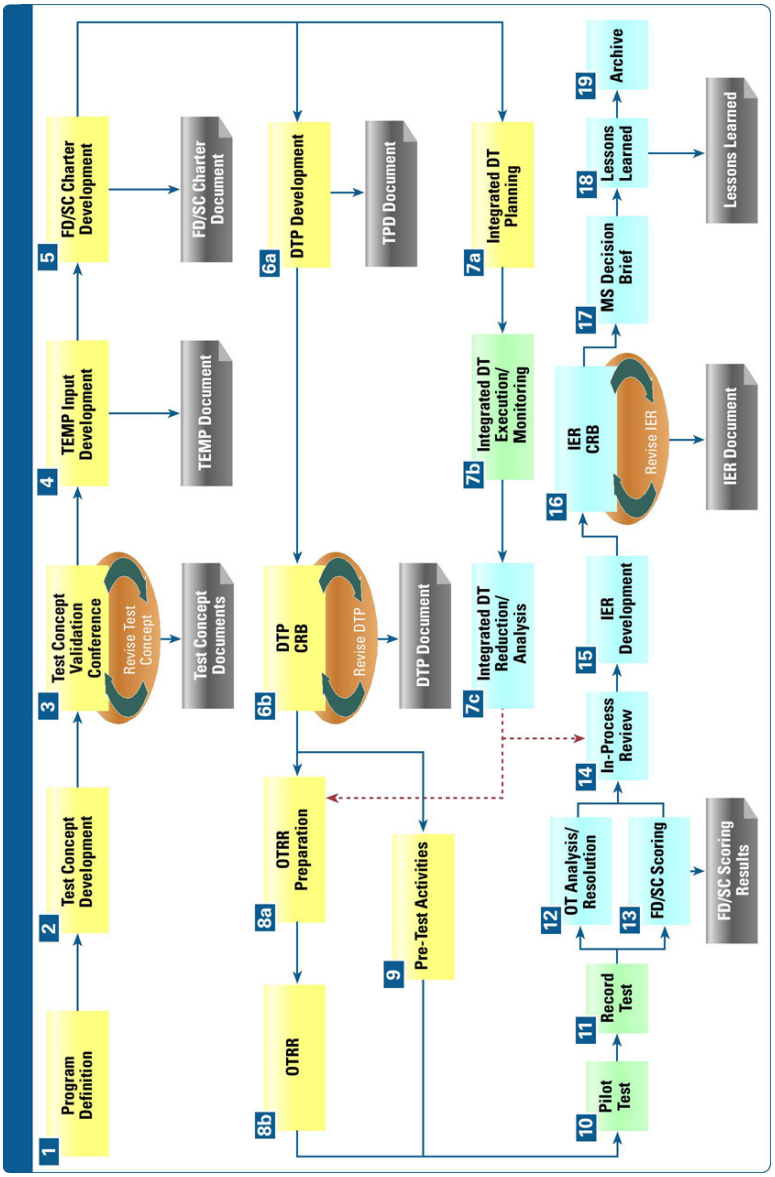


Figure 4. MCOTEA Test Process, Sequential

as indicated in the "Best Practice" boxes. Over time, the collection of metrics will become a standard and more complex part of the test process.

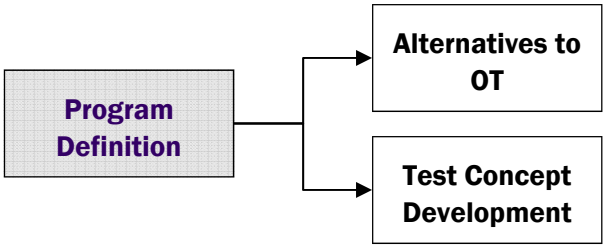
Process Implementation and Guidebook Updates

The Test and Evaluation Process Guidebook does not supersede current directives but rather provides the authoritative basis for subsequent development of CBT policy, procedures, and guidelines. Specifically, the current MCOTEA Standard Operating Procedures (SOP), dated September 2000, is still relevant and must be used in conjunction with this guidebook for depth of knowledge. Marked differences exist between the two documents, including significant changes in terminology, but the depth of information available in the SOP will take time to transition into the new CBT framework. Where this guidebook lays out clear direction contrary to the SOP, this guidebook should be considered directive; in many cases, knowledge and understanding will be enhanced by the judicious application of the current SOP.

As the implementation of the CBT process continues in MCOTEA, this guidebook will be updated. Lessons learned from pilot programs, comments from MCOTEA personnel, and updated executive guidance will affect the content of this document. Process metrics will be defined and used to determine opportunities for improvement and to assess impacts of process changes. A space on the MCOTEA Information Center or the shared drives will be identified as a repository for comments. The MCOTEA COT will resolve all comments provided in the prescribed format.

Test Concept Development

1. Program Definition



Input

- Program Discovery
  - Testing Services Request Letter
  - Program Objective Memorandum (POM) Reviews, Operations Advisory Group (OAG) Meetings, Urgent Universal Need Statement (UNS), Strategic Business Team (SBT) interaction

Output

- Program Assignment
  - Branch and OTPO designation
  - Funding request
  - Points of contact established

Key Activities

☐ Attend POM Reviews, OAG Meetings, MCSC Product Group SBT meetings (BH).

☐ Review documents (BH/OTPO).

- Initial Capabilities Document (ICD)
- Capabilities Development Document (CDD)
- Capabilities Production Document (CPD)
- Concept of Employment (COE)
- Design Reference Mission Profile (DRMP)
- Operational Mode Summary/Mission Profile (OMS/MP)
- Universal Need Statement (UNS)
- Functional Needs Analysis (FNA)

Key Activities (continued)

- Functional Solutions Analysis (FSA)
- Functional Area Analysis (FAA)
- Other documents as needed

☐ Review CDD Development (BH, SA, DSA as required).

☐ Research applicable MCOTEA Lessons Learned (OTPO).

☐ Prepare ROM for funding Pre-MS B Activity (BH).

☐ Designate lead Test Branch and OTPO (Director/Deputy Director/BH).

☐ Collect required metrics (BH).

Overview

A mission need does not proceed to a formal materiel acquisition program until approved by the Milestone Decision Authority at a Milestone A review. This does not mean, however, that a great deal of groundwork is not already under way by both MCCDC and MCSC.

Best Practice

- BH interacts with the MCSC Product Group Director (PGD) SBT.
- Metrics include
  - time from receipt of formal testing services support request until MCOTEA funding request submitted to MCSC
    - time measured in days
    - cost measured in man-hours

MCOTEA becomes aware of a potential OT&E initiative in one of three ways. The first is by word of mouth, which occurs as a by-product of routine business communications between MCOTEA and MCCDC or MCSC. Usually, a Branch Head is alerted to the development of a new system through interaction with the MCSC PGD SBT. A second way is when an ICD or CDD is routed to MCOTEA for review. The third way of discovering a new initiative is through formal notification letters that request MCOTEA's testing services.

Regardless of the discovery method, MCOTEA must decide if the new initiative allows enough time to develop a proper test concept before the TEMP is due. Pop-up projects and late notifications sometimes occur. These short suspense efforts with insufficient planning time substantially increase risk to the program.

Based on the program's Acquisition Category (ACAT), a general Rough Order of Magnitude (ROM) is developed for the level of testing support required to adequately evaluate the system. This ROM is further refined during Test Concept Development. If the MCSC Program Manager requests an endorsement from MCOTEA to be considered an ACAT IV (M) or Abbreviated Acquisition Program (AAP), an alternate review process is used. (See Chapter 5, section 1 of the MCOTEA SOP.)

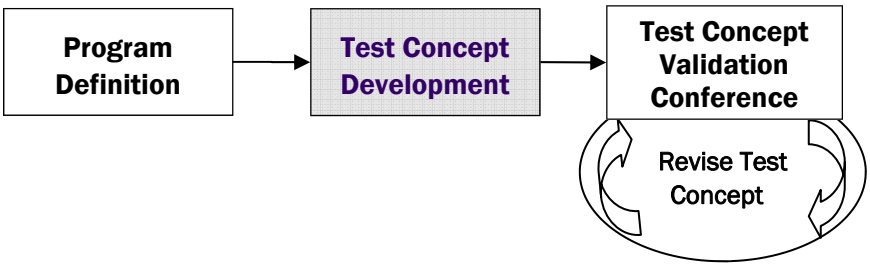
Part of Program Definition is a review of the capabilities documents. The goal of this review is to develop better requirements that are measurable and testable early in the acquisition process. As the program nears the MS B review, the intent of the review is to determine the necessary scope of OT to support future acquisition decisions. Note that while CDD can be used for OA planning and early IOT&E planning, final IOT&E should be accomplished using the CPD.

References

MCOTEA SOP Chapter 3, Section 1

MCOTEA SOP Chapter 5, Section 1 (Alternatives to OT)

2. Test Concept Development



Input

- Capabilities Documents, Employment Documents, System Threat Assessments, and all other available program documentation
- Program Office T&E IPT sessions
- Acquisition strategy
- Formal decision to enter CBT Process (Director)
- Program budget test line item

Output

- Test Team (TT) definition of "adequate" testing
- Documents Produced
  - Narrative test strategy and scenario summary
  - SOT Letter (Scoped-Out Attributes, DT Sourcing, Test Limitations)
    - Requirements Traceability Report (RTR)
  - Test Conditions Table
  - Measure Variables Table
  - CDD/CPD Clarifications
  - Preliminary Test Budget and Schedule
- Updated Quad Chart

Key Activities

☐ Determine level of test involvement (EOA, OA, IOT&E, FOT&E) (OTPO).

☐ Analyze Mission (Create Issues for OE) (OTPO).

- Consult source documents for Issues development (CDD, COE, DRMP, OMS/MP, MCTL, MCWP).

Key Activities (continued)

- Create COIs and Relevant Operational Issues (ROIs).
- Create Sub-Issues.

☐ Determine mission impacts based on objective areas (Issues Creation for OS) (OTPO).

- Consult source documents for Issues development (CDD).
- Create COIs and ROIs.
- Create Sub-Issues.

☐ Analyze Capabilities Documentation (OTPO/OA).

- Parse Attributes (KPP/Critical).
- Allocate Attributes under appropriate Issue.

☐ Assess test condition variables (OA).

- e.g., location, climate, terrain

☐ Determine Test Limitations (OTPO).

☐ Select Test Conditions (design considerations) (OTPO/OA).

- Determine test articles, duration, number of OMS/MPs, test resources, location, climate, terrain.

☐ Assess risk associated with Test Condition selection (OTPO).

☐ Determine Measure variables (e.g. C-1) (OA).

☐ Develop Measures (OA).

- Source Measures to test type (KDT, DT, OT, etc.).

☐ Determine resource allocation and budget (OTPO).

☐ Write short narrative test strategy and scenario summary.

Overview

For the Test Team to determine OE and OS satisfactorily, the test concept should be broad enough to cover all important OE and OS aspects of the SUT and deep enough to reveal the actual underlying capabilities and limitations of the SUT. Measures must adequately span the breadth of the issues they support. OE Issues must adequately span the breadth of the mission. OS Issues must adequately illuminate potential impacts to the mission.

Best Practice

- Document Lessons Learned throughout this process.
- Hold In-Process Reviews of the Test Team's progress.
- Metrics include
  - length of time from receipt of funding until read-ahead for TIWG is completed/ distributed
    - time measured in days
    - cost measured in man-hours

The TT establishes a hierarchy of requirements, with OE Issues focusing on the system's mission and OS focusing on impacts to mission accomplishment. The construction of the OE hierarchy begins with an analysis of the Concept of Employment, OMS/MP, and other mission-related documents. The team then constructs a timeline of events (actions) in a generic mission. No event is too small at this point; the TT should use this time as a brainstorming session. Next, the team should examine more specific mission profiles/scenarios and add these to the list of events as necessary. At this point the brainstorming session should end.

The TT now groups like events into broad categories (actions), which become the Relevant Operational Issues (ROI). The events under the broad categories can be used as Sub-Issues as needed to provide greater resolution of the Issues. For OS, the standard suitability objectives adequately define the potential impacts to mission accomplishment. At times, however, it may make better sense to group some of the typical Issues, such as Reliability, Availability, and Maintainability (RAM), under a single Issue. RAM issues are often

interrelated, and analysis of their impact on the mission best occurs when these Issues are combined.

The last step in Issues creation is identifying all COIs. After creating an Issue hierarchy, the Team finishes the parsing of Attributes under the Issues. The Attributes parsed from the capabilities documentation undergo a tailoring evaluation that categorizes each Attribute according to the action step determined in the mission analysis. From this process, an initial SOT is developed, and any suspected test deficiencies affecting any Issue or Attribute are annotated in the database. A more complete discussion of test deficiencies can be found in the MCOTEA SOP Chapter 5, Section 3.

Measures are created to collect the information required to answer the Issues and Attributes. Measures created solely from Capabilities Document-derived attributes may not sufficiently define the necessary breadth of information required to evaluate OE and OS. Measure development that considers all aspects of the system employment will fill these areas with the required information to adequately evaluate the system. Adequate Test Concept means that the Test Team should not be faced with important unknowns after the T&E has been completed and the roll-up determination of OE and OS is addressed.

MCOTEA uses six general types of Measures and two categories. The six general types of measure are

1. Quantitative (Measures using a sample statistic or percentage/ proportion)

2. Single Demonstration (Measures using a single actual demonstration of the system's capability)

3. Analytic Demonstration (Measure using an analysis of the system and/or its interfaces to demonstrate the capability)

4. Verification/Inspection (Measure using the physical verification of applicable certifications, physical presence of items on the SUT, inventories, etc.)

5. Opinion (User/Maintainer) (Measure using answers to one or more questions to gather information regarding the system's demonstrated performance during testing)

6. Opinion (Subject Matter Expert/Test Team)

The two categories are Measures with thresholds and Measures without thresholds. Measures assigned to Attributes must have thresholds. If no thresholds are stated in the CDD/CPD, then MCOTEA can derive a threshold value that MCCDC can approve or modify.

Testing Sources

1. Contractor Developmental Test (KDT)

- Testing completed by the developing contractor.
- System need not be operated by typical users (Marines).
- Entire system need not be production representative; however, the subcomponent being tested must be production representative.
- Testing must have Government oversight.

2. Independent Developmental Test (IDT)

- Testing completed by entity independent of the system's developing contractor.
- System need not be operated by typical users (Marines).
- Entire system need not be production representative; however, the subcomponent being tested must be production representative.

3. Developmental Test/Operational Test (DT/OT)

- Testing completed by entity independent of the system's developing contractor.
- System must be operated by typical users (Marines).
- System must be production representative.
- System need not operate in accordance with the OMS/MP or the COE.

4. Operational Test/Developmental Test (OT/DT)

- Testing completed by entity independent of the system's developing contractor.
- System must be operated by typical users (Marines).
- System must be production representative.
- System must operate in accordance with the OMS/MP or the COE.
- System need not perform all functions of the OMS/MP.

5. Operational Test (OT)

- Testing completed by an operational test activity.
- System must be operated by typical users (Marines).
- System must be production representative.
- System must operate in accordance with the OMS/MP COE.
- System must perform the functions of the OMS/MP.

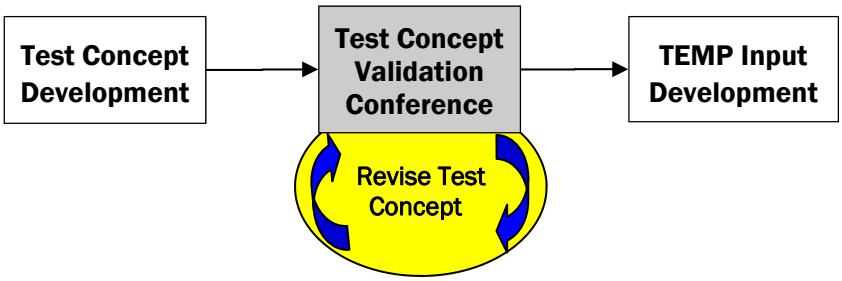
Measure sourcing must occur following Measure creation. This is the initial step in which the integrated test philosophy is implemented. MCOTEA involvement in the planning of DT events used to resolve OT and subsequent observation of those events is essential. Using DT data based solely on reading published DT reports is of minimal value in reducing the size and scope of required IOT&E. The sourcing code definitions below are applied to resolution of the measures.

Finally, the TT identifies scenarios through study of the COE and System Threat Assessment (STA). Based on these scenarios and Scope of Test, the TT develops a set of test events that will adequately support evaluation of the SUT in an operational environment. The TT identifies any requirements needing further clarification or MCOTEA interpretations and submits letters to MCCDC for resolution. As a last step, the TT develops an initial list of resource requirements.

Reference

MCOTEA SOP Chapter 5, Section 3

3. Test Concept Validation Conference



Input

- Draft SOT Letter
- Requirements Traceability Report (RTR)
- Test Conditions Table
- Measure Variables Table
- Test Constraints/Limitations
- CDD/CPD Clarifications
- Preliminary Test Budget and Schedule

Output

- Detailed Test Plan (DTP) Appendix 1 to Annex D (to the Measure level)
- Signed SOT Letter
- Signed Clarification Letter
- Updated Quad Chart
- Lessons Learned document
- Baselined Test Budget and Schedule
- Baselined Test Concept ("Adequate" Testing defined for submission to TEMP)

Key Activities

☐ Develop baseline agreement of test scope to the Measure level (MCOTEA OTPO/MCSC PM/MCCDC Capabilities Officer).

☐ Attend conference with MCOTEA (BH, OTPO, OA, SA), MCCDC, and MCSC.

☐ Conduct iterative review process until output documents are satisfactory (OTPO/BH).

☐ Capture Lessons Learned (OTPO).

Overview

Best Practice

- Metrics include
  - length of time from receipt of read-ahead package until signed SOT letter is submitted to MCSC and signed Clarification Letter is delivered to MCCDC
    - time measured in days
    - cost measured in man-hours

The Test Concept Validation Conference is a quality control event and the first test-planning milestone. The conference provides the opportunity for MCOTEA to review the TT's work to date and allows outside agencies to review and comment. The conference's ultimate goal is to develop an RTR that adequately addresses the scope of the planned testing.

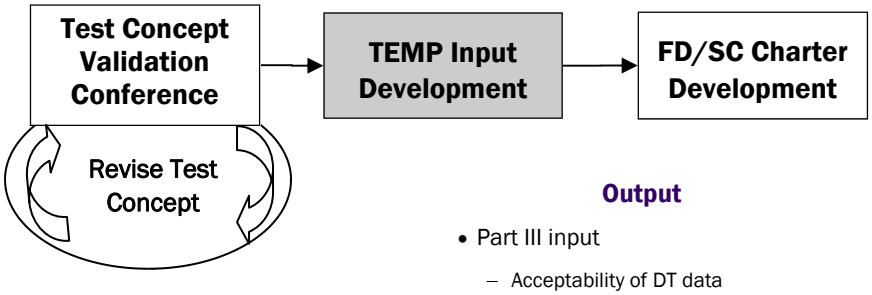
Following Test Concept Validation, the output documents proceed to the editorial review process as defined in the MCOTEA SOP for Administration. At this point, test documents begin to adhere to MCOTEA standards for structure, appearance, format, and technical editing.

References

MCOTEA SOP Chapter 5, Section 4

MCOTEA SOP for Administration (in production)

4. Test and Evaluation Master Plan Input Development



Input

- Signed SOT Letter
- Test Conditions Table
- Measure Variables Table
- Annotated capabilities documents
- Test Constraints/Limitations
- CDD/CPD Clarifications Letter
- Updated Quad Chart
- Baselined Test Budget and Schedule
- Baselined Test Concept

Output

- Part III input
  - Acceptability of DT data
  - Specify DT/OT periods
- Part IV input
  - OT entrance criteria
  - OT&E overview
  - COIs
  - OT&E to date
  - Future OT&E
  - Test events
  - LFT&E (PM or DOT&E)
- Part V input
  - Test Resource Requirements
  - Cost with Integrated Test Strategy by FY
  - Cost without Integrated Test Strategy by FY
- RTR input to Requirements Traceability Matrix (RTM) Annex
- TEMP Caveat Letter
  - When Test Concept Development process is abbreviated

Key Activities

- ☐ Attend Program Test IPT meetings (OTPO).
- ☐ Create MCOTEA TEMP inputs (OTPO).
- ☐ Review TEMP inputs (BH, SA).

Best Practice

- Metrics include
  - length of time from completion of test concept development to submission of an input to the TEMP signed by the Director
    - time measured in days
    - cost measured in man-hours

Overview

MCSC and the MCOTEA TT begin the development of the TEMP. For MCOTEA, the TEMP development process consists of two parts: (1) the review of Parts I, II, III, and V; and (2) the development of Part IV and MCOTEA input (OT&E Resources) to Parts II, III, and V. This is a refining stage in which program costs, schedule, and performance realities affect a number of documents such as the TEMP, CDD, and FD/SC Charter. MCOTEA's initial input to the TEMP should be as detailed as program maturity allows.

Upon completion of the CDD, MCOTEA develops an RTR that links all testable parameters in the CDD with an initial testing concept and proposed strategy for resolving the OE and OS of each. The TT develops the initial test deficiencies after reviewing the initial test concept and completing the RTR process. Because the TEMP is a living document, it may be periodically reviewed and updated. At a minimum, the TEMP must be updated for each program milestone.

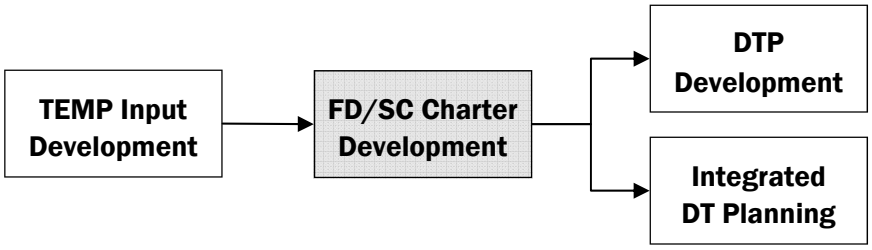
Resource requirements, an input to Part V of the TEMP, should include both the estimate that considers an integrated testing strategy and an estimate that does not consider the savings associated with Integrated Testing.

Reference

MCOTEA SOP Chapter 5, Section 4

Detailed Test Plan Development

5. Failure Definition/Scoring Criteria Charter Development



Input

- COE, OMS/MP
- System description
- CDD/CPD

Output

- Signed FD/SC Charter
- Draft RAM Evaluation (DTP Annex E)

Key Activities

☐ Attend FD/SC Charter meetings as needed (OTPO, OA, MCSC Rep, and MCCDC Rep).

☐ Develop draft Mission Essential Functions (mefs) (OTPO).

☐ Develop RAM Dendritic (OA).

☐ Develop RAM Definitions (OA).

☐ Collect metrics (BH).

Overview

The purpose of the FD/SC Charter is to provide guidelines for assessing test incidents used in evaluating system RAM and to publish procedures for the RAM FD/SC Charter Conference and the FD/SC Scoring Conference (SC).

Best Practice

- Metrics include
  - length of time from the completion of the TEMP until the FD/SC Charter is signed by MCOTEA, MCCDC, and MCSC
    - time measured in days
    - cost measured in man-hours (TT)

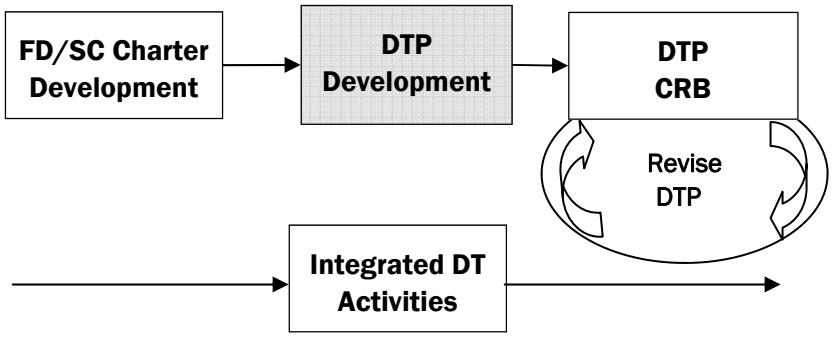
During the FD/SC Scoring Conference, members reach a mutual agreement on the definitions of mefs and Operational Mission Failure (OMF), as well as on the overall content of the FD/SC Charter. MCCDC is the final approval authority for mefs. Members, who have reviewed the draft FD/SC Charter beforehand, have the opportunity to express any concerns and resolve them during the conference. At the end of the conference, results are published as the final draft FD/SC Charter, which will be staffed for signature. It is essential that concerns surrounding any aspect of the FD/SC Charter be resolved during the conference because the FD/SC Charter includes the "ground rules" for all RAM scoring and reporting related to the system. The definition of OMF will directly affect the evaluation of several RAM Measures found in the Capabilities Documents.

Members of the conference include the action officers from the independent tester and evaluator (MCOTEA), the operational forces requirements sponsor (MCCDC), and the developer (MCSC PM). Each activity will provide only one voting member.

Reference

MCOTEA SOP Chapter 6, Section 5

6a. Detailed Test Plan Development



Input

- TEMP
- FD/SC Charter, COE, OMS/MP or DRMP
- System Threat Assessment
- Test Concept Documents
  - SOT Letter
    - RTR
  - Test Conditions Table
  - Measure Variables Table
  - CDD/CPD Clarification Letter

Output

- Test Planning Document (TPD) Naval Message
- DTP Content Review Board (CRB) package
  - Main Body
  - Annex A: Concept of Employment
  - Annex B: Test Scenarios
  - Annex C: Test Design
    - Appendix 1 to Annex C: Test Event Cross-Reference Matrix
    - Appendix 2 to Annex C: Pilot Test Plan
  - Annex D: Data Collection/ Evaluation
    - Appendix 1 to Annex D: Data Requirements
    - Appendix 2 to Annex D: Data Collection Forms
    - Appendix 3 to Annex D: Instrumentation

Output (continued)

- Appendix 4 to Annex D: Test Team Responsibilities
- Appendix 5 to Annex D: Evaluation Plan with Resolution Rules

– Annex E: Reliability, Availability, and Maintainability

- Appendix 1 to Annex E: FD/SC Charter

– Annex F: Range/Frequency

– Annex G: Logistics/Test Support

– Annex H: Admin/Personnel

- Appendix 1 to Annex H: Personnel Requirements
- Appendix 2 to Annex H: Reports
- Appendix 3 to Annex H: Test Director's Checklist

Best Practice

- IPRs of TT progress
- Metrics include
  - length of time from completion of the FD/SC Charter until submission of signature-ready DTP CRB package
    - time measured in days
    - cost measured in man-hours

Key Activities

☐ Learn about the system (OTPO/OA).

☐ Review program documentation, including RTR (OTPO/OA).

☐ Identify specific resources, test ranges, and personnel (OTPO).

☐ Conduct site surveys (OTPO).

☐ Build and refine Test Scenarios (OTPO).

☐ Create exercise schedules and coordinate with Marine Operating Forces (OTPO).

☐ Develop TPD message (OTPO).

☐ Build Daily Test Schedule (OTPO).

– Cross-reference Measures to Events (Daily Test Schedule).

Key Activities (continued)

- ☐ Develop Data Collection processes (OA/PA).
  - Establish DTP data requirements.
  - Create paper forms or program automated system.
  - Develop Survey Database.
  - Develop TIR Database.
  - Develop RAM/Performance Database.
- ☐ Identify specific resources, test ranges, and personnel (OTPO).
- ☐ Hold IPRs as necessary (BH).
- ☐ Coordinate with test site personnel (OTPO).
- ☐ Collect metrics (BH).

Overview

The DTP development process begins after the completion of the RTR and ends when the Director signs the DTP. The Branch Head (BH) approves the timelines for the development of the DTP and provides a Plan of Action and Milestones (POA&M) to the Director accordingly. The DTP CRB should be completed no later than 42 days before the start of the Pilot Test to ensure that a signed DTP is distributed to the Operating Forces in advance of the test.

The DTP defines the procedures for the entire TT, particularly for the Test Director (TD) and the Operating Forces involved in the test. Ideally, the TD should be intimately involved in the final DTP development process. The DTP provides enough detail that a “non-tester” is able to execute the plan; it is thorough and detailed enough that the TD can execute the test with minimal guidance or supervision from MCOTEA. The TD should be able to develop a Letter of Instruction, including a Daily Test Schedule, and should be able to institute sufficient data controls and procedures to ensure that the required data are collected. In addition, the DTP provides guidance to the TT for writing the IER. It

presents an outline for logical presentation of the data collected as well as analytic methods and resolution rules used in the evaluation of test results.

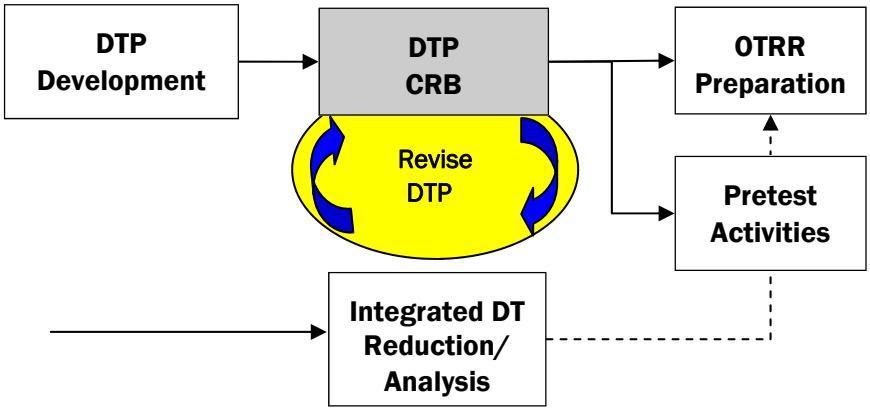
The DTP must include a cross-reference of all Measures to at least one test event from either DT or OT. By accounting for each Measure in the DTP, the TT ensures that by the end of the OT, all required data are collected from one of the approved testing sources.

When all operational and logistic planning and coordination have been completed, the TT publishes a TPD to finalize coordination with the host Operating Forces. By this time, test site surveys, test equipment setup rehearsals, and "what-if" sessions have been conducted. Funding and transportation details are complete. Before the TT proceeds to OT execution, the TT conducts an Operational Test Readiness Review (OTRR) to gain the Director's approval to proceed to test.

Reference

MCOTEA SOP Chapter 6, Sections 1–3 and 7

6b. Detailed Test Plan Content Review Board



Input

- DTP CRB package
  - Main body
  - Annex A: Concept of Employment
  - Annex B: Test Scenarios
  - Annex C: Test Design
    - Appendix 1 to Annex C: Test Event Cross-Reference Matrix
    - Appendix 2 to Annex C: Pilot Test Plan
  - Annex D: Data Collection/ Evaluation
    - Appendix 1 to Annex D: Data Requirements
    - Appendix 2 to Annex D: Data Collection Forms
    - Appendix 3 to Annex D: Instrumentation
    - Appendix 4 to Annex D: Test Team Responsibilities
    - Appendix 5 to Annex D: Evaluation Plan with Resolution Rules
  - Annex E: Reliability, Availability, and Maintainability
    - Appendix 1 to Annex E: FD/SC Charter
  - Annex F: Range/Frequency
  - Annex G: Logistics/Test Support
  - Annex H: Administration/Personnel
    - Appendix 1 to Annex H: Personnel Requirements
    - Appendix 2 to Annex H: Reports
    - Appendix 3 to Annex H: Test Director's Checklist

Output

- Signed DTP
- Lessons Learned

Key Activities

- ☐ Continue iterative review process until contents are satisfactory.
- ☐ Attend DTP CRB meeting (MCOTEA, MCCDC, and MCSC Reps).
- ☐ Review
  - Complete DTP
  - Updated Quad Chart (OTPO)
- ☐ Capture Lessons Learned (OTPO/OA).
- ☐ Identify Test Director (TD) and ensure TD involvement (OTPO).
- ☐ Collect metrics (BH).

Overview

Best Practice

- Early involvement of TD
- Metrics include
  - length of time from submission of DTP CRB package until DTP is signed
    - time measured in days
    - cost measured in man-hours

The CRB is a formal MCOTEA board created to ensure that the DTP is complete, adequate, and defensible. The CRB's purpose is to verify that the test as presented in the DTP is consistent with the TEMP and that the execution of the DTP as written will provide the data required to resolve all the pertinent issues not precluded by the accepted test deficiencies.

The DTP CRB provides a valuable in-depth understanding of the system under test to all CRB members. Members include the OTPO, the other members of the TT, and the SA. Members from the PM's office and the User's representatives also are encouraged to attend, as their participation increases their understanding of OT&E planning and provides an opportunity to resolve issues that may arise regarding interpretation of system requirements. The BH chairs the meeting.

Following the DTP CRB, the final DTP proceeds to the editorial review process as defined in the MCOTEA SOP for Administration. Style guides and detailed instructions concerning the standards for structure, appearance, format, and technical editing are contained in that SOP.

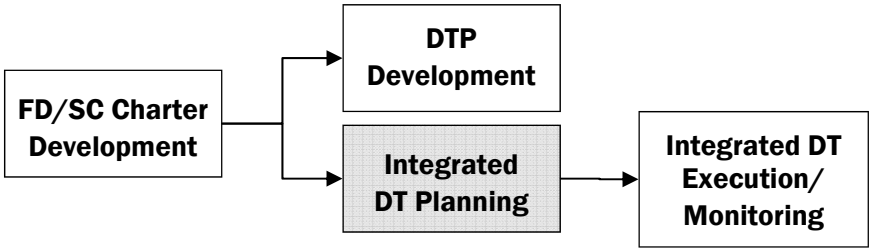
References

MCOTEA SOP Chapter 6, Sections 2 and 6

MCOTEA SOP for Administration (in production)

Integrated Developmental Test Planning

7a. Integrated Developmental Test Planning



Input

- TEMP RTM
- Draft DT Plans
- TEMP Schedule
- SOT Letter
  - RTR
  - DT Sourcing Enclosure
- FD/SC Charter

Output

- IDT Plans

Best Practice

- Metrics include
  - length of time from the completion of the FD/SC Charter to completion of DT Plans
    - time measured in days
    - cost measured in man-hours

Key Activities

☐ Attend CDR/PDRs and test planning meetings (OTPO/OA).

☐ Cross-reference DT Events to RTR Measures (KDT, IDT, DT/OT, OT/DT) (OTPO).

☐ Collect metrics (BH).

Overview

System knowledge is a key element in the integrated test planning process. The OTPO must develop an understanding not only of the required capabilities but also of the system characteristics as the design matures. This in-depth knowledge allows the OTPO to modify the test plan to help quantify technical risks that may exist. System knowledge also enables the OTPO to perform better trade-offs in data sourcing between DT and OT events.

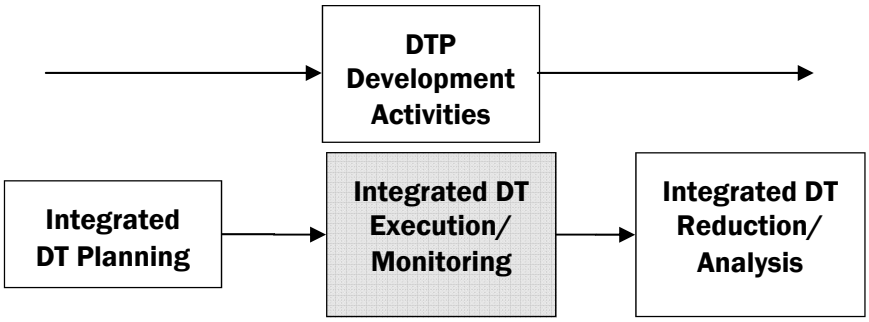
Integrated DT Planning allows MCOTEA to influence the planning of DT events in order to maximize the usefulness of DT results during the final evaluation of a system. DT is designed to capture specific information about a system's performance under controlled testing conditions. When appropriate, however, aspects of the operational environment may be added to a DT scenario in order to capture data that support the overall goal of testing and evaluation—to ensure a system's effectiveness in the field. MCOTEA brings operational experience to the Integrated DT Planning process and provides suggestions for points during DT at which operational aspects should be incorporated.

Legitimate use of DT data for OT&E purposes depends on certain conditions described by law, DOD, and SECNAV guidance. To be applicable for the final evaluation, the DT must be accomplished in a realistic operational environment with production-representative systems. MCOTEA works with the PM to minimize the resource implications of these conditions while still meeting the letter and spirit of the law and guidance. All DT Reports should be delivered to MCOTEA upon publication, and no later than 30 days before the OTRR, so that any changes to the OT can be incorporated as needed to ensure adequate coverage of all test Measures.

Reference

MCOTEA SOP Chapter 5, Section 1

7b. Integrated Developmental Test Execution/Monitoring



Input

- IDT Plans and schedules
- Draft DTP

Output

- Observation Reports (trip reports, situation reports, etc.)

Key Activities

- ☐ Attend Developmental Tests: KDT, IDT, DT/OT, and OT/DT (OTPO/OA).
- ☐ Complete Observation Reports (trip reports, situation reports, etc.) (OTPO).

Best Practice

- Metrics include
  - length of time from the completion of DT planning until DT is completed
    - time measured in days
    - cost measured in man-hours

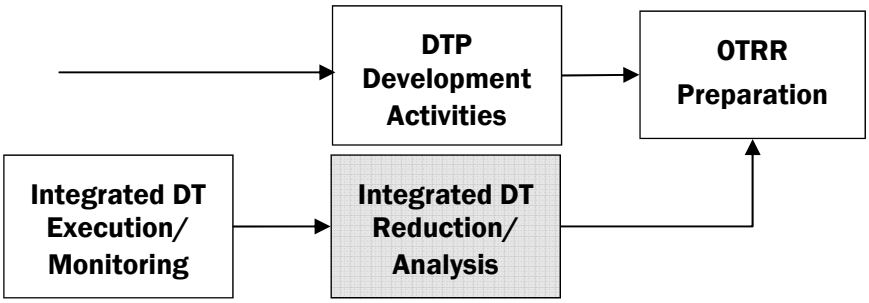
Overview

The purpose of IDT Execution/Monitoring is to witness Test Events and to ensure that execution takes place according to the IDT Plan. The intent is not to evaluate data during this stage but to gain insight to provide context for the reported results. Observation Reports will be used to document the comments and substantiate the DT Measure results reported in the IER.

Reference

MCOTEA SOP Chapter 5, Section 1

7c. Integrated Developmental Test Reduction/Analysis



Input

- IDT Reports
- Observation Reports (trip reports, situation reports, etc.)

Output

- Analysis of Measure results based on DT Reports and Observation Reports
- DT Measure results

Key Activities

- ☐ Evaluate DT Reports (OTPO/OA).
- ☐ Evaluate associated reports and documentation (e.g., SME reports, especially for technical testing).
- ☐ Evaluate ISP, System Security Authorization Agreement, technical manuals, Logistics Support Plan, etc.
- ☐ Document DT Measure results (OTPO/OA).
- ☐ Collect metrics (BH).

Overview

The objective of IDT Reduction and Analysis is to evaluate the performance capabilities and limitations of the system as the OTRR approaches. DT data and results must be provided early enough to

allow for resolution of DT Measures before the completion of OT.

Best Practice

- Metrics include
  - length of time from the completion of DT execution to the completion of data reduction and analysis to support OTRR
    - time measured in days
    - cost measured in man-hours

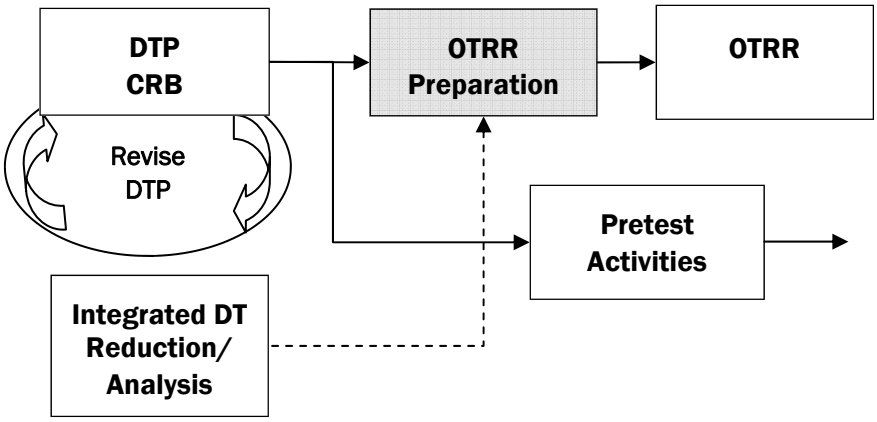
MCOTEA will not critique DT events but will evaluate DT data based on the reported findings provided by MCSC. In the context of providing a snapshot of system performance over time, the first time the Measures results can be recorded by MCOTEA will be after the DT Reports are received from MCSC.

Reference

MCOTEA SOP Chapter 5, Section 1

Operational Test Readiness Review/ Pretest Activities

8a. Operational Test Readiness Review Preparation



Input

- DT Measure results
- Quad Chart
- Safe and Ready Certification (MCSC)

Key Activities

- ☐ Evaluate system potential to perform mission (OTPO).
- ☐ Provide informal brief to Director in advance of OTRR (OTPO):
  - Internal MCOTEA meeting
  - Programmatic update
  - Significant issues
  - Collect metrics (BH)

Output

- OTRR Read-Ahead Package

Best Practice

- OTPO attends MCSC Safe and Ready Review meeting.
- Metrics include
  - length of time from signing of DTP and completion of IDT Reduction/ Analysis to the OTRR meeting
    - time measured in days
    - cost measured in man-hours

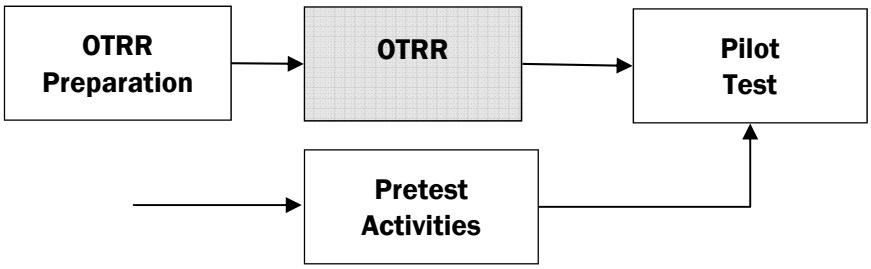
Overview

A Pre-OTRR Brief to the Director takes place at least 3 days before the formal OTRR. The brief ensures that the Director has a current understanding of the program intricacies and provides advance notice of any significant resource or planning concerns relating to the OT. Any areas of concern that entail significant risk are discussed during the brief, with resolutions proposed or recommendations agreed on in preparation for the OTRR. Attendees to the Pre-OTRR Brief typically include the Director, Deputy Director, Test Branch Head, and OTPO. Others may attend as appropriate. No specific brief format is required for this informal meeting.

Reference

MCOTEA SOP Chapter 6, Section 8

8b. Operational Test Readiness Review



Input

- Safe and Ready Certification (MCSC)
- OTRR Read-Ahead Package

Output

- Clearance to proceed to OT

Key Activities

☐ Attend meeting (MCOTEA, MCCDC, and MCSC).

☐ Provide system safety and readiness brief (MCSC).

☐ Provide test plan readiness brief (OTPO).

☐ Provide test execution and logistics readiness brief (TD).

☐ Collect metrics (BH).

Overview

The OTRR is a final review of the overall readiness of a system to undergo OT or OA. This comprehensive review, presented to the Director, addresses all aspects of the test item's readiness, as well as MCOTEA's readiness to conduct the test. As a final outcome of the OTRR, the Director will indicate whether the system may proceed to the scheduled OT or OA.

The OTPO is responsible for monitoring a program's progress and comparing test schedules against the developmental process to ensure that the system is ready for OT before it is presented at an OTRR. The OTPO should have identified any inconsistencies and taken appropriate action to achieve resolution before reaching this stage. The OTRR serves as a final confirmation that all significant issues have been resolved or clearly identified to the chain of command before the review.

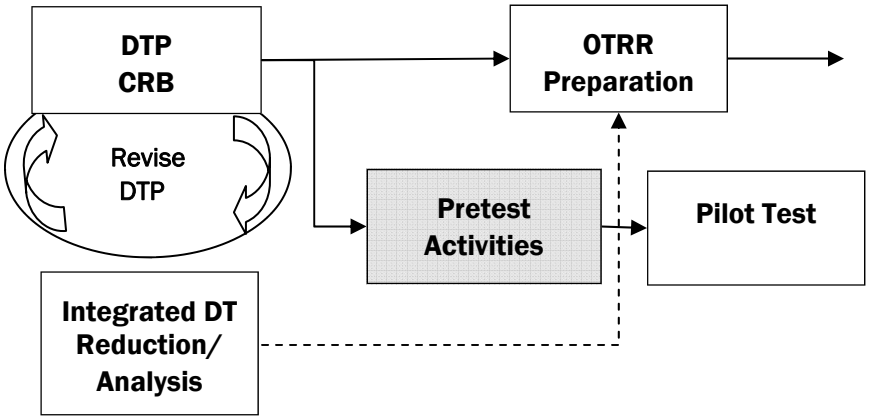
Best Practice

- Metrics include
  - length of time from completion of OTRR preparation until clearance to proceed to OT from Director
    - time measured in days
    - cost measured in man-hours

Reference

MCOTEA SOP Chapter 6, Section 8

9. Pretest Activities



Input

- Signed DTP

Output

- Data Collector's Handbook
- Trained and equipped test force

Key Activities

☐ Exercise all functions of data collection using notional data (PA).

- Create Performance, RAM, TIR, and Survey data (PA).
- Generate reports to answer Measures (PA).
- Identify and correct programming/logic errors (PA).

☐ Develop data collection training plan and handbook, or training brief (if required) (PA).

- Consult Data Collector's Reference Book Table of Contents (MCOTEA SOP Chapter 7, Section 3).

☐ Oversee final test site coordination (TD/OTPO).

☐ Conduct operator/maintainer training (MCSC).

Key Activities (continued)

- ☐ Conduct Data Collector training (OA/PA).
- ☐ Coordinate logistics (TD/OTPO).
- ☐ Ensure test execution funding is in place (OTPO/MCOTEA Fiscal).
- ☐ Collect metrics (BH).

Overview

The TT prepares to kick off the test through activities such as participant training, administrative and logistic support, and the "movement to contact."

Best Practice

- Exercise data collection during DT/OT event, if practical.
- TT, including the TD, attend the system training.
- Metrics include
  - length of time from signing DTP to start of Pilot Test
    - time measured in days
    - cost measured in man-hours

MCOTEA conducts operational tests on a "system," composed of the equipment itself and the operators and maintainers, designed to accomplish a particular mission. Before beginning the OT, the Marine operators and maintainers and key members of the Test directorate require training on the equipment/system to undergo OT&E. In order to represent the typical military user accurately and to help assess the adequacy of the supporting manuals, the TT should be trained using the newly developed USMC training packages and technical manuals for the equipment/system. The TD should attend training along with the operators and maintainers. This is crucial for a fair evaluation because the TD must be as familiar with the system being tested as the Operating Forces working with the system are. The MCOTEA Test Team, including the OTPO, OA, PA, and Data Collectors, also perform their test responsibilities better when they have attended the training.

The TT executes the logistical planning detailed in DTP Annexes G, H, and I. Even if a test site visit has been conducted earlier in the planning, the TT should conduct one at least 2 weeks prior to the test.

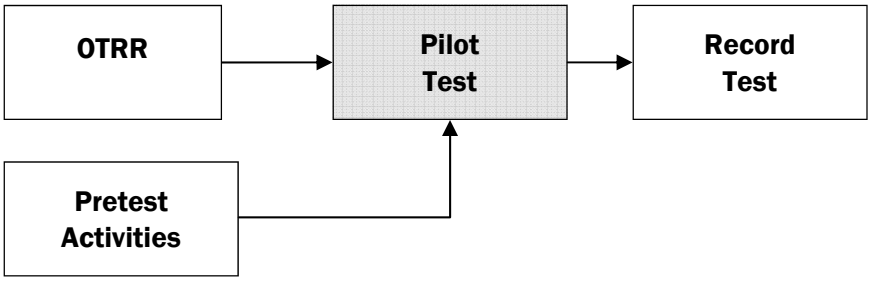
The OTPO and TT should arrive at the test site at least 2 days before the arrival of the test personnel to work out any last-minute details. This allows time to ensure that all shipments have arrived and that local facilities are available and in operating order. Data collection training is the opportunity to instruct the data collectors on the purpose of the OT and their role in the test. Data collection training is usually done at the test site, after the arrival of all personnel.

Reference

MCOTEA SOP Chapter 7, Section 1 and 3

Test Execution

10. Pilot Test



Input

- Successful OTRR
- Successful completion of all Pretest Activities

Output

- Verified Data Collection procedures
- Verified test equipment operation
- Verified SUT readiness
- Verified Test Team readiness

Key Activities

☐ Validate Data Collection Plan (OA/PA).

- Plan and execute as if data will be useable.
- Conduct Pilot Test (PT) hot wash.

Overview

The Pilot Test is a rehearsal of a portion of the Record Test where data collection forms and procedures are verified, any concerns with the operation of all test equipment are resolved, the data analysis procedures in the DTP are validated, and the system under test is verified and operational. A pilot test should be accomplished at each test site for tests with multiple locations.

All events outlined in the PT plan should be executed with outcomes analyzed. The goal is to resolve conflicts between the realities of the OT and the intellectual efforts in the DTP, sometimes done without benefit of ever seeing the system under test in operation. If enough adjustments to the equipment and DTP are warranted following the PT, a second PT may be required before proceeding to the Record Test.

Best Practice

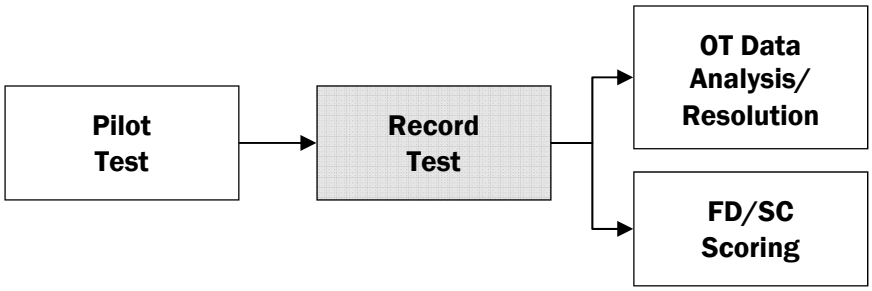
- Allow sufficient time between Pilot and record tests to analyze and refine the test plan as needed.
- Metrics include
  - length of time from completion of Pre-Test Activities and clearance to proceed to OT is given until the analysis of PT data is complete
    - time measured in days
    - cost measured in man-hours

A rehearsal of the support equipment is in order. FAX machines and printers, generators, radios, and other like systems should be tested to ensure that they are operational during the PT. If the system under test is supposed to integrate with other existing systems in a network, the network should be built and verified prior to the beginning of the PT.

Reference

MCOTEA SOP Chapter 7, Section 2

11. Record Test



Input

- Pilot Test hot wash results
- OTPO approval to proceed to Record Test

Output

- Test Data, both measured and observed

Key Activities

☐ Oversee daily execution of test plan (TD).

☐ Ensure daily validation of data collection (OTPO).

Overview

The Record Test is the focus of all OT activities to this point. The TD has developed and is following a daily schedule, approved by the Director, at the OTRR. If the test planning and coordination has gone well, the test personnel should simply be following the daily schedule developed from the DTP.

The TD does not deviate from the DTP without approval from the OTPO or BH. All OTPO-approved changes must be reported immediately to the BH for confirmation. The OTPO may make only minor changes that cannot affect the analytical process, to include schedule changes.

Best Practice

- Metrics include
  - length of time from completing Pilot Test data analysis until OT data collection is completed
    - time measured in days
    - cost measured in man-hours

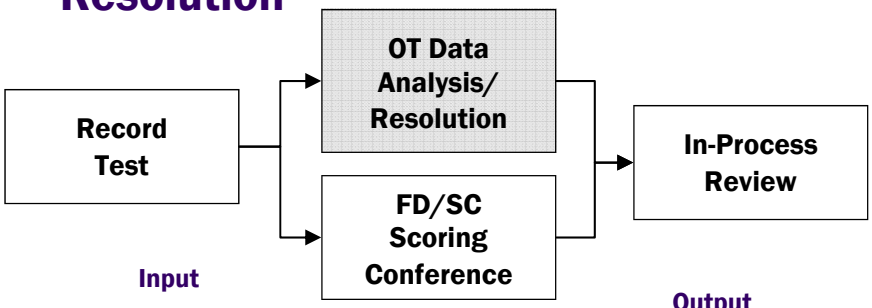
The BH must approve deviations that may affect the analytical process, to include resolution of MOEs and criteria, such as reductions in expected sample sizes. All BH-approved deviations must be immediately reported to the Deputy Director and the Scientific Advisor for confirmation. Major changes to the basic IOT&E plan are made only with the prior written approval of the Director, MCOTEA.

After the daily end brief, the TT should reduce that day's data and review it for completeness and accuracy. This information should be compared with the MOE data anticipated to be collected that day, and any discrepancies or "holes" in the data should be identified. This will allow the TT to develop a plan of action to recover from the loss of expected data. To the extent possible, data collection functions should be automated in order to obtain real-time feedback.

Reference

MCOTEA SOP Chapter 7, Section 3

12. Operational Test Data Analysis/ Resolution



Input

- OT data
- Observation reports (OT situation reports)

Output

- OT Measure results

Key Activities

☐ Analyze Data (OA).

- Begin during Record Test execution
- Focus on OT sourced data
- Statistical methods as appropriate

☐ Document Measure results (OA).

Best Practice

- Metrics include
  - length of time from completion of OT test data collection until the initial Measure results are compiled
    - time measured in days
    - cost measured in man-hours

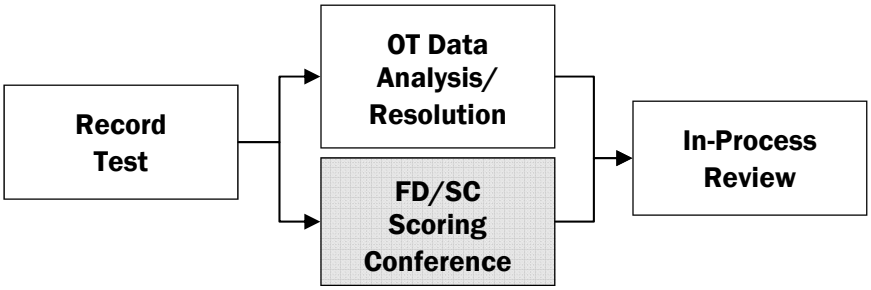
Overview

Once reviewed and entered by the PA, the data are reduced to answer the Measures specified in the DTP. Other descriptive metrics may be developed to further characterize the Measure results. Each Measure has data requirements, an analytical method, and sometimes a threshold associated with it. To the extent possible, data reduction and analysis functions should be automated to save the TT time that is better spent executing the technical evaluation and IER drafting functions.

Reference

MCOTEA SOP Chapter 8, Section 2

13. Failure Definition/Scoring Criteria Scoring Conference



Input

- Completed TIRs with all associated maintenance records
- Operator and Maintainer Logs

Output

- Scored TIRs
- Lessons Learned

Key Activities

- ☐ Attend MCOTEA, MCCDC, MCSC scoring conference (OTPO).
- ☐ Schedule intermediate scoring conferences during record test as required (OTPO).
- ☐ Capture Lessons Learned (OTPO).

Best Practice

- Metrics include
  - length of time from completion of OT data collection until RAM TIR Scoring Conference is complete
    - time measured in days
    - cost measured in man-hours

Overview

The FD/SC Scoring Conference is held to allow MCOTEA, MCSC, and MCCDC representatives to vote on the scoring of all TIRs. Outcomes will affect RAM and other performance measures. FD/SC scoring consists of multiple scoring events. First, the TD provides an initial

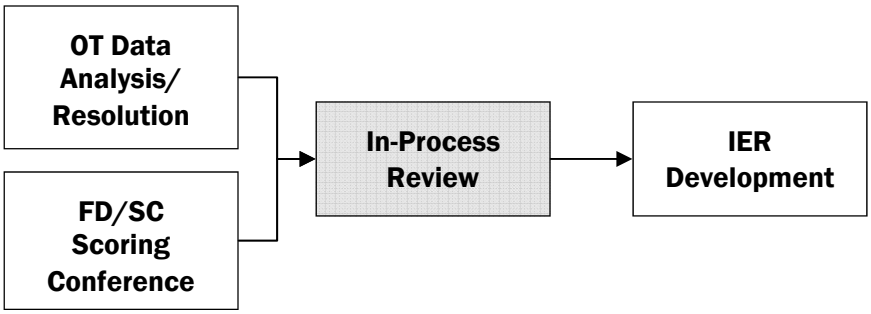
scoring of the TIRs. Second, the Conference meets to provide the final scoring. Third, the final scoring is documented in minutes, which are signed by the voting members and sent to the Director for signature per the SOP.

Reference

MCOTEA SOP Chapter 8, Section 1

Test Reporting

14. In-Process Review



Input

- DT Measure results
- OT Measure results
- Supporting data
- Scored TIRs, logs, etc.

Output

- Completed A-1 Measure Results (with supporting documentation)

Key Activities

☐ Participate in IPR (COT as chair, OA, PA, OTPO, SA (or DSA)).

☐ Review

- Measure results
  - OT Measure results, Scored TIRs
  - DT Measure results
- Analytic methodology applied
- Presentation of results

☐ Resolve Measures with thresholds.

☐ Capture Lessons Learned (OTPO).

Overview

An In-Process Review is held when data reduction and analysis are complete. The IPR's purpose is to provide early approval and guidance to the OA, PA, and SME on the adequacy and accuracy of the analysis. The IPR results in a deadline for completing the technical evaluation portions of the IER. The COT or a designee chairs the IPR. The Scientific Advisor (or his deputy) and the TT, including the OTPO, are required to attend.

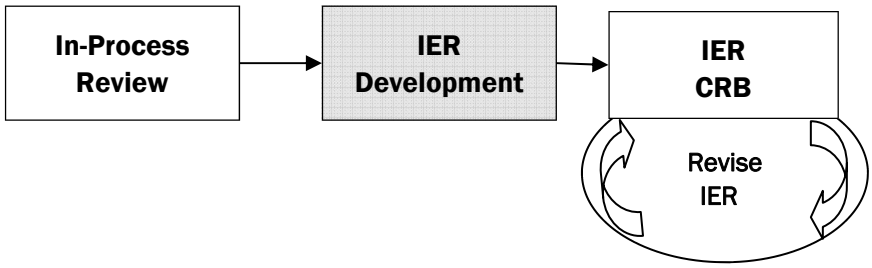
Best Practice

- Metrics include
  - length of time from finishing initial compilation of Measure results until review is concluded
    - time measured in days
    - cost measured in man-hours

Reference

MCOTEA SOP Chapter 8, Section 2

15. Independent Evaluation Report Development



Input

- Results of IPR
  - Completed A-1 Measure Results (with supporting documentation)
- Test Director's Report

Output

- IER CRB Read-Ahead Package

Key Activities

☐ Develop Attribute Table (OA).
  - Measure resolution rules

☐ Evaluate OE/OS (OTPO).
  - Evaluation plan (Measure evaluation)
  - Issue/Sub-Issue discussion (paragraph format)
  - Issues Table

Best Practice

- Metrics include
  - length of time from completing IPR until the IER CRB Read-Ahead package is completed
    - time measured in days
    - cost measured in man-hours

Overview

MCOTEA conducts independent OT for the specific purpose of supporting the acquisition process by providing the MDA with an IER. The IER, when distributed to the Marine Operating Forces, also serves as a lessons learned vehicle to share MCOTEA's observations and experiences with future users. Although this guidebook focuses on the IER, the Independent Assessment Report (IAR) resulting from an EOA or OA follows the same format, modified to meet the assessment's purpose.

The results obtained from testing a system are used to determine OE and OS. The technical evaluation begins with the TT applying the scoring conference results and the evaluation plan and resolution rules from the DTP/DAP to the Measures. Portions of the test results are also used to determine whether or not the thresholds for the Attributes of the system have been achieved. A Measure with a threshold is resolved as "Met" or "Not Met" based on whether the required Measure threshold was achieved. Any Measure not tested because of testing constraints is resolved as "Not Evaluated." Any Measure not tested because a required capability was not present is resolved as "Not Met." If the Program Manager (when required) fails to provide the necessary data and/or report, the Measure will be resolved as "Not Met" vice "Not Evaluated" to indicate that the required capability threshold has not been achieved. Each Attribute is resolved as "Met," "Not Met," or "Met with Exception" based on the resolution of its subordinate Measures as outlined in Figure 5. Attributes are resolved using the method outlined in Figure 6.

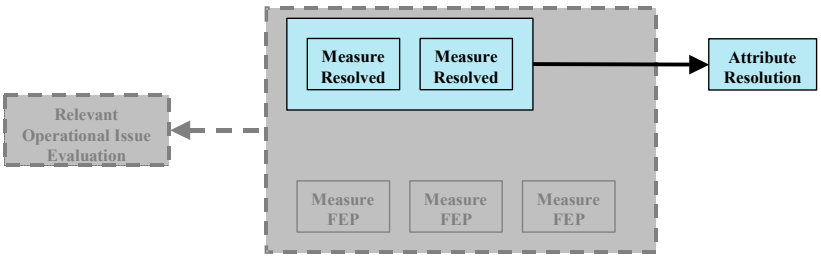


Figure 5. Attribute Resolution

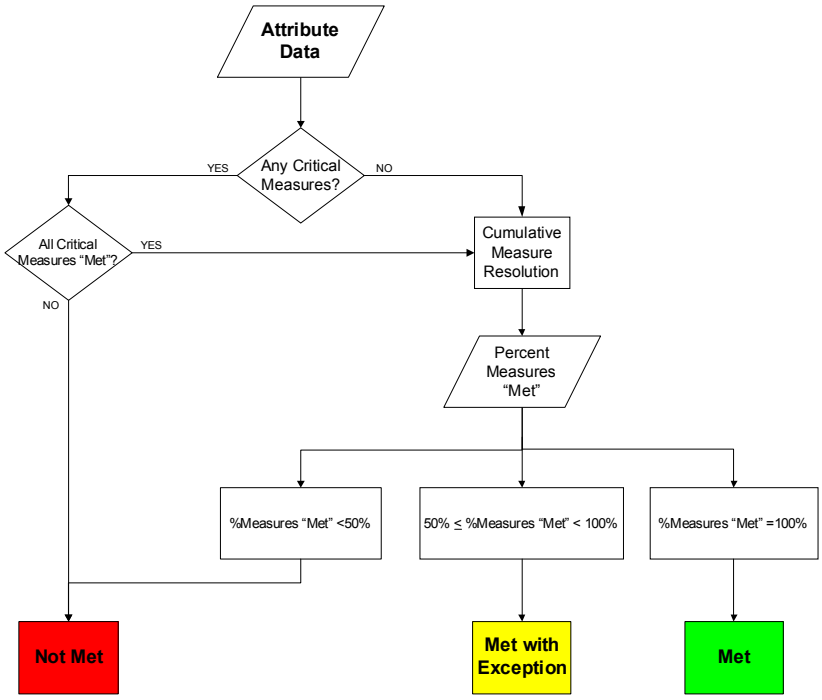


Figure 6. Attribute Resolution Method

Conclusions about OE and OS are made based on evaluations of subordinate COI and ROI, using the information obtained from Sub-Issues and Measures. The achieved result of a Measure without a threshold is reported "For Evaluation Purposes" (FEP). A Measure characterized as FEP in no way diminishes the importance of the information to be gained by that measurement. Valuable information needed to evaluate OE/OS is often gained from information that is quantifiable/qualifiable, but which lacks any specific threshold value. An example of OE/OS evaluation is shown in Figure 7.

At the Sub-Issue level, information is obtained from all subordinate Measures and is used to determine the capabilities and limitations of the system regarding mission accomplishment or impact to mission

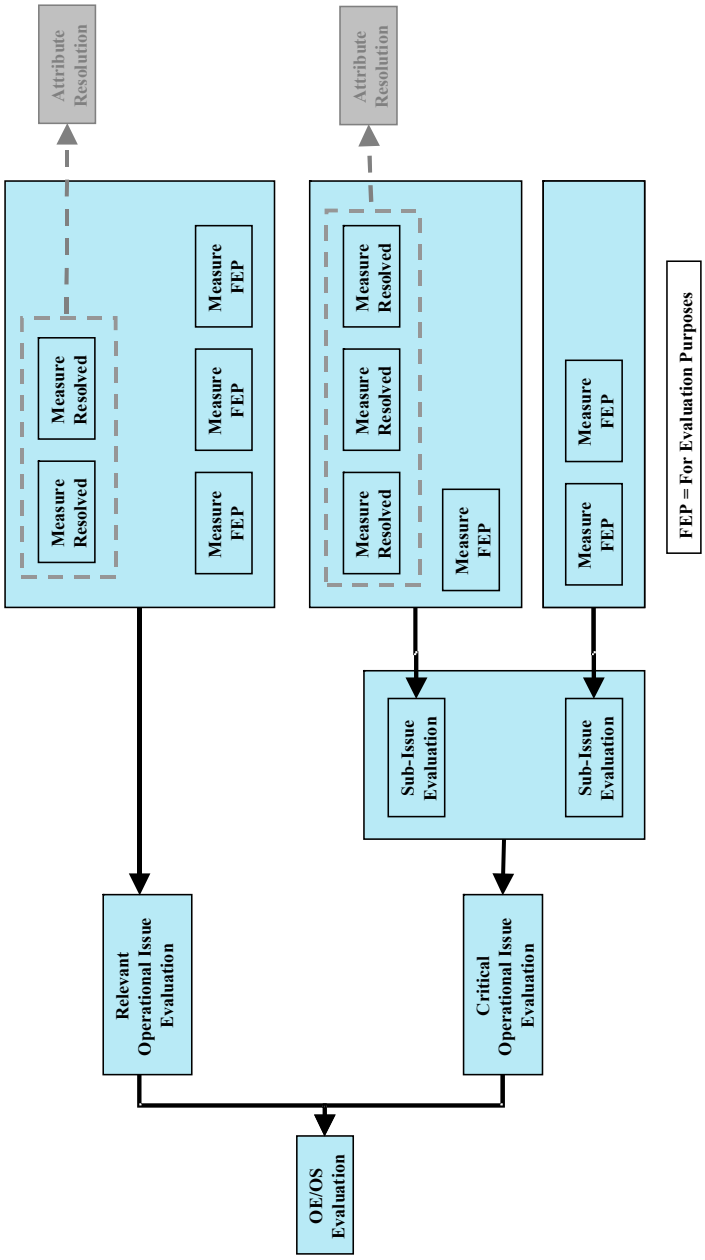


Figure 7. Operational Effectiveness/Operational Suitability Evaluation

accomplishment. The OTPO evaluates the information from the Measures in terms of operational impact. The OTPO then applies operational judgment gained through operational experience, observations during testing, relevant TIRs, understanding of the system (CDD, OMS/MP, and COE), and knowledge of Marine Corps operations to determine the capabilities and limitations of the system. Based on this information, each Sub-Issue is resolved as "Met," "Not Met," or "Met with Exception." In the event of insufficient information for an adequate determination of the level of capability, the resolution will be "Not Evaluated" and accompanied by the testing limitations that prevented the full evaluation.

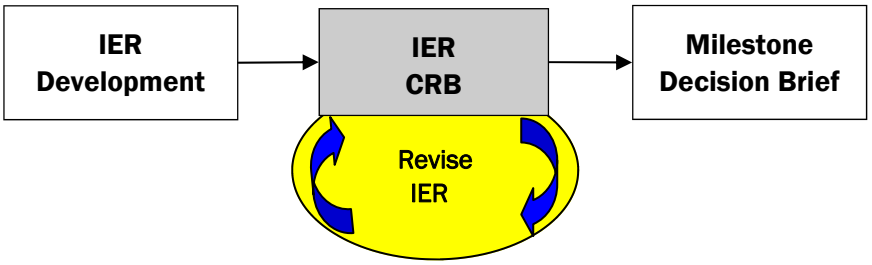
At the Issue level, information is obtained from subordinate Sub-Issues or subordinate Measures and is used to determine the capabilities and limitations of the system regarding mission accomplishment. The OTPO evaluates the information from the tasks in terms of operational impact. The OTPO then applies operational judgment gained through operational experience, observations during testing, understanding of the system (CDD, OMS/MP, and COE), and knowledge of Marine Corps operations to determine the capabilities and limitations of the system. Based on this information, each Issue is resolved as "Met," "Not Met," or "Met with Exception."

At the OE/OS level, information is obtained from the Issues and is used to determine the capabilities and limitations of the system regarding mission accomplishment and suitability for operational employment. The OTPO evaluates the information from the Issues in terms of operational impact. The OTPO then applies operational judgment gained through operational experience, observations during testing, understanding of the system (CDD, OMS/MP, and COE), and knowledge of Marine Corps operations to determine the capabilities and limitations of the system. Based on this information, the conclusion for OE is either "Operationally Effective" or "Not Operationally Effective," and for OS the conclusion is either "Operationally Suitable" or "Not Operationally Suitable."

Reference

MCOTEA SOP Chapter 8, Sections 3 and 4

16. Independent Evaluation Report Content Review Board



Input

- IER CRB Read-Ahead Package

Output

- Final IER Document
- Lessons Learned

Key Activities

☐ Use iterative review process until contents are satisfactory (BH).

☐ Review

– Complete IER

☐ Capture Lessons Learned (OTPO).

Overview

The Content Review Board's purpose is to provide final guidance to the TT and to approve the evaluation leading to OE and OS. The Branch Head chairs the IER CRB. The SA or the DSA and the TT are required to attend. The CRB's goal is to review the entire IER for technical content. The focus of the review is on completeness, accuracy, and defensibility of the test results, conclusions, and recommendations.

The layout of the IER follows the general guidelines listed below:

- Executive Summary
- Main Body
  - Purpose (MS/Acquisition Decision)
  - Discussion (put results in context)
    - System Description
    - Test Execution Summary
      - Paragraph on 5 “W’s”
      - Test deviations (reference to Annex)
    - Mission Analysis (include Graphic)
  - Results
    - Paragraph Discussions of Issues (Mission)
    - Summary Table
    - Intro to Attributes (Requirements)
    - Attribute Table
  - Conclusions
    - OE
    - OS
  - Recommendations
    - All recommendations
  - TD Report Executive Summary written by TD (full report on CD)

All supporting material and data are stored on digital media. The CD with the supporting annexes includes

- Annex A (Detailed Test Results)
  - A-1 (Measure Results)
  - A-2 (Evaluation Plan and Resolution Rules)
  - A-3 FD/SC Scoring Results and TIR Summary
  - A-4 RAM Results
  - A-5 Survey Results

- A-6 Instrumentation
- A-7 DTP Deviations
- A-xx as needed for results, tables, etc.

- Annex B (Test Director's Report)
- DTP

Best Practice

- Create Executive Summary last.
- Metrics include
  - length of time from submission of the IER CRB Read-Ahead Package until Director signs IER
    - time measured in days
    - cost measured in man-hours

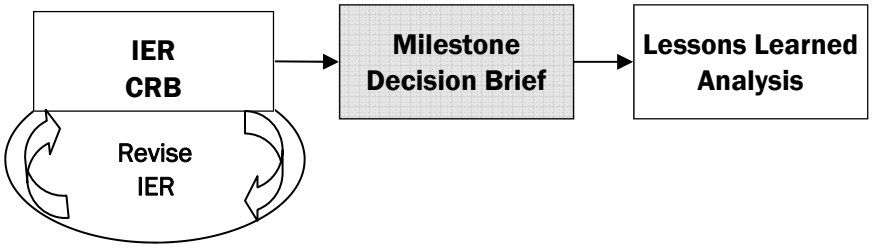
Following the CRB, the IER document proceeds to the editorial review process as defined in the MCOTEA SOP for Administration. Style guides and detailed instructions concerning the IER/IAR standards for structure, appearance, format, and technical editing are contained in that SOP as well.

References

MCOTEA SOP Chapter 8, Sections 3 & 4

MCOTEA SOP for Administration (in production)

17. Milestone Decision Brief



Input

- Signed IER

Output

- N/A for MCOTEA

Key Activities

- ☐ Attend MCSC meeting (Director/ BH/OTPO).
  - MCOTEA & MCCDC attendance
- ☐ Potentially Brief MDA (BH/ OTPO).
- ☐ Capture Lessons Learned (OTPO).

Best Practice

- Metrics include
  - length of time from submission of signed IER to MCSC until Decision Brief is complete
    - time measured in days
    - cost measured in man-hours

Overview

The purpose of the Milestone Decision Brief is to provide the MDA with the information needed to make an acquisition decision. Programs often do not require formal briefs, so the information is provided to the MDA in a "paper" Marine Corps Procurement Decision Meeting (MCPDM). If significant concerns exist about a program, however, the MDA holds a formal MCPDM. The OTPO develops MCOTEA's Milestone Decision Briefing package for the Director's review. Upon the Director's approval, the BH or the OTPO briefs the MDA on the results of MCOTEA's IOT&E.

Reference

MCOTEA SOP Chapter 8, Section 5

Lessons Learned/ Archive

18. Lessons Learned Analysis

Input

- Lessons Learned captured throughout process

Output

- Lessons Learned library updated
- Improved test process

Key Activities

- ☐ Submit compiled Lessons Learned to COT (OTPO).
  - Increase emphasis on planning phase Lessons Learned.
- ☐ Analyze Lessons Learned from all steps in process (COT).
- ☐ Update test process and guidebooks (COT).

Best Practice

- Lessons Learned submitted in an item-discussion-recommendation format under standardized topics.
- Metrics include
  - length of time from completion of Decision Brief until Lessons Learned library is updated
    - time measured in days
    - cost measured in man-hours

Overview

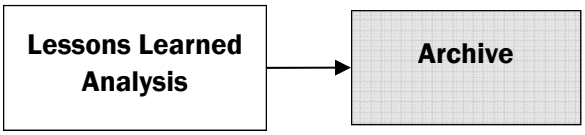
Capturing Lessons Learned throughout the process helps to improve the testing process. The TT provides Lessons Learned to inform the Director and other MCOTEA personnel of any unique challenges encountered during test planning, executing, and reporting, as well as solutions to those challenges. The goal is to provide useful and timely information to future testers. Lessons Learned are forwarded to the Administrative Section within 30 days of IER delivery.

References

MCOTEA SOP Chapter 8, Section 5

MCOTEA SOP for Administration (in production)

19. Archive



Input

- Compiled Lessons Learned
- CDD/CPD, TEMP, DTP, IER, Test Databases
- SOT Letter, Clarification Letters, TPD
- COE, OMS/MP
- Other program documentation as applicable

Output

- Digital Product maintained by Administrative Office

Best Practice

- Preferred medium is electronic archiving via DVD-ROM or hosted Web site.

Key Activities

☐ Submit all documentation to Admin within 30 days of Lessons Learned (OTPO).

Overview

At the completion of OT&E, the OTPO is responsible for archiving all pertinent program information. Archiving may be done throughout execution of the program, but must be completed within 60 days of signing of the IER/IAR. This process is fully defined in the MCOTEA SOP for Administration.

Reference

MCOTEA SOP Chapter 8, Section 5

MCOTEA SOP for Administration (in production)

MCOTEA Guidebook for Capabilities-Based Testing

V. 1.1

Marine Corps
Operational Test and Evaluation Activity

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