

# TEST AND EVALUATION CHAPTER 4: MAJOR CAPABILITY ACQUISITION

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## **1. Major Capability Acquisition (MCA) Pathway Overview**

### **1.1 Introduction**

In accordance with DoDI 5000.02, the DoDI 5000.85 establishes policy and prescribes procedures that guide the acquisition of Major Capability Acquisition Pathway programs, including Major Defense Acquisition Programs (MDAPs); other programs categorized as Acquisition Category (ACAT) I; major systems, usually categorized as ACAT II; automated information systems (AIS) (not managed by other acquisition pathways); and other capabilities developed via the MCA Pathway. The guidance provided here supports policy established in the DoDI 5000.85, DoDI 5000.88 and DoDI 5000.89. In the event of conflict, the reader should defer to policy documentation. The Milestone Decision Authority (MDA) should structure program strategies, phase content, the timing and scope of decision reviews, and decision levels based on the specifics of the product being acquired, including complexity, risk, security, and urgency to satisfy validated capability requirements.

The Program Manager (PM) should involve the T&E organizations with the acquisition program from its inception (at the Materiel Development Decision) and throughout its lifecycle to support the program decisions and delivery timeline. Contractor testing (CT), government developmental test and evaluation (DT&E), live fire test and evaluation (LFT&E), and operational test and evaluation (OT&E) should be integrated, streamlined, and automated to the maximum extent practicable to enable efficient use of data and resources across the test program and evaluation of system operational effectiveness, suitability, survivability, and lethality to inform the decision authorities. Maximum sharing, reciprocity, availability, and reuse of test results and artifacts among testing and certification organizations improve chances for a successful and efficient T&E program. Collaboration between all organizations should be considered to develop digital system models, simulations, and test environments for common use across the spectrum of system tests that may produce necessary data or information.

This chapter describes T&E community involvement throughout the MCA Pathway lifecycle.

### **1.2 Major Capability Acquisition Pathway Description**

Figure 1 illustrates the five major phases within the MCA Pathway: 1) Materiel Solution Analysis, 2) Technology Maturation and Risk Reduction, 3) Engineering and Manufacturing Development, 4) Production and Deployment, and 5) Operations and Support. Each phase is discussed briefly below. Additional details about T&E community involvement during each phase are discussed in Section 2.

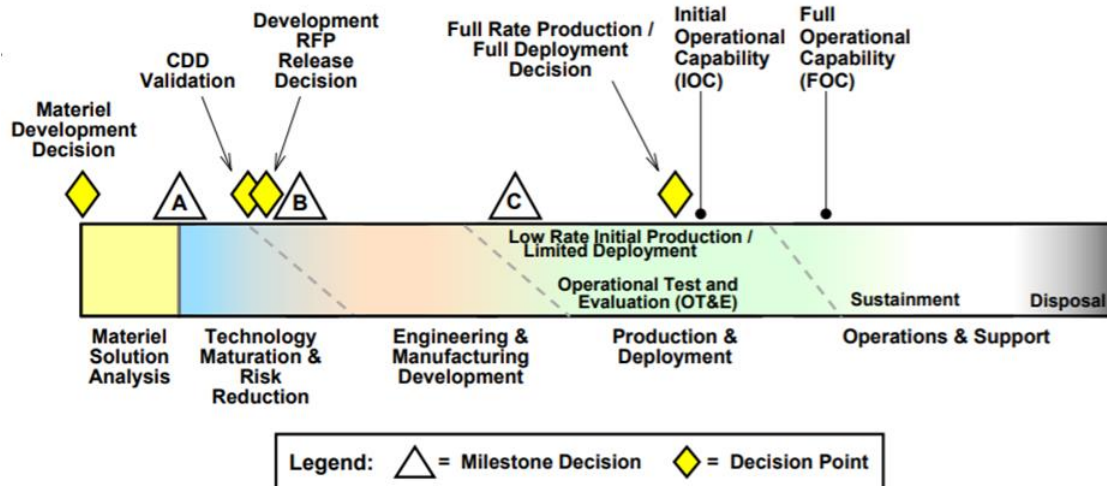


Figure 1. Major Capability Acquisition Pathway Phases<sup>17</sup>

### 1.2.1 Materiel Solution Analysis

The purpose of the Materiel Solution Analysis phase is to choose the concept for the system the DoD will acquire, begin translating validated capability gaps into system-specific requirements, and support a decision on the system’s Acquisition Strategy. During this phase, the PM charts a T&E Working Integrated Product Team (WIPT), or equivalent entity, responsible for defining the T&E activities and requirements needed to support the Request for Proposal (RFP) and Milestone A decision.

The Milestone A decision approves program entry into the technology maturation and risk reduction (TMRR) phase, the program Acquisition Strategy, and release of the final RFPs for TMRR activities. An initial capabilities document (ICD) and test strategy should inform the Acquisition Strategy and the RFP for TMRR. Government test teams should be involved early in the program during this phase to establish and document how testing will be accomplished to adequately demonstrate the required technology maturity and assess the engineering, integration, and lifecycle cost risk.

### 1.2.2 Technology Maturation and Risk Reduction (TMRR)

The purpose of the TMRR phase is to mature technology and reduce technology, engineering, integration, and lifecycle cost risk, to the point that a decision to contract for Engineering and Manufacturing Development (EMD) can be made with confidence, leading to successful program execution for development, production, and sustainment. This phase includes a preliminary design review (PDR) and multiple competitive sources conducting technology risk reduction activity to demonstrate new technologies in a relevant environment. USD(R&E) or the DoD component will conduct an Independent Technical Risk Assessment (ITRA) that provides a view of program technical risk and their potential impacts to cost, schedule, and performance. The T&E community should

<sup>17</sup> DoDI 5000.85, August 6, 2020, p. 10.

collaborate closely during this phase to ensure the testability of the requirements outlined in the ICD, and include government T&E requirements in the development RFP that supports Milestone B to ensure access to contractor data and information that may improve the program's likelihood of success.

The Milestone B decision authorizes a program to enter into the EMD phase and commits the required investment resources to support the award of contracts. Government test teams should be involved early in this phase to establish and document how testing during the EMD phase will be accomplished in the Milestone B Test and Evaluation Master Plan (TEMP).

### **1.2.3 Engineering and Manufacturing Development**

The purpose of the EMD phase is to develop, build, and test the system to determine the extent to which it meets operational, acquisition, and contractual requirements, and to support the program's production and deployment decisions. This phase includes a critical design review (CDR) and T&E to assess readiness to begin pre-production prototype hardware fabrication or software coding with acceptable risk. Government T&E should demonstrate the stability of the design, product compliance with contractual requirements, observed capabilities and limitations, any risks in meeting operational effectiveness, suitability, survivability, and lethality and the ability to achieve key performance parameters and key system attributes. Government T&E should be planned and executed in coordination with developmental, live fire, and operational test communities to efficiently and effectively uncover risks across the system's performance envelope and to assist the PM in managing those risks in support of the Milestone C Low-Rate Initial Production (LRIP) decision.

The Milestone C decision authorizes a program to enter the Production and Deployment phase, enter LRIP, and award production contracts.<sup>18</sup> In addition to the results of government T&E, the Milestone C decision review will also consider any significant manufacturing risk, the status of critical intelligence parameters and intelligence mission data requirements relative to fielding timelines, and full funding.

The T&E WIPT should consider the data collected during EMD to inform the updates to the Milestone C TEMP, another prerequisite for the Milestone C decision. The Milestone C TEMP should identify long lead items that need to be procured during this phase, which should be documented in the authorized Acquisition Decision Memorandum (ADM), along with any limits in content and/or dollar value. Examples of long lead items include number of targets, weapons, specialized range capabilities, etc. for LRIP or full-rate production T&E. The ADM should also document the LRIP quantities needed for T&E. While LRIP test assets need to be coordinated with DOT&E for programs on T&E oversight, for systems not on the T&E Oversight List, the OTA, following consultation with the PM, determines the number of test articles required for Initial Operational Test and Evaluation (IOT&E) (10 U.S.C. § 4231). The first Selected Acquisition Report submitted to Congress includes the LRIP quantity, with a rationale if it exceeds 10

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<sup>18</sup> High cost articles such as ships will not produce prototypes during EMD for use solely as test articles. In such cases, the first article produced will be tested and evaluated, and then fielded as an operational asset.

percent of the total production quantity documented in the Acquisition Strategy (e.g., if the LRIP quantity is driven by the number of systems required to support IOT&E).

#### **1.2.4 Production and Deployment**

The purpose of the Production and Deployment phase is to deliver a system to military units that meets the intended operational capability and satisfies mission needs. The Production and Deployment includes LRIP, personnel training, completion of T&E intended to meet developmental assessment objectives, IOT&E, and the full-rate production (FRP) or full-deployment (FD) decision. IOT&E is a statutory test event requiring:

- Production-representative systems
- Operationally realistic units and users, missions, threats, environments, and maintenance activities in accordance with the system's fielding concept
- Adequate resources to ensure appropriately sized and operationally realistic testing
- A strategy for mitigating known test limitations

Programs should complete all planned testing and fix any identified critical system deficiencies prior to proceeding to IOT&E.

The MDA will conduct an FRP decision review to assess the results of IOT&E and initial manufacturing. Proceeding to FRP requires demonstrated control of the manufacturing process, acceptable operational performance, to include reliability, and the establishment of adequate sustainment and support systems. The FRP decision should also be informed by consideration of changes to the validated threat environments that might affect operational effectiveness, if they were not considered in IOT&E.

#### **1.2.5 Operations and Support**

The purpose of the Operations and Support phase is to execute the product support strategy, satisfy materiel readiness and operational performance requirements, including personnel training, and sustain the system over its lifecycle, including disposal, in the most cost-effective manner.

This phase includes two major efforts: sustainment and disposal. Effective sustainment results from designing and developing a supportable, reliable, and maintainable system. The PM works with system users to document performance and sustainment requirements in agreements specifying objective outcomes, measures, resource commitments, and stakeholder responsibilities. The Services, with system users, conduct continuing reviews of sustainment strategies to compare performance expectations against actual performance measures.

During this phase, the PM may initiate system modifications, as necessary, to improve performance and reduce ownership costs, and should formally inform test organizations of system modifications in time to prepare an adequate TEMP update to assess the effect of those modifications on operational performance. The PM should also consider the use of digital technology to enable continuous evaluation of more dynamic system changes (e.g., software) and threats (e.g., cyber) as both evolve over the life-cycle of the system.

At the end of its useful life, a system will be demilitarized and disposed in accordance with all legal and regulatory requirements and policy related to safety.

### 1.3 Major Capability Acquisition Pathway T&E Overview

Figure 2 summarizes the T&E events and associated products as the program progresses through the major phases and milestones of the MCA Pathway.

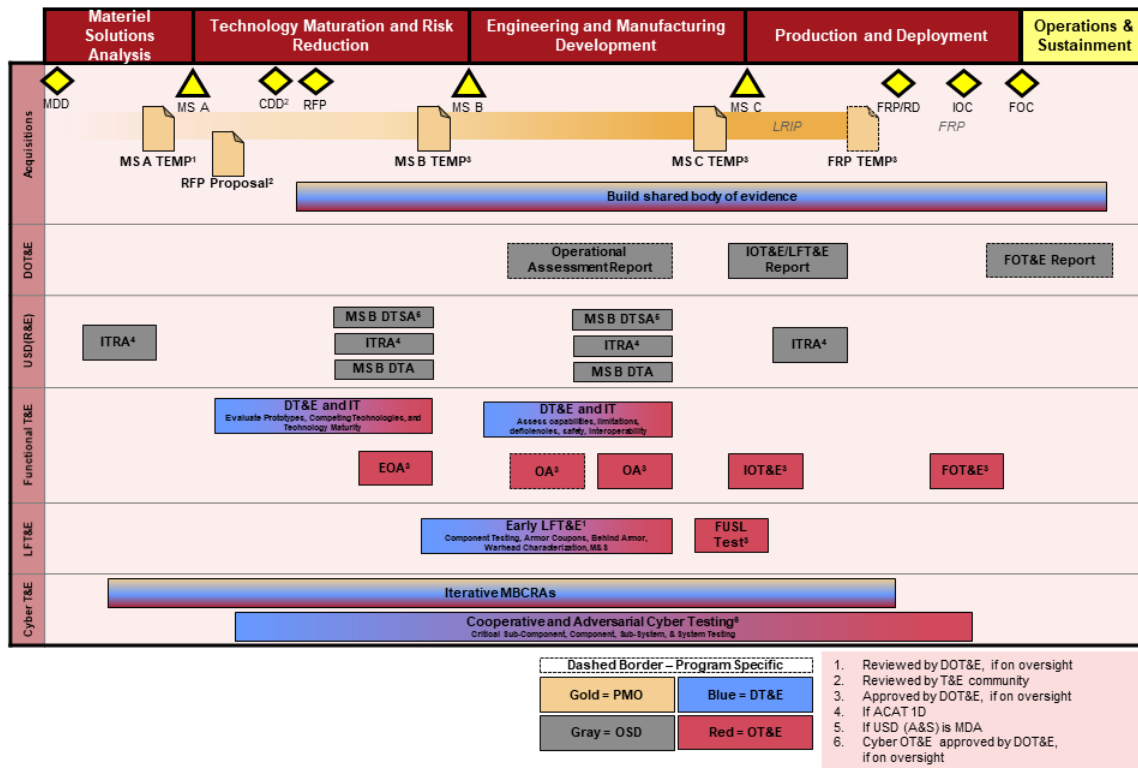


Figure 2. T&E Aligned with MCA Pathway

### 1.4 Test and Evaluation Working-level Integrated Product Team (WIPT)

The T&E WIPT coordinates top-level planning for all products and events listed in Figure 2 and the integrated schedule, which should account for the time needed to fix any deficiencies identified in test, and the associated analysis and reports. The T&E WIPT defines the data requirements and T&E resources needed to adequately plan and execute the T&E program. The PM, in collaboration and consultation with the T&E WIPT, should include the T&E requirements in RFPs and acquisition contracts to ensure government access to the data needed to inform key program decisions. In addition to contracts, the T&E WIPT should participate in acquisition program requirements refinement (e.g., ICD/CDD) to ensure the requirements' measurability, testability, achievability, and relevance to the operational mission. The PM should help the T&E WIPT coordinate with the requirements authority to clarify any requirements found untestable.



The T&E WIPT includes representatives from all organizations responsible for providing or overseeing development of the Test and Evaluation Master Plan (TEMP) and its execution. In particular, the T&E WIPT should include representatives of test data stakeholders such as systems engineering, DT&E, OT&E, LFT&E, the user, product support, the Intelligence Community, and applicable certification authorities. The T&E WIPT should enable collaboration among stakeholders to maximize efficiency by planning and executing an integrated T&E program that leverages all test events for the purposes of meeting developmental, live fire, and operational evaluation objectives. The PM should ensure that results from all test events are captured in a shared data repository (discussed below) and available for all parties to use for independent assessment.

- Government test teams should be involved from the inception of the program to ensure the T&E requirements are captured in acquisition contacts and the associated data.
- Government test teams should strive to maintain a tempo that supports the required decisions using various tools (e.g., digital engineering, sequential testing, automation).
- Government test teams should develop a robust T&E program to support the milestone decisions with end-to-end mission threads employing actual users.
- OT&E and LFT&E should concentrate on appropriately scoped, dedicated tests while integrating useable data and information from all sources to meet stakeholder needs, support operational evaluations, and inform decisions.
- T&E WIPT may develop collaborative test data scoring boards to evaluate and authenticate any available test data for potential to meet any IOT&E and LFT&E requirements.

Embedding OT&E earlier in the program's lifecycle requires OT&E awareness and participation in system engineering and system development. This includes monitoring the tests that occur throughout the development, and understanding and trusting the pedigree of the developmental testing to determine which results may be usable for operational evaluation. The test community should determine the applicability of prior data for OT&E, including the mapping of that data to the evaluation assessment areas, and identify gaps in data that will inform test planning for future iterations.

### **1.5 Test and Evaluation Planning for Major Capability Acquisition Pathway**

The purpose of T&E planning is to better understand users' needs and define an executable approach to credibly demonstrate the technical, functional, and operational capabilities that need to be delivered to meet the users' needs. As the planning process is critical and sets the conditions for success, all test teams should be involved early in the program during the planning process to establish and document how testing, modeling and simulation (M&S), analysis, and evaluation of the system performance at its various maturity stages will be accomplished. The T&E WIPT should identify the measures to be used to evaluate the system as a part of the planning process, and then the data needed and conditions under which those data will be collected. A tabletop exercise can assist in confirming the feasibility of the proposed plans, tools, and methodology prior to inclusion in the TEMP.

T&E planning should be digitized and automated as much as possible to support continuous development, integration, and delivery of system capabilities. Digital test management tools automate the process of test planning, scheduling, tracking, and reporting test events.

During the planning process, various stakeholders are developing documentation, summarized and defined in Table 1, to include the associated testing resources, tools, data and infrastructure. The T&E community should work with the acquisition community on these documents to incorporate needed T&E information. This section highlights T&E content and involvement of test teams in the development of each of these documents.

**Table 1. Planning Documents**

<b>Artifact</b>	<b>Description</b>	<b>Developed by</b>
Test and Evaluation Master Plan (TEMP)	Defines the processes by which technical, functional, and operational performance will be tested and evaluated to satisfy developmental test and evaluation criteria, and to demonstrate operational effectiveness, suitability, survivability, and lethality.	Program Manager with support from T&E WIPT
Capability Development Document (CDD)	Specifies the operational requirements for the system to deliver the capability that meets operational performance criteria specified in the Initial Capabilities Document, which documents the need for a materiel approach to close a specific capability gap.	Sponsor with support from the Program Manager and T&E IPT
Acquisition Strategy	An integrated plan that identifies the overall approach to acquiring, developing, delivering, and sustaining capabilities to meet the users' needs.	Program Manager
Systems Engineering Plan (SEP)	Documents key technical risks, processes, resources, metrics (Technical Performance Measurement and other metrics), SE products, quality control, and completed or scheduled SE activities. The SEP is a living document, updated as needed to reflect the program's evolving SE approach and/or plans and current status.	Program Manager
Validated Online Life Cycle Threat (VOLT)	Serves as the authoritative, system-specific threat assessment tailored for and normally focused on one specific program. The VOLT involves the application of threat modules and is written to articulate the relevance of each module to a specific acquisition program or planned capability.	Intelligence Community

Artifact	Description	Developed by
Intellectual Property (IP) Strategy	Identifies and describes the management of delivery and associated license rights for all software and related materials necessary to meet operational, cybersecurity, and supportability requirements. The IP strategy should support and be consistent with all other government strategies for design, development, T&E, operation, modernization, and long-term supportability of the software, as well as protection of the software supply chain, and should be implemented via appropriate requirements in the contracts.	Program Manager
Cost Estimate	Developed in accordance with DoDI 5000.73 (Cost Analysis Guidance and Procedures). The estimate should consider the technical content of the program described in the Capability Needs Statement (CNS), User Agreement (UA), acquisition strategy, and test strategy.	Program Manager
Request for Proposal	A document used in negotiated acquisitions to communicate government requirements, including those for T&E, to prospective contractors and to solicit proposals.	Program Manager

### 1.5.1 Test and Evaluation Master Plan (TEMP)

The TEMP serves as an agreement between the PM and all T&E stakeholders describing the T&E program, including T&E roles and responsibilities, and resources. The TEMP captures the data requirements and processes by which the system will be tested and evaluated to verify technical requirements and to evaluate operational effectiveness, suitability, survivability, and lethality. The TEMP should enable the evaluation of the unit equipped with the system executing the missions the system is intended to perform while considering all interfacing systems, threats, and operational environments.

The T&E WIPT should ensure the TEMP is executable and aligns with the Acquisition Strategy, T&E policy (DoDI 5000.89), and relevant T&E focus area chapters in the T&E Enterprise Guidebook. Per the DoDI 5000.89, the TEMP will include an Integrated Decision Support Key (IDSK), a table outlining the acquisition, technical, and program decisions as well as the data (e.g., CT, DT, LFT, OT, M&S) necessary to support those decisions. The IDSK provides a framework for how test events can build on one another and support the data requirements for multiple stakeholders' evaluations simultaneously, producing efficiencies across the T&E lifecycle and facilitating the integration of DT, CT, and OT. The IDSK should evolve and adapt through the system lifecycle and identify opportunities to incorporate operational realism (e.g., mission environments and

operational users) as early as possible. Incorporating operation realism early in the test program through integrated testing improves the probability of identifying and correcting problems early, rather than later in development, when redesigns are more expensive and correcting problems may prove infeasible. This approach does not support the replacement of dedicated DT&E, OT&E, or LFT&E, but may affect the scope of individual test events if stakeholders can pull data from prior events to support their evaluations. The TEMP should describe how these data will be collected to build a shared body of evidence to support evaluations of the system during the various acquisition phases.

The TEMP should define the conditions under which required data will be collected, and any tools required to manage the data and perform the testing. OT should consider informing the DT community of their OT data requirements to meet their evaluation objectives, and vice versa. As such, DT should consider the operational relevance of developmental tests to identify operationally representative deficiencies sooner in the acquisition cycle.

For programs on T&E oversight, DOT&E is the final approver for the TEMP.<sup>19</sup> At specified milestones, the TEMP is submitted to the Director for approval no later than 45 calendar days before the supported decision point. USD(R&E) is the approval authority for the DT&E plan in the TEMP for all ACAT ID programs. USD(R&E) reviews and advises the MDA on the DT&E plan in the TEMP for ACAT IB and IC programs. The TEMP should be updated as new data are collected and as the program reaches new acquisition milestones and decision points.

#### **a. T&E Resources**

The TEMP should document the T&E resources required to support DT&E, OT&E, and LFT&E. Programs should identify one-of-a-kind T&E resources and long-lead items early in the acquisition process to allocate adequate funding for development and use. The lead test organizations should verify and validate any applicable infrastructure, instrumentation, tools, and M&S planned for OT&E use before the program enters execution. This verification and validation should consider data collection, interfacing systems and databases, networks, simulated environments, simulated users, and ranges.

These resources may include, but are not limited to:

- 1) **Test articles (e.g., the system under test, test targets and expendables, threats)**

The environments used to conduct testing for OT&E should be as operationally realistic as possible, including realistic system use and threats. This requires identification and inclusion of the interfacing systems that form the system of systems with the program of record.

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<sup>19</sup> DoDI 5000.89, November 19, 2020, pg. 5

## 2) **Test facilities, infrastructure, instrumentation, and ranges, to include cyber ranges and test team, software integration laboratories**

Programs should use government T&E capabilities unless an exception can be justified as cost-effective to the government. PMs will conduct a cost-benefit analysis for exceptions to this policy and obtain approval through the TEMP approval process before acquiring or using non-government test facilities or resources.

The TEMP should include any proposed use or application of embedded instrumentation. The intent of embedded instrumentation is to facilitate data collection and system diagnostics without modifying the system's operational configuration. The PM should work with the T&E WIPT and other stakeholders to plan for the use of embedded instrumentation to collect system performance and diagnostic data whenever feasible, and to obtain accreditation and certification prior to use in OT&E. This may include adding requirements for these embedded instrumentation in program RFPs and other resourcing provisions.

The PM should work with the T&E stakeholders to enable all test infrastructure and instrumentation that supports acquisition decisions to be verified and validated by the intended user or appropriate accreditation agency.

## 3) **Automated testing tools**

Automated test execution tools may be a part of the process of executing test cases or procedures on the system under test. The T&E WIPT and PM should work with the contractor to fully understand the contractor's tools. The automated tools may provide visibility into the continuous testing occurring within the development process so that stakeholders can gain confidence in the quality of the development process. It is encouraged that government test teams be familiar with and capable of using these tools to inform whether credible use of the tools' outputs may inform evaluations. Using the same tools as the contractor is advantageous for the government (e.g., easier to replicate events when necessary) and should be included in the acquisition contract. In some cases, government test teams may become experts in the tools used by both the contractor and government. Such expectations should be clarified within the appropriate contractual provisions.

## 4) **M&S, and their verification and validation plans**

The TEMP should document initial and subsequent versions of system M&S tools to be matured during development for use by government test organizations during EMD and beyond. These may include initial digital system models, component-level reliability and availability models, or other M&S tools. The PM, in collaboration with the T&E WIPT, should also consider whether the delivery of these tools, when applicable, should be included in the program RFPs.

The M&S strategy and schedule, including the using organization, intended use, and the commitment to provide a verification and validation plan for each tool or test infrastructure asset, should be documented in the TEMP. The TEMP should specify when

particular T&E resources are required, and which organization is responsible for verification and validation, and for providing the associated resources.

**5) Manpower and personnel**

The TEMP should include information about friendly and threat operational forces, data collectors, and subject matter experts that will be required to execute the T&E program.

**6) Federal/State/local requirements, range requirements, and any special requirements**

This may include requirements for explosive ordnance disposal, corrosion prevention and control, or frequency management and control.

**7) Data repositories**

The TEMP should document a plan for a shared data repository. At program initiation, the PM should establish a shared data repository to store test and evaluation data and provide access to all test teams so that they can review, use, and input these test data to meet their objectives. This should enable the use of sequential testing, big data analytics, and other adaptive methods in support of T&E efficiencies. Throughout system development, T&E should be building a shared body of test evidence to support efficient technical, functional, and operational performance evaluations and adaptive T&E. Relevant test data gathered through all testing should be added to this shared data repository. To enable adequate use of sequential testing and similar T&E planning and analysis methods, the T&E WIPT should leverage existing or develop collaborative test data scoring boards to assess test data collected across all phases of the MCA Pathway for potential to meet IOT&E or LFT&E requirements. The OTA should maintain the authoritative record of data collected in IT that has been assessed and authenticated for use in the operational evaluation.

**8) Projected and actual level of funding**

Pursuant to Section 839(b) of Public Law 115-91, the PM should include a table in the TEMP that lists the initial resource estimates for government DT&E, OT&E, and LFT&E, and update this table each time the TEMP is updated. T&E funding in the resources section should be consistent with the cost estimate and budget submissions.

**1.5.2 T&E Content and Interests in Other Planning Documents**

While the TEMP is the main testing document deliverable during the each of the five major phases of the MCA Pathway, the success of T&E relies heavily on each of the other documents outlined in Table.

**a. Capability Development Document (CDD)**

The T&E WIPT should be involved with CDD development early to fully understand the desired capabilities and inform how certain system design requirements such as cybersecurity will be evaluated. The test teams should work with their engineering

counterparts to assist in developing requirements that are clear, testable, and measurable, and that requirements traceability exists from the requirements to the test events. Test teams should:

- Understand what constitutes mission effectiveness, suitability, and survivability, and how they will be measured at various acquisition decisions
- Ensure cyber and interoperability needs are clearly defined in the CDD

### **b. Acquisition Strategy**

The Acquisition Strategy should describe the development program and associated decisions sufficiently to convey what information/data testing is needed to adequately support the acquisition decisions and evaluate technical, functional, and operational performance. It should account for T&E when identifying resource needs. The Acquisition Strategy sets the schedule for delivering the capability during the major acquisition phases. Test teams should:

- Ensure thorough description of T&E requirements and data to be provided by the contractor
- Ensure that time is allotted in the program schedule for independent government T&E and time to fix the identified deficiencies
- Ensure that the Acquisition Strategy considers a robust T&E program
- Understand the decision points that will require test data to make informed decisions

### **c. Systems Engineering Plan (SEP)**

Test and Evaluation is a critical element of overall Systems Engineering. T&E provides the means for verifying that product solutions obtained through Systems Engineering Technical Processes will satisfy their design-to-requirements and validating that the overall system can meet its stakeholder's capability needs. T&E personnel perform key activities related to Systems Engineering by participating in Technical Assessments and Technical Design Reviews. Such reviews and the assessments that result from them are one of the keys to a knowledge-based acquisition process. The Technical Readiness Assessments (TRA), Preliminary Design Reviews (PDR) and Critical Design Reviews (CDR) provide a venue to establish the technical baselines, assess the system's technical maturity, and review and assess technical risks. Independent Technical Risk Assessments (ITRA) provide an overview of a program's technical risk posture and identifies risks to be brought to the MDA's attention and provide recommended mitigation strategies for high-risk areas.

The SEP documents key technical risks, processes, resources, metrics (Technical Performance Measurement and other metrics), systems engineering (SE) products, quality control, and completed or scheduled SE activities. The purpose of the SEP is to help PMs develop, communicate, and manage the overall SE approach guiding all technical activities of the program. T&E personnel use the SEP as a reference for developing the T&E strategy, test plans, and other planning documents.

#### **d. Validated Online Life Cycle Threat (VOLT)**

The VOLT is the authoritative, system-specific threat assessment tailored for and normally focused on one specific program. The VOLT involves the application of threat modules and is written to articulate the relevance of each module to a specific acquisition program or planned capability. While VOLT reports support Acquisition Category (ACAT) I-III programs, only Major Defense Acquisition Programs (MDAPs) and programs on the T&E Oversight List require a unique, system-specific VOLT report to support capability development.

T&E personnel use the VOLT as a reference for developing T&E plans, T&E resources and capability requirements, and test scenarios, as well as a guide for defining the threat environment for a mission-oriented context.

#### **e. Intellectual Property (IP) Strategy**

The IP Strategy should identify and describe the management of delivery and associated license rights for all hardware, software, and related materials necessary to meet operational, cyber, and supportability requirements. It should include, to the maximum extent practicable, negotiation for and periodic delivery of all executables, source code, associated scripts, build procedures, automation scripts, tools, databases, libraries, test results, data sets, firmware, training materials, and any other elements necessary to integrate, test and evaluate, debug, deploy, and operate the hardware and software application in all relevant environments (e.g., development, staging, and production). Where third-party services, particularly cloud hosting services, are used, the PM should assure that appropriate access and IP clauses are flowed down to those service providers.

Test teams should provide input to the IP Strategy on the rights to data generated (such as contractor-generated test results) during all phases of testing that would allow building a shared body of test evidence, available to the program throughout its lifecycle. The PM should further consult with the T&E community to determine any access needed to support independent testing and include these accesses in the IP Strategy as needed.

#### **f. Cost Estimate**

The cost estimate should consider the technical content of the program described in the CDD, Acquisition Strategy, and TEMP. Test teams should:

- Ensure that the cost estimate includes all the resources necessary to plan and execute the T&E as outlined in the TEMP and resources to mitigate potential deficiencies identified in test

#### **g. Request for Proposal (RFP)**

The RFP defines what the government expects from the contractor. If T&E expectations are not explicitly stated in the RFP and the acquisition contract, needed data may not be provided, increasing risk to the T&E program, and potentially, the acquisition cost and schedule. The TEMP is a source document for the RFP and should be generated in time to support RFP development. The PM should consult with government test teams to ensure that the RFP supports data collection for government T&E. At a minimum, a



Service-approved TEMP should be included as an attachment to the RFP to clearly tell the contractors what the government intends to test and evaluate. The test teams should encourage that the following items and activities are included as contract deliverables:

- Government access to contractor test events, test tools, test data repositories, and test environments
- Delivery of contractor-provided M&S tools to be used by government test organizations (these may include initial digital system models, component level reliability and availability models, or other M&S tools)
- Contractor test plans, procedures, reports, and data
- Contractor support for government testing, including early live fire testing

## **2. T&E During Major Capability Acquisition Pathway Phases**

### **2.1 Materiel Solution Analysis Phase**

Specific T&E activities within the Materiel Solution Analysis Phase include:

- Generate the initial Milestone A TEMP<sup>20</sup>
- Actively participate in the development of the RFP for the Technology Maturation and Risk Reduction Phase
- Conduct the Milestone A Independent Technical Risk Assessment (ITRA)
- Supporting the Milestone A decision

#### **2.1.1 Generate the Initial Milestone A TEMP**

In coordination with the PM, the T&E WIPT should develop and document the TEMP before progressing to the TMRR phase. The Milestone A TEMP should be complete enough to estimate and plan for the major resources required for adequate T&E in accordance with the requirements outlined in the draft CDD (or ICD), intended use of the system as outlined in CONOPS/OMS/MP, and given the operationally relevant threat as outlined in the VOLT. The Milestone A TEMP should document any risks to the T&E program and describe how the PM will mitigate these risks. To the extent possible, the Milestone A TEMP should:

- Assess the Analysis of Alternatives from the perspective of key drivers of system performance warranting evaluation focus, and key drivers of developmental risk warranting early DT focus
- Present an IDSK that links data requirements for DT&E, OT&E, and LFT&E to key program decisions
- Describe the evaluation focus areas and evaluation framework to meet DT&E, OT&E, and LFT&E
- Present an integrated program schedule that documents major program milestones, and test events supporting those milestones
- Describe each test phase or event
- Identify Milestone entrance and exit criteria
- Identify key T&E resources for the TMRR phase, and their funding
- Highlight any aspects of the CONOPS/OMS/MP that may require significant test assets, such as specialized units, target sets, ranges, threat emulators, threat models and simulations, intelligence mission data, or long production lead times
- If applicable, specify the baseline against which the new system will be judged and the resources allocated for the baseline testing
- Identify key responsible T&E stakeholders, to include stakeholders responsible for verification and validation of proposed M&S and digital tools

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<sup>20</sup> In some cases, a T&E strategy may be more appropriate at this phase in the program lifecycle.

### **2.1.2 Actively Participate in the Development of the RFP for TMRR Phase**

The Milestone A TEMP and the approved Acquisition Strategy inform development of the RFPs for any TMRR Phase contracts. The PM, in coordination with the T&E WIPT, should work to ensure that the RFP describes:

- T&E requirements/information needed for a successful T&E program
- T&E data management including T&E data rights
- M&S details, to include pertinent verification, validation, and accreditation (VV&A) reports or plans, if available
- T&E resources
- Cyber contract guidance
- Software management
- Reliability, availability, and maintainability program requirements, including contractual design-for-reliability requirements

The Contract Data Requirements List (CDRL) should identify: 1) required contractor-generated test data, 2) planned contractor T&E objectives and schedules, 3) M&S details, to include capabilities and limitations to be used by the contractor, 4) verification and validation procedures, 5) planned contractor test facility acquisitions, 6) other system information needed to support an adequate T&E, and 7) test assets needed for early live fire testing.

### **2.1.3 Conduct the Milestone A Independent Technical Risk Assessment (ITRA)**

Since 2017, independent technical risk assessments (ITRAs) are required on MDAPs before approval of Milestone A, Milestone B, and any decision to enter into low-rate initial production or full-rate production. T&E professionals are integral ITRA team members. The Milestone A ITRA provides senior leaders with an independent view of program technical risk, including the maturity of critical technologies and manufacturing processes that need to be matured. Specific guidance on the responsibilities and criteria for conducting ITRAs can be found in DoDI 5000.88, Engineering of Defense Systems.

## **2.2 Technology Maturation and Risk Reduction (TMRR) Phase**

Government T&E activities within the Technology Maturation and Risk Reduction Phase include:

- Generate the Milestone B TEMP
- Review the Logistics Risk Assessment
- Conduct the Technology Readiness Assessment
- Participate in the Preliminary Design Review
- Observe or participate in prototype demonstrations or tests
- Participate in the System Requirement and System Functional Reviews
- Participate in the Capability Development Document (CDD) Validation
- Conduct the DT&E Developmental RFP Release Program Assessment (DTA)
- Conduct the Milestone B Independent Technical Risk Assessment (ITRA)
- Conduct the Milestone B DT&E Sufficiency Assessment (DTSA)
- Conduct an early operational assessment, if applicable

- Support the Development RFP Release Decision for the EMD Phase
- Support the Milestone B decision

### **2.2.1 Generate the Milestone B TEMP**

The Milestone B TEMP should expand on and update the Milestone A TEMP content. For example, the Milestone B TEMP should:

- Adapt the IDSK, the evaluation framework, and associated fidelity of test and M&S events, to include verification and validation to leverage and build on the contractor and government testing, M&S, and analysis conducted in the previous phase
- Include the IOT&E design completed by the OTA to define operational test requirements and support test resource estimates
- If applicable, commit to FUSL live fire testing, or the Program Office, in coordination with the T&E WIPT, should submit a FUSL waiver request and detail the alternative LFT&E strategy in the TEMP in accordance with Title 10, Section 4172 USC
- Update the estimates of test risks that may prevent or delay the satisfactory execution of the test events
- Discuss safe test procedures and adequate environmental protections
- Update the projected resource and schedule requirements, including simulated threat environments and targets

### **2.2.2 Review the Logistics Risk Assessment**

The Logistics Risk Assessment is an analysis of a program's product support strategy across the system lifecycle, including sustainment costs. The T&E WIPT should review the logistics risk assessment and leverage it during development of the Milestone B TEMP.

### **2.2.3 Conduct the Technology Readiness Assessment (TRA)**

The TRA is a systematic, metrics-based process that assesses the maturity of, and the risk associated with, critical technologies to be used in MDAPs. The assessment should be based on objective evidence gathered during events, such as tests, demonstrations, pilots, or physics-based simulations. Program Managers conduct TRAs with the assistance of an independent team of subject matter experts that can include T&E professionals. For programs for which an ITRA is conducted, a technology readiness assessment report is not required as the ITRA report subsumes the TRA findings. Programs will continue to assess and document the technology maturity of all critical technologies consistent with the USD(R&E) technology readiness assessment guidance.

### **2.2.4 Participate in Preliminary Design Review (PDR)**

The PDR is the first opportunity for T&E professionals to closely observe the contractor's hardware and software design. The PDR occurs after preliminary system design efforts but before drafting the detailed system designs. During the PDR, the

contractor describes the rationale for the system's preliminary design, outlining all the designs considered, changes that were made as a result of trade studies, and the resulting design decisions.

### **2.2.5 Conduct the DT&E Developmental RFP Release and Milestone B Program Assessment (DTA)**

The USD(R&E) provides the MDA with a program assessment at the development RFP release decision point and Milestone B. These programs, if designated for DT oversight by the USD(R&E), can include MDAPs, other programs categorized as ACAT I; major systems, usually categorized as ACAT II; automated information systems (AIS) (not managed by other acquisition pathways); and other capabilities developed via the MCA Pathway. The Developmental RFP assessment reviews the overall proposed RFP and the Contract Data Requirement List for inclusion of T&E execution support. The assessment will address the adequacy of the proposed approach on T&E technical data, including management, ownership, control, timely access, and delivery of the T&E data, to include raw test data, to support future program development. Given the early maturity of the program at this stage with minimal test data available, the DT&E Milestone B program assessment focuses on the adequacy of planned testing for evaluating technical performance and technology, demonstrated capabilities, integration maturity, sustainment, and survivability.

### **2.2.6 Conduct the Milestone B Independent Technical Risk Assessment (ITRA)**

The Milestone B ITRA considers the full spectrum of technology, engineering, and integration risk. These areas could include mission capability, technology, system development, MOSA, software, security, manufacturing, sustainment, testing adequacy, and their potential impacts to cost, schedule, and performance. Specific guidance on the responsibilities and criteria for conducting ITRAs can be found in DoDI 5000.88, Engineering of Defense Systems

### **2.2.7 Conduct the Milestone B DT&A Sufficiency Assessment (DTSA)**

In accordance with 10 U.S.C. §4252, when the USD(A&S) is the MDA, the USD(R&E) will conduct DT&E sufficiency assessments for MDAPs. Milestone B DT&E sufficiency assessments will include a focus on reliability, interoperability, and cybersecurity, concentrating on the adequacy of planned testing. The assessment will address the sufficiency of:

- The DT&E plans within the TEMP
- The DT&E schedule, including a comparison to historic, analogous systems
- The DT&E resources (facilities, personnel, test assets, data analytics tools, and M&S capabilities)
- The mitigation of known risks of developmental test and production concurrency
- The developmental test criteria for entering the production phase

Findings should be included in the Milestone B brief summary report provided to the congressional defense committees. When the Service or the Component acquisition

executive is the MDA, the senior official within the Military Department, Defense Agency or DoD Field Activity with responsibility for DT&E will conduct the Milestone B Sufficiency Assessments and report the results to the congressional defense committees. An example of the Milestone B DT&E sufficiency assessment is at Appendix B.

### **2.2.8 Conduct an Early Operational Assessment (EOA)**

EOAs and relevant live fire testing should be conducted to provide a means to evaluate a program's progress early in the process toward developing an operationally effective, suitable, survivable, and lethal system. An EOA is conducted in accordance with a test plan approved by DOT&E for programs under T&E oversight. EOAs are typically an analysis, based on a review of current program plans and documentation, as well as data from early developmental testing, technology assessments, M&S, and program reviews, to include PDR. EOAs enable the OTA to provide early input on key operational strengths and risks inherent to the design that, if not corrected, could have a detrimental effect on the determination of operational effectiveness, suitability, survivability, and lethality. EOAs examine the links and consistency between the concept of operations, requirements, and technology limitations to provide recommendations to the program and the requirements authority. DOT&E (when applicable), and the appropriate OTA should report EOA findings to their Service Chief and the MDA to support the Milestone B decision.

### **2.2.9 Support the Development of RFP Release Decision for the EMD Phase**

The Development RFP Release Decision commits the program to releasing the Development RFP to industry. The Development RFP Release Decision should be based on the program's executability and affordability prior to releasing the EMD solicitation. The goal is to avoid any major program delays at Milestone B, when source selection is already complete and award is imminent. At the Development RFP Release Decision, the PM provides a draft Milestone B TEMP for the EMD Phase. The T&E WIPT also assists in developing the RFP to ensure it addresses:

- Government T&E requirements identified in the Milestone B TEMP
- Contractor T&E activities critical for program success

## **2.3 Engineering and Manufacturing Development (EMD) Phase**

Government T&E activities within the EMD Phase include:

- Generate the Milestone C TEMP
- Participate in the Critical Design Review
- Conduct Government T&E
  - Conduct DT&E on Components, Subsystems, and Prototype Systems
  - Conduct Operational Assessment(s)
  - Live Fire T&E Activities
- Support the Production & Deployment RFP Release
- Conduct the Milestone C DT&E Program Assessment

- Conduct the Low-Rate Initial Production (LRIP) Independent Technical Risk Assessment (ITRA)
- Conduct the Milestone C DT&E Sufficiency Assessment
- Support Milestone C and LRIP decisions

### **2.3.1 Generate the Milestone C TEMP**

The Milestone C TEMP should expand on and update the Milestone B TEMP content. For example, the Milestone C T&E TEMP should:

- Adapt the IDSK, the evaluation framework, and the fidelity of test and M&S events, to include VV&A, to leverage and build on the contractor and government testing, M&S, and analysis conducted in the previous phase
- Detail the Initial Operational Test & Evaluation (IOT&E), which is required by 10 U.S.C. § 4171 and all other planned data collection events
- Detail the LFT&E Full-Up System-Level (FUSL) testing, required by 10 U.S.C. § 4172
- Update the estimates of test risks that may prevent or delay the satisfactory execution of the test events
- Update the projected resource and schedule requirements, including simulated threat environments and targets

Delays in system development can pose a schedule risk for T&E activities. If the PM decides to compress the T&E activities laid out in the integrated program schedule within the TEMP, testers should characterize the risk of failing to obtain the information detailed in the developmental and operational evaluation frameworks and the LFT&E Strategy.

### **2.3.2 Participate in the Critical Design Review (CDR)**

The CDR is the decision point for certifying the system design has sufficiently matured for hardware fabrication to begin with acceptable risk. The T&E WIPT representatives should attend the CDR and provide an up-to-date assessment of the system. In particular, the CDR assesses design maturity, documentation, and risks, and establishes the initial system baseline.

### **2.3.3 Conduct Government T&E**

#### **2.3.3.1 Conduct Government DT&E on Components, Subsystems, and Prototype Systems**

Government testers should continue to leverage contractor testing when appropriate to supplement government DT&E. Programs are encouraged to include military users in government-conducted DT&E to support early problem identification and user acceptance. Involving users in government-conducted DT&E also encourages integrated T&E activities by increasing the relevance of the data to the OT&E stakeholders.

### **2.3.3.2 Conduct Operational Assessment(s)**

OTAs typically execute one or more operational assessments (OA) during the EMD Phase to provide timely and frequent feedback on capabilities as they are developed during this phase. The data for OAs may include multiple test events (DT, IT, and OT) and data analysis efforts conducted before initial production units are available and which incorporates substantial operational realism. OAs may include evaluations that range from operational analysis of system designs to assess potential design operational strengths or risks to test events that include military users with varying degrees of operational missions' realism based on the level of system maturity. An OA may be combined with developmental test activity and/or training events. The lead OTA conducts an OA in accordance with a test plan approved by DOT&E for programs under T&E oversight. As a general criterion for proceeding through Milestone C, the lead OTA will conduct and report results of at least one OA. The OTA supports the Milestone C decision by reporting the findings of any relevant DT, IT, and OT&E conducted to date. The OTA Report should focus on progress toward operational effectiveness, suitability, survivability, and lethality and any associated risks. The OTA report should also include an assessment of significant trends noted in development efforts, adequacy of performance against operational and technical requirements, and the program's ability to support adequate operational testing.

### **2.3.3.3 Live Fire T&E Activities**

LFT&E can generate information supporting the evaluation of a system's operational effectiveness, suitability, survivability and lethality. The DOT&E approves LFT&E strategies and LFT&E test plans (including survivability and lethality test plans) for covered systems as defined in Section 4172 of Title 10, U.S.C., as well as the quantity of test articles procured for all LFT&E test events for any system under LFT&E oversight. LFT&E occurs over the course of a program, beginning with component-level testing during the initial design stage. T&E continues as the system matures from assemblies to sub-systems, and finally, unless waived, to FUSL configuration. During FUSL testing, the weapon system is fully equipped for combat with all sub-systems operational and powered. Survivability and lethality tests should be carried out sufficiently early in the development phase of the system or program to allow for the correction of design deficiencies discovered during testing before proceeding beyond low-rate initial production.

Although there is no waiver from LFT&E, the law contains provisions for a waiver from the requirements for FUSL testing. The Program Executive Officer will provide a memorandum to the Service Acquisition Executive asserting that the survivability or lethality tests required by 10 USC 4172 are unreasonably expensive and impractical. The SAE will provide a similar memorandum to USD(A&S) as the Defense Acquisition Executive requesting a waiver from the requirement of FUSL testing on that basis. The waiver must be approved by USD(A&S) as the DAE, even in cases where acquisition authority has been delegated to the Service.

USD(A&S) will request that DOT&E certify that the live fire testing and evaluation laid out in the TEMP (or previously in the Live Fire Strategy/Alternative Live Fire Test and Evaluation Plan) is adequate to evaluate the survivability or lethality of the system



without using FUSL assets. DOT&E will provide a memorandum affirming this to be the case, along with the approved TEMP (or the appropriate live fire sections of the TEMP) to USD(A&S). In accordance with 10 USC 4172 (c)(3), USD(A&S) will then submit memoranda and the live fire plan to the chairs and ranking members of the congressional defense committees, informing them of the granting of the waiver.

The waiver package sent to Congress consists of these two parts: 1) certification that the waiver is needed and 2) an LFT&E plan for evaluating survivability or lethality.

### **2.3.4 Support the Production and Deployment RFP Release**

Given the maturity of the program at this stage in the acquisition cycle, programs may need to update the RFP. The updated RFP may include changes to T&E requirements, but should be consistent with the Milestone C TEMP and the Acquisition Strategy.

### **2.3.5 Conduct the Milestone C DT&E Program Assessment (DTA)**

The USD(R&E) provides the MDA with an assessment to inform the Milestone C decision for those programs designated for DT oversight. These can include MDAPs, other programs categorized as ACAT I; major systems, usually categorized as ACAT II; automated information systems (AIS) (not managed by other acquisition pathways); and other capabilities developed via the MCA Pathway. The USD(R&E) uses all available test data to evaluate technical performance and technology, demonstrated capabilities, integration maturity, sustainment, and survivability. The USD(R&E) coordinates with the Director, Operational Test and Evaluation on the integration of developmental and operational test and evaluation to minimize duplicative testing and reporting to the maximum extent possible and achieve greater efficiencies.

### **2.3.6 Conduct the Low-Rate Initial Production (LRIP) Independent Technical Risk Assessment (ITRA)**

An ITRA is required for MDAPs before approval of any decision to enter into LRIP. The LRIP ITRA assessment areas include mission capability, technology, system development, MOSA, software, security, manufacturing, sustainment, testing adequacy in, and their potential impacts to program cost, schedule, and performance. Specific guidance on the responsibilities and criteria for conducting ITRAs can be found in DoDI 5000.88, Engineering of Defense Systems.

### **2.3.7 Conduct the Milestone C DT&E Sufficiency Assessment (DTSA)**

In accordance with 10 U.S.C. §4253 when the USD(A&S) is the MDA, the USD(R&E) will conduct a DTSA to support the Milestone C decision and entry into the P&D Phase for MDAPs. The Milestone C DTSA focuses on the sufficiency of completed testing, the risks identified during that testing, and the plans for remaining testing. The reportable elements that the USD(R&E) provides to the USD(A&S) for inclusion in their Milestone C Brief Summary Report submitted to the congressional defense committees are:

- DT&E completed
- DT&E Plans (for remaining DT&E)

- Risks to Production and Deployment
- DT&E Resources (for remaining DT&E)
- Readiness for IOT&E

When the Service or the Component acquisition executive is the MDA, the senior official within the Military Department, Defense Agency, or DoD Field Activity with responsibility for DT&E will conduct and report the DTSA results to the MDA for their Milestone C Brief Summary Report to the congressional defense committees.

### **2.3.8 Support the Production and Deployment RFP Release**

Given the maturity of the program at this stage in the acquisition cycle, programs may need to update the RFP. The updated RFP may include changes to T&E requirements, but should be consistent with the Milestone C TEMP and the Acquisition Strategy.

## **2.4 Production and Deployment Phase**

Government T&E activities within the Production and Deployment Phase include:

- Generate the Full-Rate Production (FRP) TEMP, as necessary
- Conduct Government T&E, to include any remaining DT&E and LFT&E (e.g., FUSL Testing if applicable), IOT&E
- Generate an IOT&E Report
- Conduct the FRP Independent Technical Risk Assessment (ITRA)

### **2.4.1 Generate the Full-Rate Production TEMP**

At any point after the FRP or full deployment decision, DOT&E and/or Director, DTE&A may direct the DoD Component Acquisition Executive (CAE) to provide TEMP updates or addendums to articulate additional testing (e.g., FOT&E, Verification of Correction of Deficiencies periods, or test programs for future increments). The OTA may also request TEMP updates or addendums to articulate additional testing.

### **2.4.2 Conduct Government T&E**

#### **2.4.2.1 First Article Testing (FAT):**

The purpose of FAT is to evaluate how production processes and environmental stress affect system performance. FAT should be conducted expeditiously because the production line may continue to flow while testing is conducted and results are being analyzed.

#### **2.4.2.2 Acceptance Testing (AT):**

The purpose of AT is to ensure that each system that comes off the production line functions properly. AT is critical because it is the point where the government accepts ownership and responsibility of the system, and may also be the date on which warranty coverage begins.

Both FAT and AT are normally conducted either by Program Management Office personnel or by the contractor using government-approved test plans and under the oversight of government personnel resident at the contractor facility.

### 2.4.2.3 Production Qualification Tests (PQT):

PQT is conducted post-Milestone C to ensure the effectiveness of the manufacturing process, equipment, and procedures, and provides 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. PQT is repeated if the process or design is changed significantly and when a second or alternative source is brought on line.

### 2.4.2.4 Initial Operational Test and Evaluation (IOT&E):

An IOT&E, a test event mandated by 10 U.S.C. § 4171, provides Congress, the Secretary of Defense, the Milestone Decision Authority, and the warfighter an independent evaluation of a system's operational effectiveness, suitability, survivability, and lethality. The lead OTA conducts an IOT&E in accordance with a test plan approved by the DOT&E for programs under OT & LFT&E oversight.

IOT&E uses production or production-representative test articles that, at a minimum, will incorporate the same materials and processes, including system parts and software items, to be used in production articles. Properly qualified integrated test data collected during EMD may be used to fulfill some IOT&E requirements subject to DOT&E approval or the OTA approval in the absence of DOT&E oversight. IOT&E also requires more than an evaluation based exclusively on computer modeling, simulation, or an analysis of system requirements, engineering proposals, design specifications, or any other information contained in program documents. It requires end-to-end testing of system capabilities, including all interrelated systems needed to employ and support those capabilities when operated by typical (trained) users or units under conditions simulating combat stress, or if applicable, peacetime operations. Individuals employed by the contractor for the system being developed may only participate in IOT&E to the extent they are planned to be involved in the operation, maintenance, and other support of the system when deployed in combat.

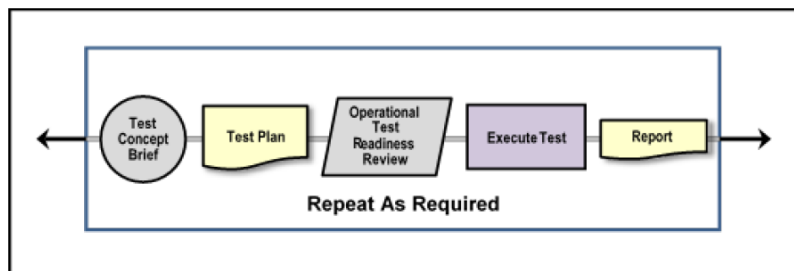


Figure 4. Typical sequence of OT&E activities

### 2.4.2.5 Full-Up System-Level (FUSL) Tests

FUSL testing fulfills the requirements of Title 10, U.S.C. Section 4172 for “realistic survivability” and “realistic lethality” testing. “Realistic survivability testing” means testing for the susceptibility, vulnerability, force protection, and recoverability of the system and its crew in a contested operational environment using adversary-

representative threats fired against the production-representative system equipped with any available countermeasures. “Realistic lethality testing” means testing for lethality by engaging the production-representative weapon against adversary-representative targets configured for combat equipped with any associated countermeasures.

DOT&E approves LFT&E plans for select live fire test events, as identified in the TEMP. Examples include FUSL tests, Total Ship Survivability Trials, Full Ship Shock Trials, M&S plans, and similar. The document approval matrix in the TEMP specifies which planning documents will be submitted for DOT&E approval and which will be submitted for information and review only. The Service OTA or assigned test activity conducts LFT&E events, executing the planned events in accordance with the LFT&E strategy and approved LFT&E plan.

### **2.4.3 Generate an IOT&E Report**

For programs on OT or LFT&E oversight, DOT&E issues an IOT&E report to the MDA, Secretary of Defense, and Congress. The report includes the Director’s independent assessment of test adequacy and an evaluation of the system’s operational effectiveness, suitability, survivability, and lethality. For programs on the T&E Oversight List, operational and live fire testing occurs in accordance with the DOT&E-approved TEMP and subsequent operational test and LFT&E plans. For programs only on LFT&E oversight, the Director will submit a report at the conclusion of survivability or lethality testing.

If a decision is made to proceed to operational use or make procurement funds available prior to the completion of IOT&E, DOT&E will submit a report to the Secretary of Defense as soon as practicable, referred to as an Early Fielding report. An Early Fielding report will document test adequacy and provide an assessment of operational effectiveness, suitability, survivability, and lethality.

### **2.4.4 Conduct the Full-Rate Production Independent Technical Risk Assessment (ITRA)**

An ITRA is required for MDAPs before approval of any decision to enter into Full-Rate Production (FRP). The FRP ITRA assessment areas include demonstrated mission capability, technology, system development, MOSA, software, security, manufacturing, sustainment, testing adequacy and their potential impacts to program cost, schedule, and performance. Specific guidance on the responsibilities and criteria for conducting ITRAs can be found in DoDI 5000.88, Engineering of Defense Systems.

## **2.5 Operations and Support (O&S) Phase**

Government T&E activities within the Operations and Support Phase does not end upon full-rate decision. The O&S phase focuses on executing the product support strategy, satisfying materiel readiness and operational performance requirements, and sustaining the system. Effective sustainment of systems results from the design and development of supportable, reliable, and maintainable systems. Sustainment strategies can evolve throughout the system’s life cycle. The PM works with system users to document performance and sustainment requirements in agreements specifying objective outcomes,

measures, resource commitments, and stakeholder responsibilities. The Services, with system users, conduct continuing reviews of sustainment strategies to compare performance expectations against actual performance measures. When appropriate, follow-on activities include planning for a Follow-on Operational Test & Evaluation (FOT&E) conducted by the OTA's to evaluate operationally significant improvements, modifications, and corrective actions made to the system subsequent to the IOT&E. Surveillance testing and shelf-life extension testing.

### **2.5.1 Follow-on Operational Test & Evaluation (FOT&E)**

An FOT&E is a test event that may be conducted, if necessary, after IOT&E to determine whether deficiencies identified during IOT&E were corrected, or to evaluate aspects of system performance not tested during IOT&E due to test or system limitations or because system updates were required. An FOT&E is conducted in accordance with a DOT&E-approved test plan for systems on T&E oversight. FOT&E should be conducted in a realistic tactical environment similar to IOT&E and use production systems with appropriate modifications, upgrades, or increments. FOT&E verifies and evaluates the operational effectiveness, suitability, survivability, and lethality of the production system in light of any changes to the system or operational environment. Additional FOT&E may be conducted over the life of the system to refine doctrine, tactics, techniques, and training programs, and to evaluate future increments, modifications, and upgrades. Specific objectives of FOT&E include testing modifications to be incorporated into production systems. The tests are also used to evaluate the system in a different platform application for new tactical applications or against new threats.

## **Appendix A. Acronyms & Glossary**

ACAT	Acquisition Category
AT	Acceptance Testing
BLRIP	Beyond Low-Rate Initial Production
CDRL	Contract Data Requirements List
CDD	Capability Development Document
CDR	Critical Design Review
CDT	Chief Developmental Tester
COI	Critical Operational Issue
CONOPS	Concept of Operations
CTP	Critical Technical Parameter
DEF	Developmental Evaluation Framework
DOT&E	Director, Operational Test and Evaluation
DSQ	Decision Support Question
DTA	Developmental Test Assessment
DT&E	Developmental Test and Evaluation
D,DTE&A	Director, Developmental Test and Evaluation
DTSA	Developmental Test Sufficiency Assessment
EMD	Engineering and Manufacturing Development
EOA	Early Operational Assessment
FAT	First Article Testing
FD	Full Deployment
FOT&E	Follow-on Operational Test and Evaluation
FRP	Full-Rate Production
FUSL	Full-Up System-Level
ICD	Initial Capabilities Document

IDSK	Integrated Decision Support Key
IOT&E	Initial Operational Test and Evaluation
ITRA	Independent Technical Risk Assessment
JMETC	Joint Mission Environment Test Capability
KPP	Key Performance Parameter
KSA	Key System Attribute
LFT&E	Live Fire Test and Evaluation
LRIP	Low-Rate Initial Production
LVC	Live, Virtual, or Constructive
M&S	Modeling and Simulation
MCA	Major Capability Acquisition
MCF	Mission Critical Function
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MP	Mission Profile
MRTFB	Major Range and Test Facility Base
MSA	Material Solution and Analysis
O&S	Operations and Support
OA	Operational Assessment
OEF	Operational Evaluation Framework
OMS	Operational Mode Summary
OPM	Operational Performance Measure
OT&E	Operational Test and Evaluation
OTA	Operational Test Agent
OTP	Operational Test Plan
P&D	Production and Deployment
PDR	Preliminary Design Review

PM	Program Manager
RFP	Request for Proposals
T&E	Test and evaluation
TBPM	Technical Baseline Performance Measure
TEMP	Test and Evaluation Master Plan
TMRR	Technology Maturation and Risk Reduction
TPM	Technical Performance Measure
TRA	Technology Readiness Assessment
VV&A	Verify, Validate, and Accredite
VOLT	Validated Online Lifecycle Threat
WIPT	Working-level Integrated Product Team



## Appendix B. DT&E Sufficiency Assessment Memorandum Examples

### Milestone B DT&E Sufficiency Assessment Memorandum Example

[OFFICE LETTERHEAD]

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND  
SUSTAINMENT [OR COMPONENT/SERVICE ACQUISITION  
EXECUTIVE]

SUBJECT: Developmental Test and Evaluation Sufficiency Assessment for the *<name of program>* Program in Support of the Milestone B Brief Summary Report

This memorandum provides my assessment of the sufficiency of developmental test and evaluation (DT&E) plans for the *<name of program>* program as required by section 2366b(c)(1)(G) of Title 10, United States Code.

I have conducted a formal review of the program's DT&E efforts and, on the basis of such review, assess that the DT&E is *<sufficient><not sufficient>* to support Milestone B and entry into the Engineering and Manufacturing Development (EMD) phase. During my review and assessment, I have determined the following:

DT&E Planning. The DT&E plans within the Test and Evaluation Master Plan are *<sufficient><not sufficient>* to support the EMD phase.

Basis for Assessment. *Provide a brief discussion supporting assessment of DT&E planning. Summarize DT&E planning concerns with recommendations to resolve any issues. Use an attachment, if necessary.*

DT&E Schedule. The DT&E integrated master schedule for EMD is *<sufficient><not sufficient>*.

Basis for Assessment. *Provide a brief discussion supporting assessment of the DT&E schedule. Summarize DT&E schedule concerns with recommendations to resolve any issues. Use an attachment, if necessary.*

Milestone B DT&E Sufficiency Assessment Memorandum Example, Continued

DT&E Resources. The planned DT&E resources (including facilities, personnel, test assets, automated data analytics tools, and modeling and simulation capabilities) supporting EMD are < sufficient > < not sufficient >.

Basis for Assessment. Provide a brief discussion supporting assessment of DT&E resources. Summarize DT&E resource planning concerns with recommendations to resolve any issues. Use an attachment, if necessary.

Risks of Developmental Test and Production Concurrency. The mitigation of known risks of developmental test and production concurrency is < sufficient > < not sufficient >.

Basis for Assessment. Provide a brief discussion identifying DT&E risks and supporting DT&E risk mitigation. Summarize DT&E risk concerns with recommendations to resolve any issues. Use an attachment, if necessary.

DT&E Entrance Criteria for Production Phase. The developmental test criteria for entering the production phase are < sufficient > < not sufficient >.

Basis for Assessment. Provide a brief discussion supporting DT&E production phase entrance criteria. Summarize DT&E entrance criteria concerns with recommendations to resolve any issues. Use an attachment, if necessary.

Additional Information (optional). Provide the MDA with any relevant information (e.g. Supply Chain Security) appropriate to this DT&E sufficiency assessment. Use an attachment, if necessary.

The point of contact for additional details and analysis supporting this DT&E sufficiency assessment is < Name, Email Address, and Phone Number >.

< Signature block of the D(DTE&A) > or

< Signature block of senior official within the Military Department, Defense Agency, or DoD Field Activity with responsibility for DT&E >

cc:

USD(R&E) or DD(Engineering) if Component signed  
DOT&E

Milestone C DT&E Sufficiency Assessment Memorandum Example

[OFFICE LETTERHEAD]

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND  
SUSTAINMENT [OR COMPONENT/SERVICE ACQUISITION  
EXECUTIVE]

SUBJECT: Developmental Test and Evaluation Sufficiency Assessment for the <name of  
program> Program in Support of the Milestone C Brief Summary Report

This memorandum provides my assessment of the sufficiency of developmental test and  
evaluation (DT&E) completed for the <name of program> program as required by section  
2366c(a)(4) of Title 10, United States Code.

I have conducted a formal review of the program's completed DT&E and assess on the  
basis of such review that the DT&E completed is <sufficient><not sufficient> to support  
Milestone C and entry into the Production and Deployment (P&D) phase. During my review and  
assessment, I have determined the following:

Completed DT&E. The evaluation of results from DT&E completed to date is  
<sufficient><not sufficient> to support entry into the P&D phase.

Basis for Assessment. *Provide a brief discussion supporting assessment of completed  
DT&E. Summarize DT&E completion concerns with recommendations to resolve any issues. Use  
an attachment, if necessary.*

DT&E Remaining Plans and Resources. The plans and resources available for remaining  
DT&E are <sufficient><not sufficient> to support the P&D phase.

Basis for Assessment: *Provide a brief discussion supporting assessment of remaining  
DT&E plans and resources. Summarize DT&E remaining plans and resources concerns with  
recommendations to resolve any issues. Use an attachment, if necessary.*

Risks to the P&D Phase Identified During DT&E. The mitigation of risks identified  
during DT&E to the P&D phase is <sufficient><not sufficient>.

Milestone C DT&E Sufficiency Assessment Memorandum Example, Continued

Basis for Assessment. *Provide a brief discussion supporting DT&E risk mitigation. Summarize DT&E risk concerns with recommendations to resolve any issues. Use an attachment, if necessary.*

System Readiness for Initial Operational Test and Evaluation (IOT&E). The system is <ready/not ready> for scheduled IOT&E.

Basis for Assessment. *Provide a brief discussion supporting system readiness for IOT&E assessment. Summarize DT&E IOT&E readiness concerns with recommendations to resolve any issues. Use an attachment, if necessary.*

Additional Information (optional). *Provide the MDA with any relevant information (e.g. Supply Chain Security) appropriate to this DT&E sufficiency assessment. Use an attachment, if necessary.*

The point of contact for additional details and analysis supporting this DT&E sufficiency assessment is <Name, Email Address, and Phone Number>.

<Signature block of the D(DTE&A)> or  
<Signature block of senior official within the  
Military Department, Defense Agency, or DoD  
Field Activity with responsibility for DT&E >

cc:

USD(R&E) or DD(Engineering) if Component signed

DOT&E