

# AIR FORCE TEST AND EVALUATION GUIDE



**8 FEBRUARY 2019**

## **LIST OF FIGURES AND TABLES**

FIGURE 4.1 AF T&E ORGANIZATION STRUCTURE

TABLE 5.1 TYPES OF TESTING

FIGURE 5.1 UNIQUE SOFTWARE INTENSIVE PROGRAMS

FIGURE 5.2 INCREMENTALLY DEPLOYED SOFTWARE INTENSIVE PROGRAMS

FIGURE 5.3 CYBERSECURITY T&E PROCESS

FIGURE 8.1 ESSENTIAL TEST ELEMENTS

FIGURE 8.2 WATERFALL VS. AGILE SOFTWARE DEVELOPMENT RISK PROFILES

FIGURE 8.3 TEST RELATIONSHIP IN ASD

FIGURE 8.4 SOFTWARE ITERATION TEST-DRIVEN EVENTS

FIGURE 8.5 ASD TEST MATRIX

FIGURE A5.1 NOTIONAL ITT STRUCTURE AND MEMBERS

FIGURE A5.2 CONFLICT RESOLUTION FLOWCHART

## **SUMMARY OF CHANGES**

1. General reformatting, language revisions and terms/titles/organizations updated.
2. Added Rapid Acquisition (Section 804) guidance.
3. Added Agile Software Development Test guidance.
4. Added test support to experiments guidance.
5. “Hierarchy of Test and Evaluation Policy Guidance” and “Legislation Impacting Test and Evaluation” appendices have been moved to the AF/TEP SharePoint site: <https://haf-te.sharepoint.afncr.af.mil/TEP/SitePages/Home.aspx>

# **PART I – GENERAL TEST GUIDANCE**

## **1. PURPOSE AND SCOPE**

1.1. This document contains guidance, best practices, and lessons learned relevant to Air Force test and evaluation (T&E). It is a “living” guide that reflects information compiled from many sources based on most recent collective test community experiences. Consequently, updates will occur more frequently than with official policy. Although this guide supplements and expands on HQ USAF/TE policy, is not directive nor prescriptive in nature. It mirrors AFI 99-103’s broad applicability across multiple areas and complements policies and best practices encompassing a range of test communities and functions. Every effort is made to ensure this guide content is aligned with USAF and OSD guidance; however, if inconsistencies are discovered please contact AF/TEP so that these are resolved.

## **2. T&E BACKGROUND**

2.1. Just as the warfighter plans by working back from the target or desired end state, a tester must know the requirements, acquisition strategy and available resources to devise an effective T&E strategy. T&E aims to mature system designs, manage risks, identify and help resolve deficiencies as early as possible, and ensure systems are operationally mission capable (i.e. effective, suitable, survivable, and safe). The Air Force T&E community must plan and execute integrated testing as an efficient continuum in collaboration with the requirements, acquisition, and user communities. A tester’s role is vital throughout the program’s life cycle to informing a Program Manager (PM) on the projected success or failure of the system under test. A continuous flow of credible T&E data about the development and continued sustainment of combat systems is needed to keep systems and warfighters ready for current and emerging combat needs.

2.2. Along with AF/TE policies and directives, be familiar with the following:

- [DoD Instruction \(DoDI\) 5000.02](#), Operation of the Defense Acquisition System (document requirements in Table 2, DT&E in Enclosure 4 and OT&E and LFT&E in Enclosure 5)
- [Manual For The Operation Of The Joint Capabilities Integration And Development System](#) (JCIDS Manual)
- [AFI 10-601](#), Operational Capability Requirements Development (integrated T&E in paragraph 1.4.3, KPP, KSA development in paragraph 4.6)
- [AFI 63-101/20-101](#), Integrated Lifecycle Management (Chief Developmental Tester (CDT) and Test Manager (TM) roles in paragraph 2.9, test planning in paragraph 4.8)
- [DoD Cybersecurity Test and Evaluation Handbook](#) 1 July 2015

## **3. DOD-LEVEL TESTING ROLES AND RESPONSIBILITIES**

### **3.1. Director, Operational Test and Evaluation (DOT&E)**

Given DOT&E’s central role in the approval cycle of test execution, testers should familiarize themselves with how DOT&E interacts with their program. The Director is appointed by the President, confirmed by the Senate, and reports directly to SECDEF and Congress. The Director is the principle advisor to the SECDEF and USD (AT&L) on OT&E and the principal OT&E

official within the DoD. Congress made the Director responsible for live fire test and evaluation (LFT&E) in 1994.

### **3.2. DOT&E Responsibilities**

Their primary responsibilities are to give final approvals for Test and Evaluation Master Plans (TEMPs) before milestone decision reviews and OT&E plans before those tests may commence. They issue beyond low-rate initial production (B-LRIP) reports to senior DoD officials and Congress, and an Annual Report to Congress. They participate in Defense Acquisition Executive Summary (DAES) reports and reviews. Last, DOT&E's staff works closely with the Operational Test Agencies (OTAs), Integrated Test Teams (ITTs), and test teams to ensure better OT&E planning via early involvement.

### **3.3. DOT&E Interest**

DOT&E's primary interest is to ensure OT&E and LFT&E are adequate before full rate production (FRP) or deployment, and that the T&E was properly executed according to statute and DoD policy. DOT&E makes a determination of the operational effectiveness and suitability of these systems prior to FRP. DOT&E also looks at the operational mission impacts of deploying a system. They look at the system under test from an "end-to-end" perspective with all the interoperability and supportability considerations thrown into the mix. Operational assessments of mission impacts should look at these considerations early in order to address the issues, questions, and problems that will be raised 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 T&E data or the analysis. Any involvement from a system contractor must be limited to instrumentation, data collection and data processing or be representative of wartime concept of operations (CONOPS). 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. DOT&E personnel must get these issues identified early so they can be more effectively dealt with. TEMP and test plans that were developed with early DOT&E action officer inputs stand a much better chance of smooth OSD approval. Early involvement helps prevent unknown issues from surprising and potentially derailing the program during final coordination. DOT&E approves LFT&E strategies and management plans and alternative LFT&E strategies, if they are developed to support full-up system-level LFT waivers. With consultation from the PM, they determine the number of production or production representative test articles required for LFT&E and IOT&E of programs on the OSD T&E oversight list. Overall, DOT&E provides independent oversight, independent evaluation, and objective reporting of the results of operational test and LFT&E.

### **3.4. DOT&E Guidance**

DOT&E is the final approval authority of TEMP in conjunction with the DD(DTE&P) for programs on oversight. The DOT&E TEMP Guide provides guidance to defense acquisition programs for developing and documenting the program's evaluation strategy and management approach in the TEMP throughout the program's life cycle.

### **3.5. Deputy Director, Developmental Test, Evaluation and Prototyping (DD [DTE&P])**

Under the authority, direction, and control of the USD(R&E) and in accordance with Section 838 of the NDAA for FY 2018, the DD(DTE&P) has overall responsibility for conducting the MS B and MS C DT&E sufficiency assessments for MDAPs for which the USD (A&S) is the Milestone Decision Authority (MDA). Additionally, the DD(DTE&P) reports the DT&E sufficiency assessment determinations to the USD(A&S).

### **3.6. DT&E Responsibilities**

DT&E supports program offices and the DoD T&E community early and throughout the life cycle of a program to ensure test planning and resourcing are adequate to discover system deficiencies, support system development, and evaluate system performance. DT&E works to improve DoD developmental test and evaluation practice by focusing on support to Programs and Program Offices, improving DT&E Policy & Oversight, advancing DT&E Capability and improving Service DT&E Competencies.

### **3.7. DT&E Guidance**

DT&E provides guidance for the planning, execution, and reporting of DT&E in the DoD, as well as the integration of developmental and operational tests in coordination with the DOT&E. DT&E published a T&E Management Guide in December 2012 that defines all the required activities for DoD testing. See Test & Evaluation Management Guide.

### **3.8. Oversight Program List**

3.8.1. DOT&E publishes an annual OSD DOT&E oversight list which addresses OT&E and LFT&E. According to DoDI 5000.02, USD (AT&L) has a designated special interest list and OSD (DT&E) has an engagement list. DD(DTE&P) uses the MDAP, MAIS, and AT&L designated special interest lists to identify programs for DT&E oversight. Access to the USD (AT&L) designated special interest list requires a Defense Acquisition Management Information Retrieval (DAMIR) account (DoD CAC required). “Oversight” programs typically require additional briefings and reports, supporting documentation, and increased test rigor. Title 10 lays out the requirement for DOT&E approval of operational test plans prior to conducting operational testing of all MDAPs per §2430 or if so designated by DOT&E and DD(DTE&P). DoDI 5000.02, Enclosure 5 paragraph 3 spells out this designation process by stating that all programs “on the OSD T&E Oversight List” are subject to such approval. This same paragraph also points out that approval is required before conducting operational testing whether such testing occurs prior to, or after fielding and full-rate production decisions. AFI 99-103 defines the various types of Air Force led operational testing all of which fit within OSD’s understanding of operational testing and that may be subject to oversight and approval of operational test plans and reports. Each year AF/TE will recommend changes to the T&E Oversight List, and will recommend deletions once oversight serves no further purpose. All test organizations are encouraged to forward any change requests to AF/TEP for forwarding to OSD. See the [Defense Acquisition Guidebook](#) (DAG) for additional details.

3.8.2. What goes on the OSD T&E Oversight List? 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 list

annually. The following criteria are listed in the DAG although any program can be placed on OSD T&E oversight at any time.

3.8.3. OSD criteria for determining whether or not a program should be on formal T&E oversight includes:

- a. Acquisition category level
- b. Potential for becoming an acquisition program (such as an Advanced Concept Technology Demonstration project or pre-MDAP)
- c. Stage of development or production
- d. Whether program is subject to DAES reporting
- e. Congressional and DoD interest
- f. Programmatic risk (cost, schedule, performance)
- g. Past history of the developmental command with other programs
- h. Relationship with other systems as part of a system-of-systems
- i. Technical complexity of system

3.8.4. If there is a question pertaining to program oversight status, query DOT&E and/or reference the DAG. Chapter 8 in the DAG provides guidance on developing a test strategy, information on the different DoD and Service test agencies, test resources and ranges, and required documentation including detailed TEMP guidance. The DAG also describes roles and responsibilities of test personnel such as the CDT, KLP, and test organizations including the Integrated Test Team (ITT) and Lead Developmental Test and Evaluation Organization (LDTO).

### **3.9. Interagency Cooperation**

Many other agencies must be considered for ITTs and Working-level Integrated Product Teams (WIPT). It is important to understand where each office/agency is coming from and how their specific area of concern affects your test activities. Where you are in your program's life cycle can greatly change who cares about the test activities you are trying to accomplish at any given moment. Air Force Operational Test & Evaluation Center (AFOTEC) may not be involved in the early design of testing for a DT&E test plan; however, an office like Joint Interoperability Test Command (JITC) may be heavily involved depending on your system. Make sure you know all the players on the field.

## 4. AF T&E ORGANIZATION AND WORKFORCE

### 4.1. T&E Organizational Structure

While programs should strive to combine DT&E, LFT&E, and OT&E, much of it is organizationally separated. Figure 4.1 shows the decentralized nature of T&E organizations. It is our job as testers to facilitate a seamless transition from one stage of testing to the next in order to engender an integrated test continuum throughout the life cycle of the program.

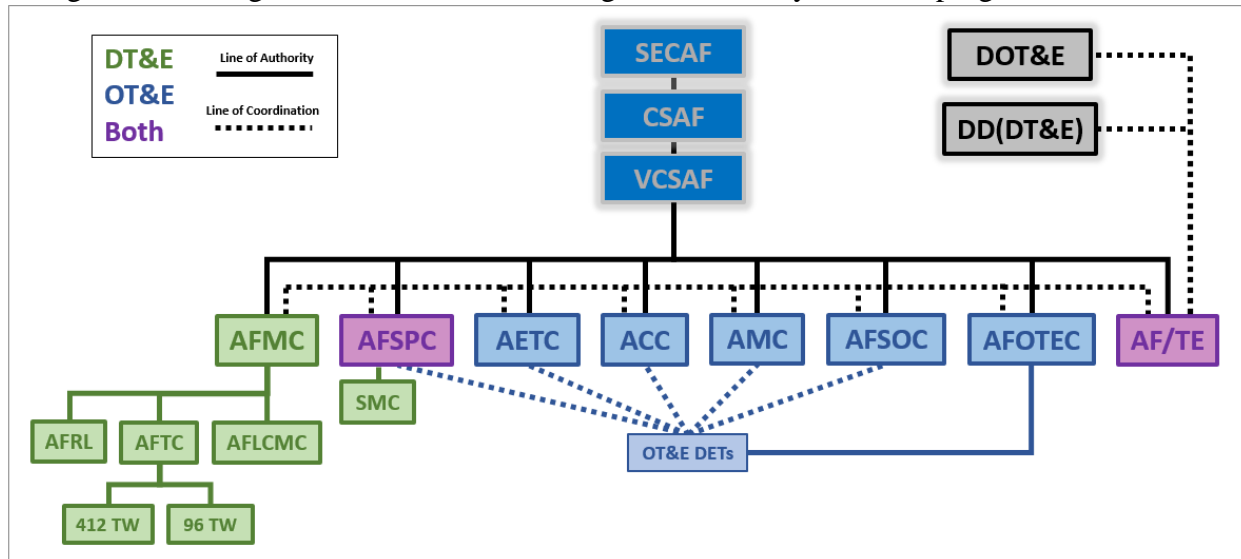


Figure 4.1 AF T&E Organization Structure

### 4.2. Developmental Test Units

4.2.1. Other than Space Systems, DT&E is primarily conducted by AFMC. In 2012, AFMC re-organized to consolidate Developmental Test under AFTC.

4.2.2. AFLCMC (acquisition arm) provides the construct for the management of all weapon systems from cradle to grave

4.2.3. AFSC executes all maintenance and supply chain activities.

- a. The Air Force Research Laboratory (AFRL) and Air Force Nuclear Weapons Center (AFNWC) have remained largely unaffected aside from a few minor internal efficiencies and realignments.
- b. Hybrid unit Big Safari conducts DT&E and OT&E in-house (primarily for C2ISR systems).

4.2.4. AFTC includes the 412 TW at Edwards AFB, Arnold Engineering Developmental Complex (AEDC), the 96 TW at Eglin and focuses on DT&E efforts across the enterprise. Units from AFTC make up a large portion of the LDTOs within the AF.

- a. 412th Test Wing: flight and ground test of aircraft, weapons systems, software, and M&S for the AF. The 412 TW is comprised of the 412 OG, 412 ENG and the Range Group.

- b. 96th Test Wing: DT&E AF weapons systems, air-launched weapons, C4I, guidance systems. The 96 TW is comprised of the 96 OG, 96 TG, SEEK EAGLE, and the Range Group.
- c. AEDC: 43 aerodynamic and propulsion wind tunnels, rocket and turbine engine test cells, space environmental chambers, arc heaters, ballistic ranges; comprised of the 704 TG and AEDC TG.

### **4.3. Operational Test Units**

4.3.1. AFOTEC is the USAF's Operational Test Agency (OTA). It is a Direct Reporting Unit (DRU) that reports directly to the CSAF to provide leadership and procedural guidance for OT&E. AFOTEC is broken up into the following five detachments to address specific mission areas:

4.3.2. Detachment 1 (Edwards AFB, CA). Lead agency for accomplishing IOT&E of the F-35 Lightning II for the Joint Operational Test Team (JOTT), Royal Air Force, Royal Australian Air Force, and the Royal Netherlands Air Force. Contact Information: (661) 275-2120.

4.3.3. Detachment 2 (Eglin AFB, FL). To evaluate operational system(s) mission capability, effectiveness, and suitability for Air Force and multiservice users by conducting impartial and realistic operational evaluations and assessments. Focuses on a broad range of assets spanning munitions to command and control. Contact Information: (850) 883-1089.

4.3.4. Detachment 4 (Peterson AFB, CO). Operationally tests space, missile, and missile defense capabilities in the battlespace environment for the warfighter. Contact Information: (719) 556-5850.

4.3.5. Detachment 5 (Edwards AFB, CA). Ensures warfighters and logisticians have the right tools for the job, permitting them to effectively and safely accomplish their mission. Focus areas: Bomber and UAV operational testing. Contact Information: (661) 277-3666.

4.3.6. Detachment 6 (Nellis AFB, NV). To plan and conduct realistic, objective, and impartial operational test and evaluation of fighter aircraft (including F-35 Block 4 IOT&E). Contact Information: (702) 652-4325.

4.3.7. AFOTEC is not the USAF's sole Operational Test Organization (OTO). MAJCOM test squadrons also conduct OT&E that is responsive to their respective MAJCOM priorities and mission needs. They retain strong OT&E culture at operational MAJCOM levels, offer lower cost and faster response times, and typically accomplish a greater total number of operational tests. Some examples of OTOs are:

- a. 53 WG at Eglin AFB, FL
- b. 505th Command and Control Wing, Hurlburt Field, FL
- c. 17 TS at Schriever AFB, CO (space test)
- d. 346 TS at Joint Base San Antonio-Lackland, TX cyber testing a broad range of systems



- e. 66 ABG at Hanscom, AFB does cyber test
- f. ANG –AFR ANG, AF Reserve Test Center at Tucson, AZ: AATC conducts operational test (OT) on behalf of each MAJCOM

#### 4.4. Test and Evaluation Workforce Development

4.4.1. Cross-Functional Authority (XFA). CSAF appointed AF/TE as the XFA for the Test and Evaluation Enterprise on 11 Oct 16. Per AFI 36-2640, Cross Functional Authority means: “Responsible for strategic oversight and force development advocacy related to the requirements of their occupational capability...”

- a. The designated XFA has valid force development requirements across various Air Force specialties.
- b. The XFA can generate, implement, and manage force development strategies.
- c. The XFA is NOT authorized to establish its own development teams or new career fields.

4.4.2. AF/TEP established an XFA working group to address management; i.e. tracking and utilization of the AF TE workforce.

4.4.3. Test and Evaluation Functional Authority for Acquisition Professional Development Program (APDP).

- a. AF/TEP will continue to serve as the Functional Authority for APDP T&E issues. If you do have an urgent APDP matter, please email the AF/TEP workflow [usaf.pentagon.af-te.mbx.af-tep-workflow@mail.mil](mailto:usaf.pentagon.af-te.mbx.af-tep-workflow@mail.mil) or call (703) 697-0252/DSN 227-0252.

### 5. TYPES OF TEST

#### 5.1. Test type overview

A program it will go through multiple types of testing but not all systems will follow the same path. Chapter 3 in AFI 99-103 provides an overview of the major types of testing (Table 1.1) so this guide will only address specific areas that need further clarification. Contact AF/TEP for specific guidance to get your programs through the T&E approval process.

Type of Testing	Description	References
Advanced Technology Demonstration (ATD) (Note 1)	Air Force Research Laboratory-funded, MAJCOM-sponsored development efforts that demonstrate the maturity and potential of advanced technologies for enhancing military operational capabilities.	AFI 61-101, <i>Management of Science and Technology</i>
Technical Assurance Standards Testing	Evaluates offensive cyberspace operations capabilities against technical assurance standards.	DoDI O-3600.03, <i>Technical Assurance Standard (TAS) for Computer Network Attack (CNA) Capabilities</i>
Electronic Warfare Integrated Reprogramming (EWIR)	Process intended to produce and deliver software/hardware changes to electronic equipment used to provide awareness and response capability within the EM spectrum. May require changes in TTP, equipment employment guidance, aircrew training and training devices (threat simulators and emitters). Provides guidance for test / fielding of mission data (MD) changes, OFP changes, or minor hardware changes that comply with the guidance in AFI 63-131 concerning modifications.	AFI 10-703, <i>Electronic Warfare (EW) Integrated Reprogramming</i>

Emission Security (EMSEC) Assessment	Assesses against the requirement to control the compromise of classified electronic emissions.	AFSSI 7700, <i>Emissions Security</i> , AFSSI 7702, <i>EMSEC Countermeasures Reviews</i>
Foreign Comparative Testing (FCT) (Note 1)	FCT is an OSD-sponsored program for T&E of foreign nations' systems, equipment, and technologies to determine their potential to satisfy validated United States operational requirements.	10 U.S.C. § 2350a(g) OSD Comparative Technology Office Handbook ( <a href="https://cto.acqcenter.com/">https://cto.acqcenter.com/</a> )
Joint Capability Technology Demonstrations (JCTD) (Note 1)	Exploits maturing technologies to solve important military problems and to concurrently develop the associated CONOPS to permit the technologies to be fully exploited. Emphasis is on tech assessment and integration rather than development.	DoDI 5000.02, <i>Operation of the Defense Acquisition System</i> AFI 63-101/20-101, <i>Integrated Life Cycle Management</i>
Joint Interoperability Test and Certification	Required certification for net-readiness prior to a system being placed into operation. Must be preceded by Air Force System Interoperability Testing (AFSIT), formal service-level testing to determine the degree to which AF systems which employ tactical data links conform to appropriate DoD MIL-STDs.	CJCSI 5123.01G, <i>Charter of the Joint Requirements Oversight Council (JROC)</i> DoDI 8330.01, <i>Interoperability of Information Technology (IT) and National Security Systems (NSS)</i>
Joint Test & Evaluation (JT&E) (Note 1)	Evaluates non-materiel capabilities and potential options for increasing joint military effectiveness. Focus is on evaluating current equipment, organizations, threats, and doctrine in realistic environments. JT&E projects are not acquisition programs.	DoDI 5010.41, <i>Joint Test and Evaluation (JT&amp;E) Program</i> AFI 99-106, <i>Joint Test and Evaluation Program</i>
Testing of Urgent Needs (Note 1)	Quick reaction capability for satisfying near-term urgent warfighter needs.	DoDI 5000.02, <i>Operation of the Defense Acquisition System</i>
Unified Capabilities (UC) Certification	Certifies interoperability and information assurance for Unified Capabilities (defined as integration of voice, video, and/or data services delivered ubiquitously across a secure and highly available network infrastructure, independent of technology). AFSPC appoints the Air Force UC test organization responsible for testing technologies meeting the definition.	DoDI 8100.04, <i>DoD Unified Capabilities</i> AFMAN 33-145, <i>Collaboration Services and Voice Systems Management</i>

**Table 5.1 Types of Testing**

Note 1. Activity falls outside the traditional acquisition process; however, Air Force testers may be required to support the activity by providing T&E expertise in assessing the military utility of new technologies.

## 5.2. Software Testing

5.2.1. DoDI 5000.02 page 10 calls out two models for software acquisitions and testing: Defense Unique Software Intensive Programs and Incrementally Deployed Software Intensive Programs. Agile Software Development (ASD) is another model seeing increased use in a growing number of software-intensive acquisition programs and is covered greater detail in Part III of this guide.

5.2.2. Defense Unique Software Intensive Programs focus on a standard software build and test cycle where multiple builds may be required to deliver a deployable capability (Figure 1.2).

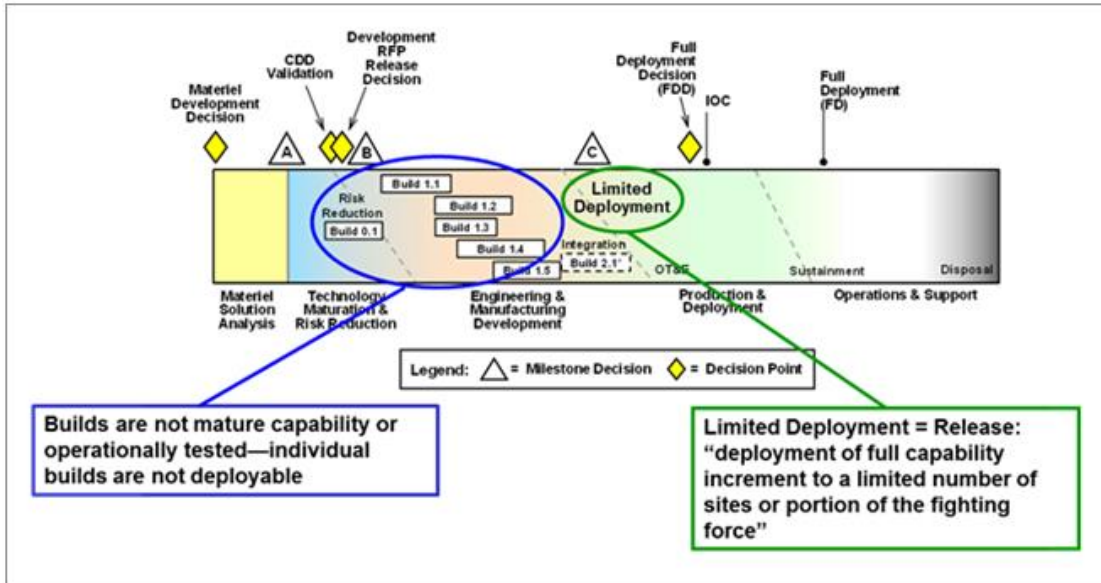


Figure 5.1 Unique Software Intensive Programs

- a. Incrementally deployed software intensive programs apply to upgrades to some command and control systems or weapons systems software where deployment of the full capability will occur in multiple increments as new capability is developed and delivered, nominally in one to two year cycles (Figure 1.3).

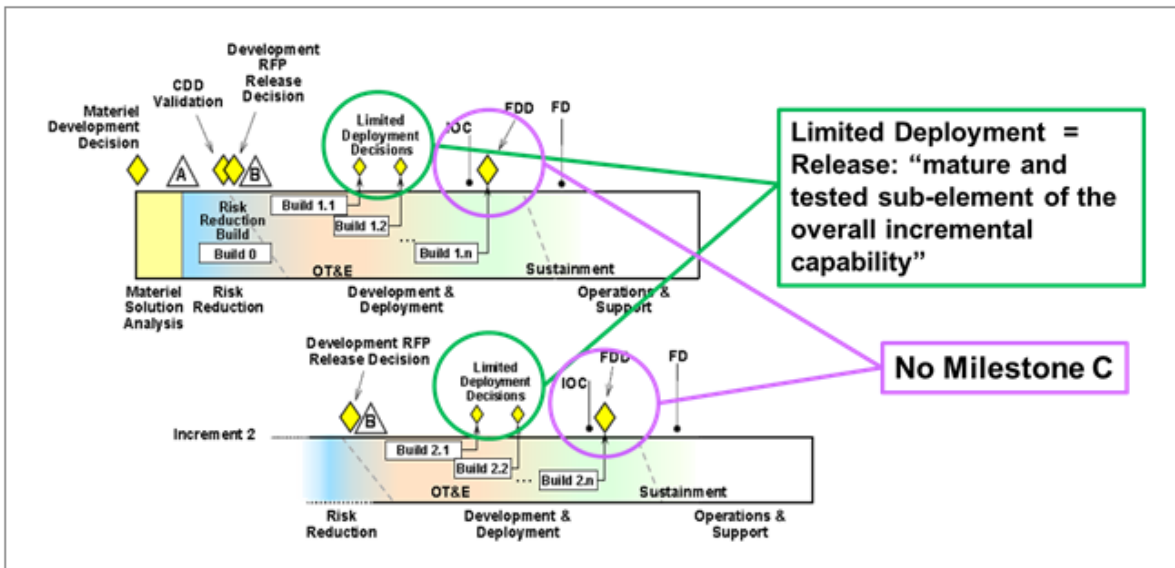


Figure 5.2 Incrementally Deployed Software Intensive Programs

**5.2.3. Software Nomenclature.** System acquisition is increasingly software-intensive allowing deployment of a series of “releases” within a formal acquisition increment. A distinct, tested, deployable software element of a militarily useful capability to the government are referred to as a “release.” A release may be a subset of a formal acquisition increment or the final product. Releases incorporate multiple “builds:” a version of software that meets a specified subset of the

requirements but is, in itself, not deployable. “Release” is the only acceptable term to describe the smallest field-able/deployable software element prior to a milestone increment in subsequent AF TEMPs, Operational Test Plans (OTPs), and test reports as well as updates to previous documents. Reference the glossary in Attachment 1 for additional information. ASD-specific terms are defined in Part III.

**5.2.4. Cybersecurity Test.** Cybersecurity test evaluates and characterizes systems and sub-systems operating in the cyberspace domain, and the access pathways of such systems. Cyberspace is defined as a domain characterized by the use of electronics and the electromagnetic spectrum to store, modify, and exchange data via networked systems and associated physical infrastructures. The primary objectives of cybersecurity test are to evaluate a system’s cybersecurity and cyber resilience to verify mission assurance. Different types of cybersecurity tests touchpoints are planned based on program schedule and development milestones (Figure 5.3). See AFI 99-103 for a more detailed definition of cybersecurity test as well as DoDI 5000.02 Enclosure 14, which address this area in-depth.

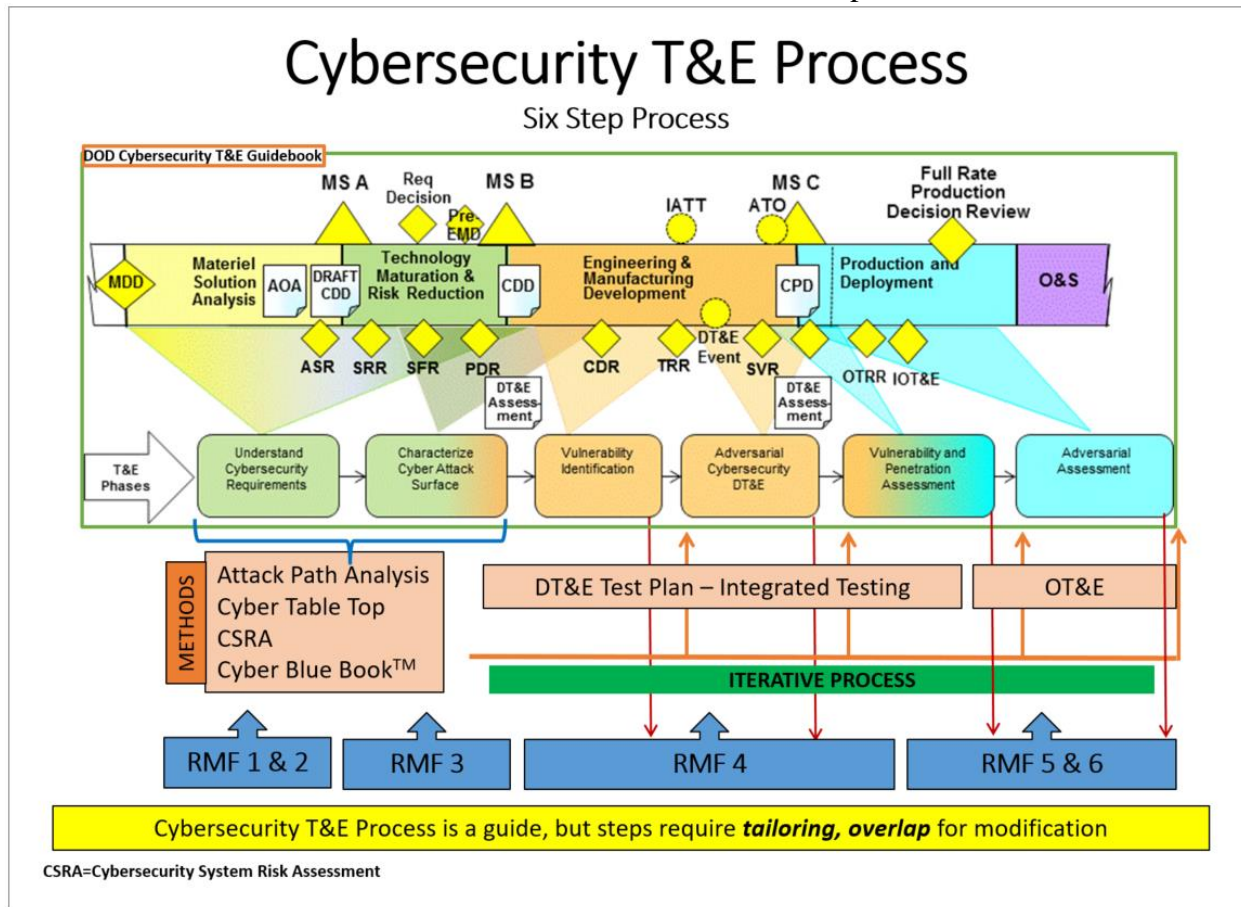


Figure 5.3 Cybersecurity T&E Process

**5.2.5. AF Cybersecurity Test Policy.** The latest update of AFI 99-103 defines cyber testing as a combination of cybersecurity testing and operational resiliency testing. Much of present TEMP content is focused on cybersecurity testing and certification. Testing of operational resiliency is largely encapsulated by “detect, react to, and restore from” cyber attacks or planning for mission

continuation in the event restoration is impossible or impractical. TEMPs should explain what will be accomplished for resiliency testing and the associated scope and should follow the process covered by the Joint Cyber Survivability Endorsement Implementation Guide (CSEIG). Explain program capabilities and limitations with regard to test. Create a classified annex if needed.

**5.2.6. Cybersecurity in TEMPs.** While the entire realm of “cyber” continues to evolve, make sure to address the following elements as part of a comprehensive test strategy during your planning and for your TEMPs:

- a. Define the cybersecurity strategy for the system under test.
  - What elements are being incorporated into the system’s design to ensure resiliency during a cyber attack?
  - What is your plan for managing supply chain threats, permanent and air gap connections, software development and updates, etc.?
- b. Based on the program strategy, identify the elements that require testing (verify and validate, or V&V).
  - How will the program V&V that the system under test is survivable in a cyber attack (or against classes of attacks)? This strategy must include formal DT (i.e., measureable, repeatable, etc.) and OT.
  - Include a plan for how the system will be characterized, what will be tested, when in the lifecycle, the resources required (i.e., where, using what, and whom), and the organizations that will perform the testing. Limitations/risks should also be identified alongside mitigation plans.
- c. Identify the cyber hygiene strategy for the weapon system.
  - How will cyber hygiene be verified/tested throughout the weapon system lifecycle?
  - Include the program plan for identifying vulnerabilities, incorporating RMF, performing penetration testing, and achieving an authority to operate (ATO) certification. This plan should identify the resources required (ranges, organizations, etc.)
- d. Cybersecurity Test Integration. Cybersecurity testing has become an integrated part of the test like every other subsystem (propulsion, avionics, weapons, e.g.). Cybersecurity test should be integrated throughout DT and OT, and executed in operationally representative cyberspace environments. All DT and OT documents and plans must be developed the system architecture and all potential attack surfaces (interfacing and embedded systems, services, and data exchanges that may expose the system to potential cyber threats) throughout all applicable domains. See Part III for more information regarding cybersecurity testing within an ASD framework.
- e. Cyber Survivability Endorsement (CSE). The Joint Staff developed the CSE process to improve cybersecurity requirements within development and test documents. The CSEIG helps sponsors articulate cyber survivability requirements with the appropriate detail based on the system under test’s software dependency, adversary threat tier, and impact of system compromise. For more information on the CSEIG, visit the Risk Management

Framework (RMF) Knowledge Service and request access using the following link:  
<https://rmfks.osd.mil/login.htm>.

## **PART II – TEST PROGRAM MANAGEMENT AND SCHEDULE**

### **6. TEST MANAGEMENT RESPONSIBILITIES**

#### **6.1. Roles and responsibilities**

Roles and responsibilities of key personnel and organizations are defined in AFI 99-103 Chapter 2. Two key positions, Chief Developmental Tester and Lead Government DT&E Organization (LDTO), need to be identified for each program. Please see AFI 99-103 para 4.5.4 for guidance on the Alternate LTDO option for non-oversight ACAT III programs. In addition, the Chief Developmental Tester (MDAP and MAIS) is identified as “ITT Chair” and the OTA/OTO is designated as “ITT Co-chair”.

#### **6.2. Deficiency Reporting**

Ensure the PM has established a database and a process for administering Deficiency Reports (DRs). Remember that using JDRS (or a waiver) is required per T.O. 00-35D-54. Establish who the participants will be and establish the process for prioritizing and resolving DRs.

#### **6.3. Test and Evaluation Master Plan**

6.3.1. TEMP coordination can be a difficult process if not accounted for early in the program’s lifecycle. For MDAPs, the start of the 90-day coordination cycle for signature begins once it is received by the Air Staff. The 90 days is split between Air Staff (45 days) and OSD (45 days). Air Staff consists of AF/TE and SAF/AQ. OSD consists of DD(DTE&P) and DOT&E. Programs that have navigated this timeline successfully have completed early coordination with AO’s from AF/TE, DOT&E and DD(DTE&P). Some programs not on oversight may not require the OSD review. Relevant issues should be understood and resolved before submitting for signature.

6.3.2. DODI 5000.02 requires a TEMP update for RFPs. RFP TEMPs must be signed by the PM, PEO, and CAE. Air Force guidance is that AF/TE will also sign RFP TEMPs that are on oversight. The coordination cycle for TEMPs at the Air Staff will also apply to RFP TEMPs (i.e. 45 days for Air Staff approval). For programs that enter post MS A, a MS A TEMP has not been accomplished. Therefore, an update of the TEMP for RFP release is effectively the MS A TEMP. Updates are required for significant changes to the test program. See AFI 99-103, para 5.15.

6.3.3. Rapid acquisition programs may not be subject to DODI 5000.02 requirements and this may have implications for TEMP (or equivalent document) timelines as well as content. Check with AF/TE for latest TEMP guidance regarding rapid acquisition programs. See para 8.1 for more information regarding implications for test regarding rapid acquisition programs.

6.3.4. Regardless of program type, useful TEMP references include:

- a. [AF/TE TEMP Guide](#)
- b. [Defense Acquisition Guidebook \(DAG\), Ch 8 - sample TEMP](#)
- c. [DOT&E TEMP Guidebook v3.1 \(Jan 2017\)](#)

6.3.5. Detailing test program resources and limitations is critical. This data is compiled by AF/TE to provide an aggregate resources and limitations picture across the AF test community.

This not only informs T&E resource decisions and budgeting, but also allows AF/TE to forecast future requirements that empower emerging test needs and associated ranges, assets, and manpower.

#### **6.4. Pre-MS A Tester Involvement**

6.4.1. This period of the acquisition cycle is of the greatest importance for the T&E professional. During this timeframe, you can set the foundation for timely, technically adequate testing to allow the Program Manager to make informed decisions for the program's future milestones (post MS B & EMD phase). All aspects of the program's testing must be thought of at least in a notional way, and can be better defined as the program matures (e.g. ITT membership, TEMP generation, LDTO & OTO identification, cyber test strategy, etc.). AFI 99-103 paragraphs 4.4, 4.5, 4.6 provide in-depth guidance for early tester activities.

6.4.2. MS A TEMP Requirements. The MS A TEMP should address major sections of the TEMP outline in the DAG, understandably with limited detail available at MS A. The MS A TEMP should include the following: an estimate and plan for required resources to support adequate T&E, all planned T&E for phase completion including test entrance and exit criteria, and a strategy and resources for cyber test and evaluation to name a few; refer to para 4.11.3 in 99-103 for a complete list.

#### **6.5. T&E Events Prior To MS B**

6.5.1. Keep tabs on T&E funding, secure appropriate Modeling and Simulation resources, and know the capabilities and limitations pertaining to contractors as the program progresses toward MS B.

6.5.2. T&E Funding. One of the largest concerns for the T&E professional leading up to milestone B is securing the funding streams and the contract vehicles to perform the bulk of upcoming testing. It is crucial that the CDT and T&E action officers work with both the PM and the program's contracting officer to ensure all applicable T&E resources (test articles, ranges, facilities and/or contractor support) have been accounted for, allowing seamless completion of the required program test activities.

6.5.3. Modeling and Simulation (M&S) in Support of T&E. Increasingly complex battlespace environments, cross-domain systems interdependencies and increasingly capable and dynamic threats drive the necessity for capable M&S. As the DOD relies more and more on M&S as a T&E force multiplier, the full scope of a program's life-cycle needs to be considered in order to maximize the cost benefits to the overall T&E outlay. Two great resources for M&S are the DoD Modeling and Simulation Coordination Office (MSCO) and the Air Force Agency for Modeling and Simulation (AFAMS). These two databases allow a tester to review M&S assets and applications to reduce duplication of existing technology and products.

- a. Joint Simulation Environment (JSE). JSE is a high fidelity, T&E focused, M&S initiative intended as an Air Force-focused next step in the development of that program with an eye to expansion of the JSE to include other 5th generation and beyond aircraft/systems and, in the long term, be expanded to include the multiple domains e.g. Space, Cyber, Land, etc. If approved to go forward, AF M&S and acquisition policy will need to be adjusted requiring acquisition programs to actively plan and resource for the use of JSE



as a development tool to include funding a high-fidelity model of their weapons system for use in JSE.

## **6.6. T&E Activities In Support Of Milestone C And Beyond**

6.6.1. Acquisition Strategy and Schedules need to be coordinated with the OTA/OTO; see AFMAN 63-119 Attachment 2.

6.6.2. Provide detail that ensures sufficient testing is planned before major milestone events.

6.6.3. Do not just include a program schedule. Provide verbiage that communicates how the schedule will be achievable: Reasonable T&E cycle times with sufficient slack for rework, analysis, reports. Where the program is accepting program risk, identify mitigations in place.

6.6.4. Phasing is reasonable: Key performance capability evaluated before MS C and is balanced relative to that after MS C.

## **6.7. Miscellaneous**

6.7.1. Despite having a designated lead command per AFPD 10-9, some ACAT III, non-OSD oversight programs support multiple users with differing requirements. The lead MAJCOM and AFOTEC will negotiate an OT&E involvement role, or coordinate with appropriate HQ MAJCOM T&E OPR for a multi-MAJCOM/AFOTEC test approach.

6.7.2. AFI 99-103 and DoDI 5000.02 address the limitations on contractors during operational testing with the one exception: Contractor personnel may only participate in OT&E of Air Force programs to the extent they are planned to be involved in the operation, maintenance, and other support of the system when deployed in combat. This delineation is important to consider during the last phases of DT when approaching an Operational Test Readiness Review (OTRR) to ensure that sufficient training of OT personnel has been properly accomplished. Under-trained OT personnel can drastically affect the OTO/OTAs assessment of the system under test.

6.7.3. Some programs may not be clearly “owned” by a MAJCOM or sponsor with an organic operational test function. In these cases, the program’s sponsor coordinates with AFOTEC to identify an appropriate OTO, with respective MAJCOM concurrence, to complete any required operational testing. If an appropriate OTO cannot be identified, the sponsor contacts AF/TE for guidance.

6.7.4. If the OTO and lead HQ MAJCOM T&E OPR jointly agree that no operational testing is necessary, the LDTO provides relevant DT&E data that supports the option to not conduct operational testing. The OTO reviews the LDTO’s work, assesses the risk of accepting that work, and documents their assessment with a Sufficiency of Test Report (SOTR). SOTRs can only be used for non-oversight programs of limited scope and complexity. Some clarification: the ITT recommends a SOTR when there is sufficient DT data to answer all test measures. The OTO confirms this through analysis and assesses this can support a fielding or production decision.

## **PART III – GUIDANCE UPDATES**

### **7. POLICY UPDATES AND CLARIFICATIONS**

This section highlights recent updates to formal guidance worth noting due to potential far-reaching effects across the acquisition and test enterprise. It also seeks to clarify policy prior to formal guidance updates.

#### **7.1. Project vs. Program**

As DoDI 5000.02 and AFI 63-101 point out, all acquisition programs are ACAT programs; there is no funding floor for ACAT III. In discussions with SAF/AQ, we agree that regardless of size or dollar value, if the acquisition adds or improves capability, it is a program, even if just a sustainment upgrade. This can be treated one of two ways: managed as a modification under an existing ACAT program or as its own (small) ACAT program. Science and technology (S&T) projects are managed IAW AFI 61-101, Management of Science and Technology. See paragraph 1.7.2 in AFI 99-103.

### **8. DEVELOPING GUIDANCE**

This section addresses urgent or emerging T&E subjects that may not fit into previous sections and/or will be incorporated into future policy. Certain topics may be so new that policy/direction has not caught up, yet warrant guidance updates in lieu of formal documents.

#### **8.1. Test in Rapid Prototyping/Rapid Fielding**

##### **8.1.1. Test in Rapid Prototyping/Rapid Fielding**

- a. This guidance applies to Middle-Tier Acquisition (MTA) rapid prototyping and rapid fielding activities using authorities provided by Section 804 of Public Law (P.L.) 114-92, as amended by Sections 849(a), 864(b), 897 and 1081 of P.L. 114-328. This guidance also applies to tailored DoDI 5000.02 programs. This guidance references both MTA and tailored DoDI 5000.02 programs as “rapid acquisition activities.” This guidance also applies to operational demonstrations or experiments supporting rapid acquisition activities.
- b. Rapid acquisition requires rapid learning. Test allows us to learn about the system, correct its faults, and develop it further. We must take an approach to test that allows it to keep pace with rapid acquisitions. This preserves the ability to effectively characterize a rapidly developing system and increases probability of success as the program approaches readiness for fielding or production.
- c. Rapid acquisition may necessitate taking greater technical or program risk, but not at the expense of safety. While a full characterization of the system considering all environmental factors may not be necessary or realistic; smart, mission-focused test tailored to the expected operational environment is required. The warfighter must be involved in the risk acceptance decision.
- d. Independence of test is a principle that ensures objective and unbiased test results. Testers can (and in many cases should) be embedded with rapid development teams, but they should develop test reports and be supervised independently of program management chains. Independence does not preclude participation by the program office or development team in test. Contractors and system developers are important partners in test and automated software tools can enable test efficiency.

- e. Operational effectiveness, system interoperability, safety, cybersecurity, maintainability, and other requirements are critical factors and should be evaluated by independent testers.
- f. Speed in system development is achieved by early tester involvement. Testers can aid the PM in developing a realistic test strategy and schedule as well as identify resources and easy design decisions that enable efficient test. Integrated test teams are a best practice to realize effective test planning, efficient test execution, and timely and relevant reporting.

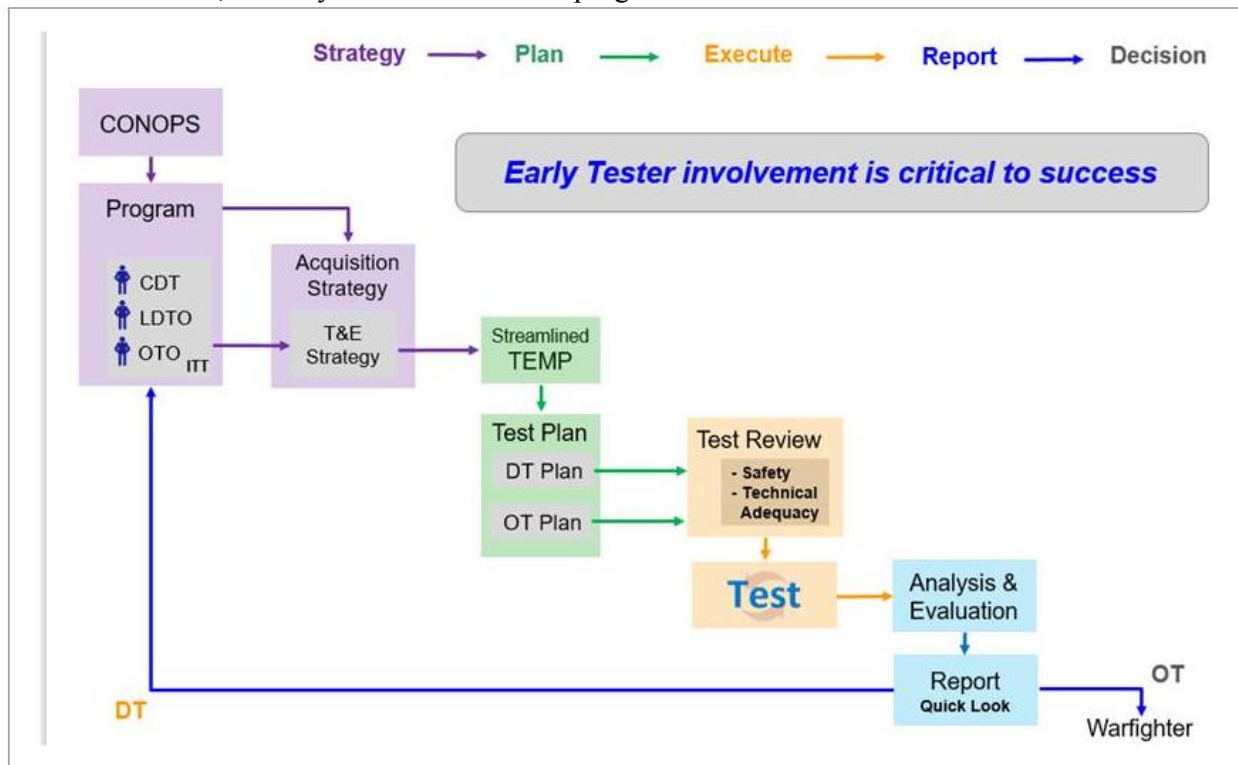
#### **8.1.2. Roles and Responsibilities**

- a. The Director, Air Force Test and Evaluation (AF/TE), as the senior Service official responsible for developmental and operational testing will:
  - Provide guidance, direction, and oversight for the formulation, review, and execution of T&E plans, policies, programs, and budgets.
  - Review and approve top-level test and evaluation plans to include schedule, tests, resources, i.e. the TEMP.
  - Review and prepare release of T&E reports outside the Air Force and ensure test results are available to decision makers in a timely manner.
  - Provide assessment of Sufficiency of Developmental Test Reports for DoDI 5000.02 programs to the DD(DT&E) or Service Acquisition Executive (SAE) as applicable.
- b. Program Executive Officer (PEO)/MDA will assist the PM and ITT in identifying key government DT&E organizations and personnel, to include LDTO candidates, CDTs, and TMs.
- c. The PM shall:
  - Prioritize early tester engagement.
  - Appoint a CDT or TM as applicable.
  - Assist the CDT/TM, LDTO and the OTO (or OTA) in forming an ITT.
  - Develop T&E strategy with early tester collaboration.
  - Request an appropriate LDTO and OTO.
- d. OTA or OTO will participate in preparation of strategies for T&E, plan and execute operational test in accordance with user-provided CONOPS.
- e. LDTO will:
  - Function as lead integrator for all DT&E activities.
  - Work with the CDT/TM to plan and conduct DT&E and oversee contractor developmental test.

#### **8.1.3. Test Elements**

- a. Rapid acquisition activities will include the following minimum items:
  - CONOPS
  - ITT
  - CDT or TM
  - LDTO
  - OTO

- Integrated Master Test Plan (Objectives, Schedule, Resources, Evaluation Frameworks)
  - Developmental Test Plan
  - Operational Test Plan
  - Test Review that considers adequate technical and safety review
  - Test Report
- b. Figure 8.1 illustrates relationship and flow between these test elements. Each item must be addressed, but may be tailored to each program's need.



**Figure 8.1 Essential Test Elements**

#### 8.1.4. Master Planning

- a. CONOPS.
- The CONOPS is the over-arching, high-level vision and architecture that describes the desired system capability or function. Expected system employment informs requirements to include operations, maintenance and logistics.
  - Lean design, agile methodology, and continuous development that permit requirements to emerge as part of the development process are acceptable, but there must be a common, clear understanding of how the user will actually employ the capability to guide development and permit Evaluation (the objective of T&E).
- b. T&E Strategy.
- The PM should map out the test and evaluation strategy at program initiation with test agency involvement. Early, realistic planning coordinated with developmental and operational testers will set the stage for efficient and effective testing that is aligned with the CONOPS.

- The T&E strategy should be mission focused and include an operationally realistic environment. This allows for early identification and correction of deficiencies based on operationally relevant data.
  - Early and frequent smaller-scale assessments enable rapid learning, allowing greater and earlier influence in system design. These should be small subsets of selected combinations of components, subsystems, environments, and scenarios. This ensures that critical configurations are tested and lowers the risk of unexpected system malfunctions near fielding or production decisions.
  - An integrated DT/OT approach will result in greater efficiency by maximizing resources and reducing the number of dedicated test periods. Early collaboration between the LDTO and OTO is key to ensuring a cohesive integrated test approach.
  - The T&E strategy should address safety, program requirements, technology maturity, interoperability requirements, required operator expertise, training, existing data, sustainment, and mission impact.
  - Prototyping and experimentation can reduce development risk. Digital engineering and modeling and simulation can fulfill some test requirements.
- c. Integrated Master Test Plan.
- The proposed T&E strategy and resources must be captured in a document to ensure all parties (testers, program office, AF/TE) are aware of the way-forward for test execution. A Master Test Plan describes the overall test objectives (“the why?”), the roles and responsibilities (“the who?”), the resources required (“the what?”), and the overall timeline for test (“the when?”). Timelines should clearly convey precedence of events as there will likely be uncertainty in the schedule driven by unknown factors.
    - Minimum requirements for this document are: Objectives, Schedule, Resources, Limitations, and Integrated Evaluation Framework. Live Fire Test and Evaluation (LFT&E) should also be described as required.
    - Alternate formats (including tailored traditional TEMP) should be considered. The objective is to provide minimum information necessary to understand the test strategy, schedule, and resources required to collect the data needed for the MDA to make a fielding or production decision.
  - Signature and coordination should be limited to those with a valid stake in the T&E plan. As an example for non-oversight programs, coordination should include the decision authority, PM, LDTO, and OTO as a minimum. For programs on OSD T&E oversight, the master test plan will be coordinated IAW the TEMP signature and coordination process in AFI 99-103.

#### **8.1.5. Test Design**

- a. Planned tests must assess system capability against user CONOPS in an operationally relevant environment as well as other requirements such as interoperability, cybersecurity, and sustainability.
- b. Testing should always be scoped to the minimum required to satisfy test objectives and inform decision-makers. This is true for all programs. In order to minimize test scope, test design must consider the relevant variables and factors (e.g. using Scientific Test and Analysis Techniques [STAT]) to determine the data needed. These factors will in turn generate necessary test measures and test events.

- c. Priority during DT must be given to requirements or capabilities that could impact system design. Test must find critical gaps early enough to facilitate timely and cost effective system design changes.
- d. Operational effectiveness and suitability (including Reliability, Accessibility, and Maintainability (RAM)) considerations will drive test requirements, to be recorded in the integrated master test plan.
- e. Operational environment or test resource constraints will drive test limitations, to be recorded in the integrated master test plan.

#### **8.1.6. Test Execution**

- a. Test execution must be disciplined, relevant, and timely. A good test plan provides the framework for test execution ensuring appropriate test points are accomplished to produce useful data. Early tester involvement (“moving test left”) is the best way to learn early and support rapid acquisition.
- b. Integration of developmental and operational test should be maximized to efficiently utilize resources and reduce overall test duration.
  - Mission-focused test opportunities during developmental test permits early operational assessment and feedback. Tests should be designed using proposed CONOPS as appropriate.
  - Provide shared data to support independent analysis, evaluation and reporting by all stakeholders.
- c. Independent technical adequacy review of the planned test.
  - Technical adequacy reviews of the test design and operational test readiness reviews are key to ensuring that tests are effective (i.e., the test will produce data to answer the test objectives).
  - The only failed test or failed experiment is the one that cannot answer the objective or hypothesis because of a flaw in the test or experimental design.
  - Systems failing during test is not a failure of test (unless it could have been tested earlier and was not).
- d. Independent safety review of the planned test.
  - Rapid learning supports rapid acquisition. “Failing fast” does not mean being reckless. Risk management and safety are paramount in test. Test agencies will assess safety risks to personnel and property and mitigate them appropriately.
  - Robust safety planning is based on risk awareness: the perception of uncertainty and the potential, projected outcomes resulting from uncertainty.
  - Early involvement enables adequate time for testers to build knowledge and understand the system under test in order to characterize uncertainty (safe test execution requires understanding system boundaries).
  - Proper test safety planning minimizes potential for program delays by identifying hazards and allowing for progress through mitigation efforts.

#### **8.1.7. Test Reporting**

- a. Test reports should be relevant, timely, factual, and concise.
  - Test organizations can support rapid learning cycles with “quick look” reports and other, innovative processes.
  - Test reports should be written to meet the decision maker’s needs.

- Test reporting and coordination should be tailored to minimize impact to production and fielding.

### **8.1.8. Systems Engineering**

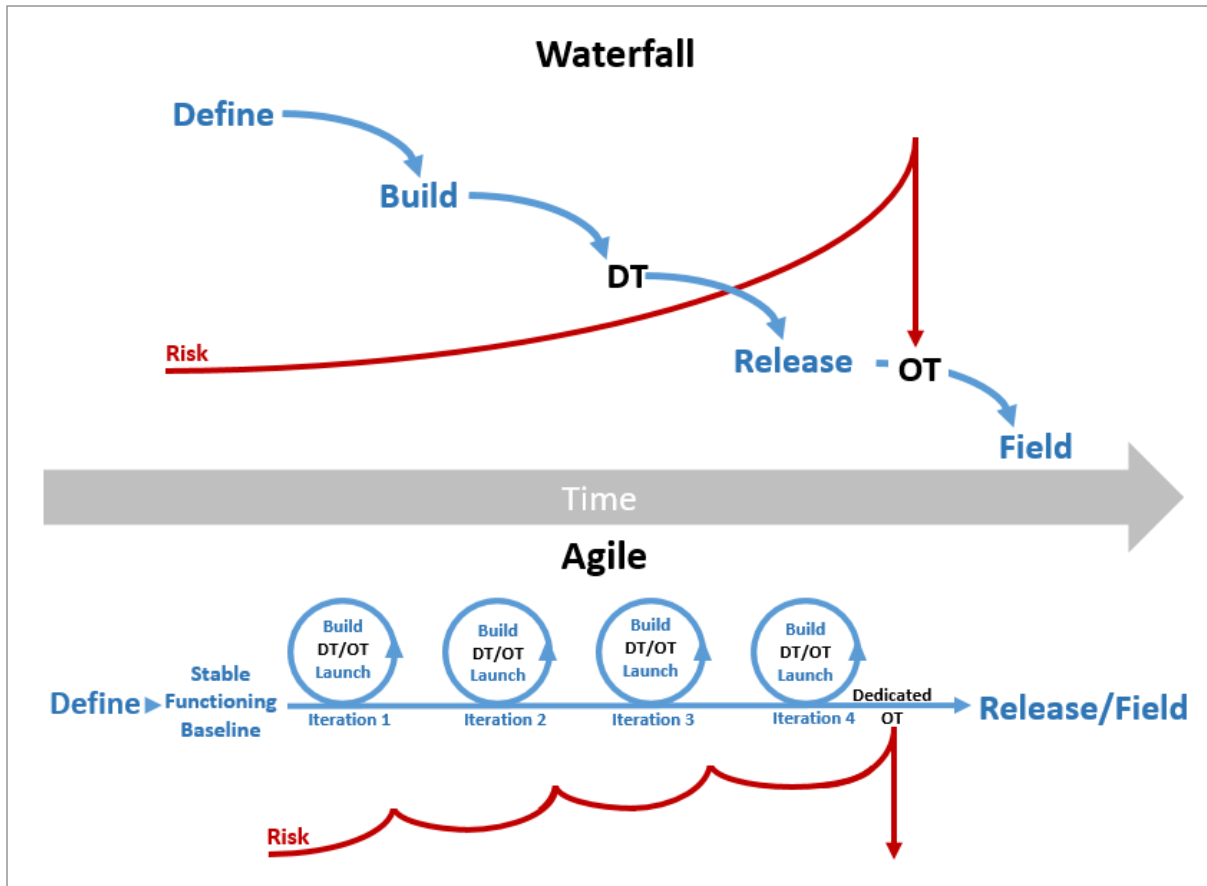
- a. Rapid acquisition programs require systems engineering. Time and resources dedicated up-front to system design and system engineering will result in smoother development and more effective and efficient test. A CONOPS-focused approach ensures system development supports desired capability or function. Understanding the mission helps define system functional, interoperability, and security requirements.
  - “Test-driven development” and “engineering-for-test” enable efficient test and rapid learning and ultimately support rapid development.
  - Systems engineering informs decomposition for subsystem test and integration for end-to-end, systems-level test.
- b. Complex systems require deliberate testing.
  - By definition, system-level behavior of complex systems is non-deterministic; test rigor is more important as complexity increases.
  - End-to-end, integrated testing in operationally representative environments is the best method to understand performance of complex systems. Programs can accelerate learning about complex system performance by conducting early mission-focused testing in relevant environments utilizing test strategies that examine the most stressing combinations or most likely use cases. This strategy can also expose potential operational issues early in the development cycle and reduce the likelihood of a costly and time-consuming delay towards the end of a program’s development.
  - Modeling and simulation and component-level testing assist in developing answers for complex systems. While limited in their ability to provide the full complex system performance answer, they can provide answers for cases not testable any other full end-to-end testing. The test strategy must include proper resourcing and schedule consideration for modeling and simulation validation and accreditation activities.

8.1.9. AF/TEP will assist program offices in bringing in the developmental and operational testers early onto a program so that the program can plan, fund, and execute the most efficient, capability-based, operationally relevant testing possible.

## **8.2. Agile Software Development Test**

8.2.1. Agile Software Development Program Overview. Agile Software Development (ASD) is an iterative and incremental approach performed in a highly collaborative manner. ASD is characterized by early and continuous cross-functional/stakeholder involvement and is responsive to requirements that may change in priority throughout the system’s development. ASD produces successive usable software releases that build upon previous releases though successive development cycles (AFI 99-103 derives its definition of “release” from the 9 June 2015 Software Engineering Institute Technical Memorandum, which describes it as “a distinct, tested, deployable software element of a militarily useful capability to the government. A release is an increment (version) of the system/software that is transferred from one organization to another.” Unlike the tradition waterfall approach to software development, key attributes of ASD are “velocity” and “cadence” that address risk throughout the software’s development and

sustainment (see Figure 8.1). For more information regarding general ASD concepts reference <https://www.agilealliance.org/agile101/>.



**Figure 8.2 Waterfall vs. Agile Software Development Risk Profiles**

8.2.2. In the scope of Air Force acquisition and test, basic ASD principles include:

- a. Cross-functional teams: Collaborative teams composed of, at minimum, the product owner, system users, software developers and testers.
- b. Decomposable and flexible requirements: Programmatic requirements must be deconstructed into smaller, more specific elements (or “user stories”) that allow themselves to be sorted into appropriate development cycles (backlogs). These requirements may be re-prioritized based on evolving mission needs.
- c. Defined “Done” for a specific capability or functionality and Minimum Viable Product (MVP) for release: Cross-functional teams must define MVP and “Done,” or project-specific analogous terms. Testers must be on the same page with the developers when developing their test plans.
- d. Fixed cadence for releases: A fixed cadence/schedule enables more effective integration of independent test resources, particularly with respect to high demand, low density assets such as cyber red teams and actual operational users. Schedules also determine



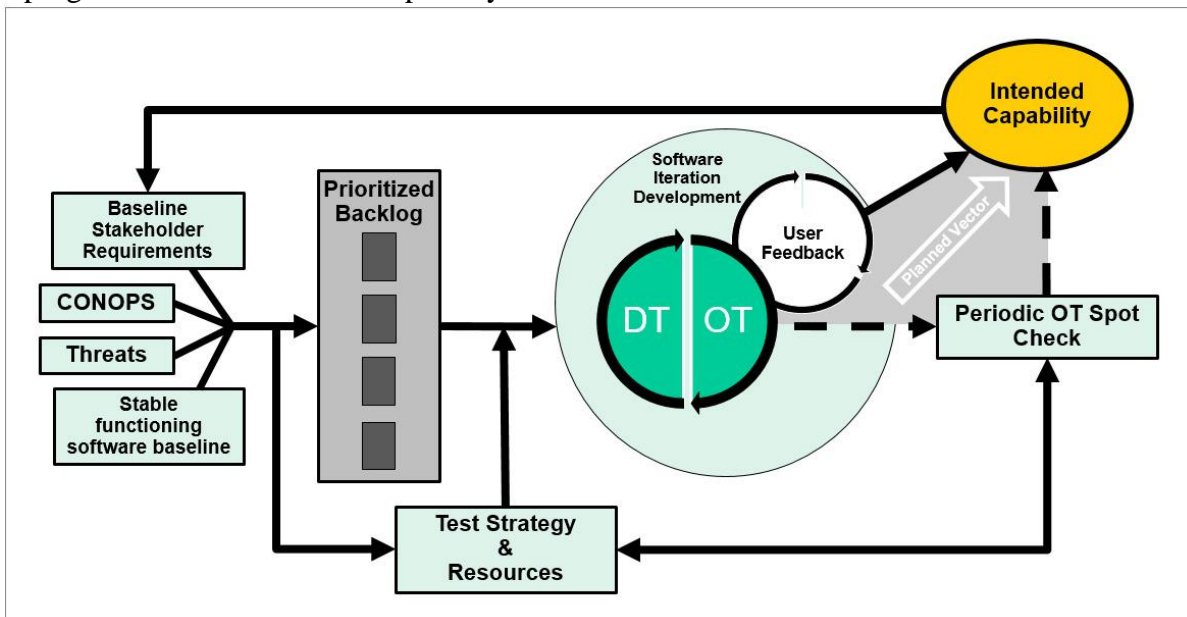
how projects and teams will be composed to support near- and longer-term releases. Fixed cadence is key to keeping risk from accruing.

- e. Contract type and structure that supports ASD: ASD (and its integrated test process) cannot succeed if the acquisition program is not oriented to collaboratively producing, testing, and releasing rapid software iterations. Early PM and cross-functional team coordination is essential to structuring the program to enable ASD.

### 8.2.3. Key ASD enablers are:

- a. **Stable Functioning Baseline System:** An established initial software build or platform that provides a stable foundation enabling consecutive software iterations. A systems engineering approach to ASD is key to a stable functioning baseline, which in turn enables successful iterations that lead to an effective MVP.
- b. **Modular Software Architecture:** This type of architecture separates software program functionality into independent modules; each contains everything necessary to execute only one aspect of desired functionality and allows modifications that do not impact other areas or functions of the system.
- c. **Automated Test:** To ensure working releases, automated testing must be accomplished to check operational functionality, integration, and regression testing. Automated test enables increased test rigor throughout the release cycle if properly designed. Automation does not replace the need for OT involving typical users. However, automated testing may reduce the OT scope and risk. Automated tools may need to be modified to account for system changes as development progresses and complexity increases.

8.2.4. ASD Test Overview. Ideally, ASD test is highly integrated into the development and release cycle. It informs early, often, and combines with user feedback to not only inform stakeholders but also help evolve requirements that drive future software iteration cycles (Figure 8.2). Test must be adaptive while providing sufficient safeguards to manage risk while ensuring the program achieves intended capability.



### Figure 8.3 Test Relationship in ASD

8.2.5. ASD Test Responsibility. Test obligation does not change for ASD programs but interaction does. ASD test fosters rapid delivery of quality software to the warfighter without accepting unreasonable risk. However, it does not purely grade capability at the end of the development phase but informs its development. ASD test responsibility hinges on appropriate level of independence, effective test execution and adequacy of reporting.

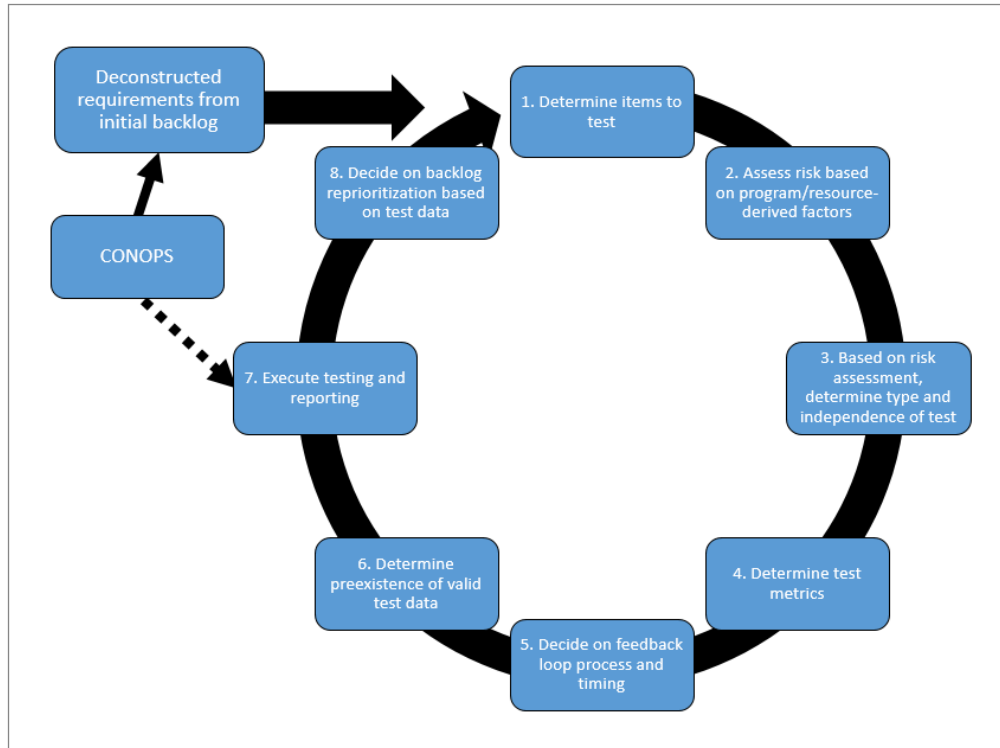
- a. Independence. While integrated (and tailored) DT/OT is a key aspect of USAF ASD programs, testers should remain organizationally independent from developers and the program office. The Test Strategy should define the degree of test independence required, the test type, and level of rigor required based on the system's developmental stage. The level of tester independence will be determined by the test approach risk assessment. Programs with lower risk may allow for increased levels of internally-executed test, while higher levels of risk (e.g. interacting with mission/safety critical external systems or databases) should drive increased tester independence. NOTE: Well-coordinated and objective DT is the bedrock for seamless OT integration in ASD; therefore, PEOs must still designate a Lead Developmental Test and Evaluation Organization (LDTO) or obtain a waiver IAW AFI 99-103.
- b. Test Strategy & Planning. Effective test starts with collaboration of the cross-functional team to determine test strategy and scope that is compatible with ASD, i.e. an initial roadmap meeting. DT and OT testers must be active participants in program contract writing from the very beginning to establish, at a minimum, initial test resource commitments from the contractor and government. Test must also be represented in software release planning meetings to determine test cadence based on a fixed release schedule. Testers must determine level of test rigor within the release and its iterative cycles based on assessed risk.
  - Determine Traceability of deconstructed requirements in every software iteration backlog to original CONOPS and program requirements set forth by program stakeholders. Recommend breaking requirements down to epics and features to obtain true traceability.
  - Identify critical areas to test not captured in software developer's test-driven design process. Although proactive test planning should minimize this possibility, ASD pacing and fluidity could result in unguided, undocumented exploratory test. The fluid nature of ASD highlights a need to continuously capture the test cases and outcomes, compare those against current and subsequent releases, and continually re-evaluate developmental risk and priority for test objectives.
  - Determine DT and OT weight of effort to best match resources according to the assessed risk of the functional code being developed.
  - Determine DT/OT integration and balance to best match resources according to the assessed risk of code being developed per release cycle. Regarding cybersecurity testing, factor in when spot checks (to establish or continue "certification" of an automated security scanning pipeline) should occur, and verify the results are being addressed along with a periodic penetration-like tests.
  - Determine level of contractor testing and their resources to conduct test. The developer may be involved in the conduct of the OT&E if they will operate,

maintain, or support the deployed system. An Operational Test Agency (OTA) or organization will determine if the developer has the expertise and operationally-representative environments to collect valid test data. Furthermore, determine whether developers can effectively test if government data/environment restrictions are in place.

- Determine test frequency, particularly when defining periodic independent testing and risk thresholds (edges of the envelope) that require independent “looks.” It is important to balance frequency (and its resulting impact on resources) with the ability to inform development.
- c. Test reporting adequacy. Reporting requirements must keep pace with ASD development and T&E. Testers, together with PMs, should assess the frequency and types of reports the preserve program “agility” as much as practical without creating program health blind spots. See Paragraph 8.2.7 for more information.

8.2.6. Test Approaches. Risk analysis conducted during the early stages of the program’s life cycle (and subsequent development/test planning meetings) will drive test approach selection. Test approaches are tailorable based on program needs, flexible based on software system progress, adaptive to iterations produced by developmental cycles, and should anticipate the requirements for external test resources. The options presented in this guide are not an inclusive list of all the possibilities available but provide good starting points for executing ASD test.

- a. Test must build an adaptive plan that captures what, when, and how to test during the program’s software development road map.
- Start with the bigger picture. Overall CONOPS and program requirements are deconstructed and prioritized across the software release plan. Test resources and limitations should be identified and accounted for as much as possible.
  - Using this data, cross-functional teams collaborate on further refining the software release plan and schedule. Test involvement during release planning provides a solid foundation for synchronizing test that supports the release, providing a better framework for lining up applicable test resources.
  - Using the release plan road map, cross-functional teams determine such things as software iteration timing, team collaboration details, and feedback mechanisms linking sequential software development iterations that build up to a release.
  - Testers work with the rest of their cross-functional team to optimize test during each software development iteration that maintains release velocity but also characterizes software and informs decision makers appropriately. Figure 3 illustrates the recommended flow of events within a software development iteration.



**Figure 8.4 Software Iteration Test-Driven Events**

- b. Risk Analysis (Figure 8.3, Step 2). Multiple factors must still be considered to include system complexity (to include number of subsystems) and resulting integration aspects, impact on external/unrelated systems, impact on mission critical and/or safety aspects, and enabled capabilities. Additionally, consider the evolving scope and complexity of the work being fielded. For example, an MVP may be relatively simple but eventually grows more complex. As system complexity increases, the risk of adverse system interactions increases requiring more detailed systems theoretic process analysis. Furthermore, test planners must know capabilities and limitations of internal and external test resources, to include scheduling independent testers and security issues spanning both systems and personnel.
- c. Independent DT and OT (Figure 8.3, Steps 3 and 5). Embedding independent testers is the preferred method when synchronizing test with ASD. Testers are integrated with the development team and user, providing continuous feedback and diminishing the risk that serious issues will not be discovered before they require extensive rework. DT and OT tester independence must be assessed after weighing available resources against acceptable levels of overall risk. See paragraph 1.3.1. for additional details regarding test independence.
- d. Execute DT or OT based on defined thresholds (Figure 8.3, Step 7). If resource constraints do not allow for a continuous independent integrated DT/OT, selectively choose which type of test best fits each release cycle or proposed transition to the warfighter (see Paragraph 8.2.8.). These selections should consider overall risk to the iteration, release, or program as a whole.

- e. Periodic OT. Depending on system capability or software function being released, test planners should consider when to sequence a periodic end-to-end, high-volume capacity test. The frequency of these events should be determined based on required confidence in the program and assess the appropriate level of interoperability and cybersecurity testing (this is particularly critical if these system attributes were not as rigorously tested during the embedded DT/OT process). End-to-end high-volume capacity testing in an operationally-representative environment becomes increasingly critical as system complexity increases as the likelihood of unexpected system interactions increases with complexity.
- f. Certification. Certification of the automated test environment (e.g. test tools and/or simulations) is part of all test approaches. Automated tests enable rapid agile development, but should be certified by independent developmental and operational testers. Certification should take into account the risk assessment. Higher levels of risk should result in an increased level of independent monitoring of the certified automated testing process. Certification should be updated as the automated test environment is changed.
- g. Automated vs. manual test. Assess the amount of automated vs. manual testing. Heavy reliance on automated test increases the likelihood of quality, viable code resulting from each iteration. For example, test-driven development is a software engineering technique that involves writing the test code first that the functional code must pass. Manual testing can be minimized by a well-developed automated test plan. However, any use cases not considered in the automated test plan will not be explored, thus manual testing can lead to potential discoveries.
- h. Additional considerations:
  - Backlog items may be reprioritized based on previous iteration performance (informed by test) or changing warfighter needs (Figure 8.3, Step 8). Testers must plan for this, anticipate it as early as possible, and readily communicate with the product owner in order to realign test resources for subsequent, reprioritized iterations/releases.
  - ASD depends on considering and planning cybersecurity testing from the very beginning of a development cycle. However, testers should carefully assess when to bring in cybersecurity cooperative vulnerability and adversarial assessment teams as these resources will likely require advanced scheduling. Fixed release schedules greatly aid in forecasting the need for these resources.

8.2.7. Documentation. Tailored test documentation must be able to keep up with the ASD process while still capturing a valid program health snapshot for stakeholders. While planning the test approach itself, testers should establish the type and pace the frequency of reports to match software development/release cycles. Minimum documentation should capturing relevant data quickly to enable subsequent software iterations.

- a. TEMP. At a minimum (and depending on level of oversight and program complexity), an ASD TEMP or equivalent should focus on four major areas: overall tailored test strategy, resources, schedule, and limitations. The strategy portion includes the planned release schedule, how releases are structured with regard to test, resulting risk-based test approach, and defined program safeguards that keep the software system on target to meet requirements. Describe the pipeline from developer to released product. Specific

test events and correlating test measures may be captured in TEMP annexes. This strategy would allow aggregating test results to fulfill “dedicated OT” (IOT&E) requirements.

- b. CONOPS. CONOPS should be established at program initiation and be promulgated to the program office, developer, and testers to design the program’s test strategy.
- c. Operational Test Plan. The Operational test Plan (OTP) or Master Test Plan (MTP) is a vehicle for increment and release test plans. The tailored OTP provides the overarching approach derived from the TEMP and provides the framework for keeping test at pace with the ASD velocity. The OTP should guide test event planning and determine periodic outside looks informed by evolving software system capabilities. The OTP enables independent operational testers to formulate an adequate plan by supplying specific anticipated release capabilities, release features and a basic understanding of mission operations. A test matrix (Figure 8.4) is a useful tool in tracking testing against requirements across multiple software development cycles.

<b>Test #1</b>					
<b>Test #2</b>					
<b>Test #3</b>					
<b>Test #4</b>					
<b>Test #5</b>					
	<b>COI #1</b>	<b>COI #2</b>	<b>COI #3</b>	<b>COI #4</b>	<b>COI #5</b>

**Figure 8.5 ASD Test Matrix**

- d. Metrics. Metrics should be developed by the cross-functional team to accurately indicate program progress as well as gauge test effectiveness (Figure 3, Step 4). Metrics answer whether test is doing what it needs to be in order to ultimately delivery products that work. Test, through effective metrics, should support the agile process while validating the quality of automated testing (i.e., the amount of coding errors caught through test). Other things metrics can capture are (but not limited to) defect density, amount of code covered by test, mean time to recover/repair, and velocity of releases.
- e. Reporting. Reporting should be tailored to provide an accurate and relevant program assessment while avoiding undue delays to the ASD process. Keep statutory vs. regulatory reporting requirements in mind while developing the test and reporting approach. Reporting can take on many different forms but should be established early during test planning in order to posture the SPO, ITT and cross-functional teams for

timely testing, feedback, and backlog reprioritization. Determine the questions needing answered or decisions the report will inform, and write it accordingly.

- Automated reporting. Automated testing can generate a large amount of data that may exceed test community's capability to analyze in a timely fashion. However, some test tools can produce summary reports that can be tailored to support the test's community analysis process. Test strategy should account for what automated reporting should focus on and, if analysis resources are limited, which key data indicators trip program/follow-on test decisions. Automated testing and reporting should be built in from the very beginning.
- Quick-look reports. Quick-look reporting should take into account how quickly the feedback from one software iteration makes it into the next (or subsequent) iteration. If quick-look reports are to be used, the time it takes for resulting feedback to affect subsequent backlogs needs to be accounted for in the MTP. Since software iterations/releases manifest in continually evolving software capabilities, quick-look reports should list capabilities, limitations, and risks.
- Aggregate test data. Aggregated test data, whether resulting from automated or manual testing, must meet or exceed predetermined criteria before informing an IOT&E or equivalent report.

8.2.8. Limitations. The relative newness to the USAF -- and inherent speed/flexibility -- of ASD presents challenges to the T&E community. Workforce expertise, capacity, representative test environments, and security clearances are limitations that must be factored in when planning and executing ASD testing. Limiting factors discovered during proactive test planning should fuel resource requests by the project team.

- a. Workforce expertise. Currently the USAF T&E workforce is structured to support traditional acquisition testing. Test organizations supporting ASD programs should educate their testers on ASD concepts and coordinate closely with developers to tailor their training to the program's selected ASD technique. ASD involves heavy user involvement so leverage user capability and knowledge when considering their role in test.
- b. Workforce capacity. The USAF T&E workforce is structured toward traditional acquisition workload demands. However, ASD demands a higher amount of continuous tester involvement throughout vs. near the end of the program's development. T&E organizations may be tasked to persistently support multiple ASD programs and test planners must research availability and schedule appropriately, particularly if it involves high-demand, low-density capabilities (e.g., cyber red teams). This may be a key driver when assessing risk. Furthermore, determine the balance of contractor vs. government test responsibility and capacity to inform the program's test strategy.
  - Local vs. remote testing. As mentioned previously in this section, test planners must ascertain whether testers must be physically present (or how often) or if testing can be accomplished remotely. If the former is the case, funding and other bed down issues will have to be resolved, particularly if the test facility is not located on/near a DOD installation. If the latter is selected, planners must ensure remote access to the program's software platform is possible. Additionally, inherent latency issues must be analyzed to determine their effect on testing.

- Security. Test planners face the potential of testing software on a variety of systems across escalating classification enclaves. Therefore, data access or transfer limitations between different platform enclaves, as well as security clearance disparities between developers, testers and users must be taken into account. Formal data management planning and documentation is helpful in resolving security, network and personnel access and availability issues.
- c. Representative environments/ranges. Determine the requirements for environments and/or platforms to be operationally representative. This facilitates more comprehensive automated testing and enables valid/adequate OT to be integrated right from the start. Cloud environments or multiple software integration labs (SILs) prevent progress bottlenecks as one can be used for development while the other can be leveraged for training. Be aware that multiple SILs can also add complexity if they are not baselined. Collocated SILs are best, but if not possible then research connectivity issues to be resolved prior to software development commencement. Furthermore, if external ranges are involved, determine their capabilities and limitations as well (which may include latency limitations). Keep tester access in mind while planning supporting ranges or other test environments.
- d. Synchronization and interoperability. ASD does not happen in a vacuum; consider development pacing for any subprograms that make up the greater system. Where are the integration points? Awareness that system risk and vulnerabilities increase with system complexity is critical. When and how often can interoperability and cybersecurity be tested? How will these impact overall, end-to-end test? Will everything be ready on time? Can subprogram iterations be aligned to allow consolidated test? How early can operational users be integrated into the process? Answering these questions will determine the availability of test resources, especially external ones that are shared with other defense acquisition programs.

### **8.3. Test Support to Experimentation**

8.3.1. Experimentation is currently not addressed in AFI 99-103 but warrants discussion as there is potential for its use during program development. The likelihood of experimentation under the auspices of test is increased by a DOD-wide push to accelerate defense acquisition. There are differences between experimentation and test, but also similarities; in fact, there is a close connection between the two. First let us review their definitions:

8.3.2. Test - A procedure intended to establish the quality, performance, or reliability of something, especially before it is taken into widespread use (Random House, 2018).

- a. An African Swallow development program is designing toward a validated requirement of an unrefueled, medium-altitude, still-air range of 1,000 nautical miles carrying one coconut. A test characterizes the swallow's true capability as 998 miles, informing the warfighter acceptance decision.

8.3.3. Experiment - A scientific procedure undertaken to make a discovery, test a hypothesis, or demonstrate a known fact (Random House, 2018).

- a. An experiment will determine whether a remote control receiver integrated with the Swallow will allow in-transit commands to avoid unforeseen threats along the flight path. This experiment will validate a hypothesis and possibly result in a new CONOPS.



8.3.4. For additional context, AFI 99-103 defines T&E as “The act of generating empirical data during the research, development or sustainment of systems, and the creation of information through analysis that is useful to technical personnel and decision makers for reducing design and acquisition risks. The process by which systems are measured against requirements and specifications, and the results analyzed so as to gauge progress and provide feedback.” T&E should be tailored based on program and/or system complexity.

8.3.5. Experiments (does A cause B?) generally focus on the search for solutions to address capability gaps, whereas tests seek to characterize the relationship of said solution to a defined requirement. In other words, experimentation shapes the development of a system CONOPS while test informs how well the system will perform with regard to established CONOPS. The interconnectivity of experiment and test can be illustrated by viewing an experiment as a systematic sequence of individual test events to examine a causal relationship (test a hypothesis), while a test quantifies an attribute. Furthermore, experimentation is a trial-and-error process that results in an approach to solve a problem. Test informs how well the approach works.

- a. Demonstrations show how a process or system works and is neither an experiment nor a test. Demonstrations assume the process or system works based on previous experimentation and testing results.

8.3.6. The International Test and Evaluation Association (ITEA) identifies four validity requirements for rigorous experiments:

- a. Ability to employ the new capability
- b. Ability to detect change
- c. Ability to isolate the reason for change
- d. Ability to relate results to real operations

These requirements are applicable to T&E and must be considered as the PMO and ITT craft their overall strategy. Other overlapping characteristics between experimentation and test include:

- a. Apply a methodology. Whether using the scientific method to explore a hypothesis through experimentation or following a test plan to characterize a SUT, a clearly stated methodology identifies guardrails as well as practices in order to effectively achieve results.
- b. Set clear objectives. Clear objectives allow individuals and organizations to understand the reason behind the experiment or test, keep energy and resources on task, when to terminate efforts, and context for interpreting the results.
- c. Plan to meet objectives. A clear plan follows pre-established methodology in order to achieve predetermined objectives. Everyone involved with the experiment or test should understand how the activity should be conducted, what the limitations and risks are, and when the effort should terminate. This is key to preventing unduly risky practices and also keeps efforts focused on achieving the aim behind the experiment or test.
- d. Execute per the plan. Once the plan is understood by all involved it must be faithfully executed in order to mitigate any risks to personnel, assets, and other involved resources. Conduct all pertinent reviews to preclude safety violations. Additionally, following the

plan allows a systematic assessment of the results and allows for valid changes to the plan, if required.

- e. Report results. Accurate reporting allows effective assessment of a hypothesis or characterization of a system or capability. This will in turn either validates said hypothesis or capability, or results in 1) subsequent experiment that zeroes in on a CONOPS or 2) feedback resulting in system fixes or increased warfighter understanding.

8.3.7. A key difference between experimentation and test centers on the amount of coordination required prior to the event and the subsequent review process. Experiment plans are typically reviewed internal to an organization before proceeding. Conversely, DT/OT involves more detailed test protocols to properly characterize the SUT, and deviations may require extensive coordination with both internal and external agencies depending on test program complexity and oversight. The level of reporting after an event typically follows suit with the amount of coordination done prior. Whereas experiment feedback can stay within the organization to inform a subsequent experiment, test results can be used to inform stakeholders spanning the individual service to DOT&E.

8.3.8. Another key distinction between test and experimentation lies in their relation to a system's performance envelope. Experimentation's purpose is to discover the boundaries of said envelope, so uncertainty expands beyond pure system performance to encompass safety to a higher degree than test. Test normally occurs within predetermined safety boundaries (boundaries are avoided versus probed); while safety is still accounted for, the performance realm where test occurs should see less risk on the safety aspect while system performance is characterized.

8.3.9. Test organizations involved with experimental efforts will apply the same level of planning and execution rigor as if conducting official test activities. Test organizations will follow AFI 99-103 when planning and executing experiments. Specifically, DT and OT organizations will conduct technical, environmental and safety reviews IAW paragraph 5.21.

- a. Testers involved with experiments will not eschew regulations and other guidelines already in place to prevent mishaps. For example, aircrew responsible for conducting airborne experimentation will continue to adhere to established operational risk management (ORM) procedures. If none are established, an ORM process will be created and vetted by the local safety office prior to initiation of any experimental activities.
- b. Test organizations, whether overseeing, advising, or directly involved with experimentation, will ensure all participating units adhere to [AFI 91-202, The US Air Force Mishap Prevention Program](#) and [AFI 91-203, Air Force Consolidated Occupational Safety](#) when formulating and conducting experimental activities.

8.3.10. DT and OT organizations will assess the nature of the potential experiment's failure to determine the risk of injury or death to personnel as well as property damage. Testers will adhere to standards prescribed by test and safety regulations, and the LDTO and participating test organization (PTO) will hold all experiment co-participants to the same standards. Although the goals of experimentation may differ from test, the approach to reaching those goals does not.

#### **8.4. Directed Energy Weapons (DEW) Testing.**

8.4.1. Current directed energy (DE) test policies and range procedures are primarily based on biological hazards to humans and space (satellite) sensors. These policies reflect a conservative approach to DE test limiting realistic operational test and, in turn, inhibiting DEW development. DoDI 3100.11, Management of Laser Illumination of Objects in Space, published 24 Oct 16, allows probabilistic risk analysis (PRA) for DEW opening test, current range and safety restrictions limit DE testing potentially expanding DEW test capability. Efforts underway to take advantage of this approach include:

8.4.2. Establish Special Use Space Range to allow, deconflict DEW operational tactics.

8.4.3. PRA method to be implemented by USSTRATCOM in new CJCSI 3225.01, Illumination of Objects in Space by Lasers, which will drive AF DEW test policy.

8.4.4. AFRL/RH developing models to take advantage of PRA but needs more data.

8.4.5. Test and AFRL leadership certification of model(s)/tool(s) for test community and ranges.

8.4.6. The following publications provide more guidance on DEW test and safety concerns:

- a. AFI 13-212V1, Range Planning
- b. AFI 48-139, Laser and Optical Radiation Protection Plan
- c. AFI 91-401, Directed Energy Weapons Safety
- d. AFD 91-4, Directed Energy Weapons
- e. DoDI 3100.11, Management of Laser Illumination of Objects in Space
- f. DoDI 6055.15, DoD Laser Protection Program
- g. CJCSI 3225.01, Illumination of Objects In Space By Lasers
- h. MIL-HDBK-828C, Range Laser Safety

# **ATTACHMENTS**

## **1. ABBREVIATIONS AND ACRONYMS**

**ACAT**—Acquisition Category

**AFAMS**—Air Force Agency for Modeling and Simulation

**AFC2ISRC**—Air Force Command and Control & Intelligence, Surveillance, and Reconnaissance Center

**AFDD**—Air Force Doctrine Document

**AFI**—Air Force Instruction

**AFMAN**—Air Force Manual

**AFMC**—Air Force Materiel Command

**AFOTEC**—Air Force Operational Test and Evaluation Center

**AFPD**—Air Force Policy Directive

**AFROCC**—Air Force Requirements for Operational Capabilities Council

**AFRL**—Air Force Research Laboratory

**AFSPC**—Air Force Space Command

**Ao**—Availability

**AoA**—Analysis of Alternatives

**APDP**—Acquisition Professional Development Program

**ATD**—Advanced Technology Demonstration

**ATEC**—Army Test and Evaluation Command

**C2**—Command and Control

**C4I**—Command, Control, Communications, Computers, and Intelligence

**CAE**—Component Acquisition Executive

**CDD**—Capability Development Document

**CDT**—Chief Developmental Tester

**CJCSI**—Chairman of the Joint Chiefs of Staff Instruction

**CJCSM**—Chairman of the Joint Chiefs of Staff Manual

**COI**—Critical Operational Issue

**COTS**—Commercial-Off-The-Shelf

**CPD**—Capability Production Document

**CSAF**—Chief of Staff of the Air Force

**CTF**—Combined Test Force

**CTP**—Critical Technical Parameter

**DAB**—Defense Acquisition Board

**DAU**—Defense Acquisition University

**DEW**—Directed Energy Weapons  
**DoD**—Department of Defense  
**DoDD**—Department of Defense Directive  
**DoDI**—Department of Defense Instruction  
**DOT&E**—Director, Operational Test and Evaluation  
**DR**—Deficiency Report or Deficiency Reporting  
**DRR**—Design Readiness Review  
**DTIC**—Defense Technical Information Center  
**DT&E**—Developmental Test and Evaluation  
**EA**—Evolutionary Acquisition  
**EOA**—Early Operational Assessment  
**EW**—Electronic Warfare  
**EWIR**—Electronic Warfare Integrated Reprogramming  
**FAT**—First Article Test  
**FCT**—Foreign Comparative Testing  
**FDE**—Force Development Evaluation  
**FOT&E**—Follow-on Operational Test and Evaluation  
**FRP**—Full-Rate Production  
**FSA**—Functional Solution Analysis  
**GFE**—Government Furnished Equipment  
**HPT**—High Performance Team  
**HQ**—Headquarters  
**IA**—Information Assurance  
**ICD**—Initial Capabilities Document  
**IOC**—Initial Operational Capability  
**IOT&E**—Initial Operational Test and Evaluation  
**ISP**—Information Support Plan  
**ISR**—Intelligence, Surveillance, and Reconnaissance  
**IT**—Information Technology  
**ITT**—Integrated Test Team  
**JITC**—Joint Interoperability Test Command  
**JP**—Joint Publication  
**JROC**—Joint Requirements Oversight Council

**JT&E**—Joint Test and Evaluation  
**LAT**—Lot Acceptance Test  
**LDTO**—Lead Developmental Test and Evaluation Organization  
**LFT&E**—Live Fire Test and Evaluation  
**LRIP**—Low-Rate Initial Production  
**M&S**—Modeling and Simulation  
**MAJCOM**—Major Command  
**MCOTEA**—Marine Corps Operational Test and Evaluation Agency  
**MDA**—Milestone Decision Authority  
**MDAP**—Major Defense Acquisition Program  
**MOE**—Measure of Effectiveness  
**MOT&E**—Multi-Service Operational Test and Evaluation  
**MS**—Milestone  
**NDI**—Non-Developmental Item  
**NSS**—National Security System *or* National Security Space  
**OA**—Operational Assessment  
**OPR**—Office of Primary Responsibility  
**OPTEVFOR**—Operational Test and Evaluation Force  
**OSD**—Office of the Secretary of Defense  
**OT&E**—Operational Test and Evaluation  
**OTA**—Operational Test Agency  
**OTO**—Operational Test Organization  
**OTRR**—Operational Test Readiness Review  
**OUE**—Operational Utility Evaluation  
**PAT&E**—Production Acceptance Test and Evaluation  
**PEO**—Program Executive Officer  
**PM**—Program Manager  
**PMO**—Program Management Office  
**PMD**—Program Management Directive  
**PPQT**—Pre-Production Qualification Test  
**PQT**—Production Qualification Test  
**PRA**—Probabilistic Risk Analysis  
**PTO**—Participating Test Organization

**QOT&E**—Qualification Operational Test and Evaluation

**QT&E**—Qualification Test and Evaluation

**R&D**—Research and Development

**RDT&E**—Research, Development, Test, and Evaluation

**RFP**—Request for Proposal

**RM&A**—Reliability, Maintainability, and Availability

**SAMP**—Single Acquisition Management Plan

**SECDEF**—Secretary of Defense

**SPO**—System Program Office

**SRB**—Safety Review Board

**T&E**—Test and Evaluation

**TD&E**—Tactics Development and Evaluation

**TDS**—Technology Development Strategy

**TEMP**—Test and Evaluation Master Plan

**TIPT**—Test Integrated Product Team

**TM**—Test Manager

**TTP**—Tactics, Techniques, and Procedures

**VV&A**—Verification, Validation, and Accreditation

## 2. GLOSSARY

A common understanding of terms is essential to effectively implement instructions and guidance. In some cases, definitions from multiple sources are offered where they may be of value. Italicized words and notes in brackets are not part of the definition and are offered only for clarity.

**Acquisition Category (ACAT)**—Acquisition categories determine the level of review, decision authority, and applicable T&E policies and procedures. They facilitate decentralized decision making and execution, and compliance with statutorily imposed requirements. See DODI 5000.02, Enclosure 2 for details.

**Advanced Concept Technology Demonstration**—A demonstration of the military utility of a significant new technology and an assessment to clearly establish operational utility and system integrity. (CJCSI 3170.01D)

**Availability (Ao)**—A measure of the degree to which an item is in the operable and committable state at the start of a mission when the mission is called for at an unknown (random) time. (*Defense Acquisition Guidebook*)

**Capability Based Testing**—A mission-focused methodology of verifying that a capabilities solution will enable operations at an acceptable level of risk. Capabilities-oriented evaluations are emphasized throughout system testing in addition to traditional evaluations of system performance measured against specification-like requirements. It requires understanding Concept of Operations and involves developing T&E strategies and plans to determine whether a capability solution option merits fielding.

**Combined Testing**—See Integrated Testing.

**Covered System**—**1.** A vehicle, weapon platform, or conventional weapon system that includes features designed to provide some degree of protection to users in combat; and this is a major system within the meaning of that term in Title 10 §2302(5). (Title 10 §2366). **2.** All categories of systems or programs identified in Title 10 §2366 as requiring live fire test and evaluation. In addition, non-traditional systems or programs that do not have acquisition points referenced in Title 10 §2366, but otherwise meet the statutory criteria. **NOTE:** The definitions of “covered system,” “major munitions program,” and “covered product improvement program” are encompassed in the single DoD term “covered system.” (*Defense Acquisition Guidebook*, Appendix 3, which includes conventional munitions programs for which more than 1,000,000 rounds are planned to be acquired; or a modification to a covered system that is likely to affect significantly the survivability or lethality of such a system.)

**Covered Product Improvement Program**—See Covered System.

**Critical Operational Issue (COI)**—**1.** Operational effectiveness and operational suitability issues (not parameters, objectives, or thresholds) that must be examined during operational testing to determine the system’s capability to perform its mission (paraphrased from DAU’s *Test and Evaluation Management Guide*). **2.** A key question that must be examined in



operational test and evaluation to determine the system's capability to perform its mission. Testers normally phrase a COI as a question to be answered in evaluating a system's operational effectiveness or suitability.

**Critical Technical Parameter (CTP)**—Measurable critical system characteristics that, when achieved, allow the attainment of operational performance requirements. They are technical measures derived from operator requirements. Failure to achieve a critical technical parameter should be considered a reliable indicator that the system is behind in the planned development schedule or will likely not achieve an operational requirement (paraphrased from *Defense Acquisition Guidebook*).

**Dedicated Operational Testing**—Operational test and evaluation that is conducted independently from contractors, developers, and operators and used to support production or fielding decisions.

**Deficiency Report (DR)**—The report used to identify, document, and track system deficiency or enhancement data while a system is in advanced development, operational test, or operational transition.

- **Category I DRs** are those that could cause death, severe injury, severe occupational illness, major loss or damage, or directly restrict combat or operational readiness if left uncorrected.
- **Category II DRs** are those that do not meet the criteria of a Cat I DR. They are attributable to errors in workmanship, nonconformance to specifications, drawing standards, or other technical requirements; or identify a problem for potential improvement or enhancement.
- **Enhancements** are a type of Category II DR that identifies conditions that complement, but are not absolutely required for successful mission accomplishment. The recommended condition, if incorporated, will improve a system's operational effectiveness or suitability (paraphrased from TO 00-35D-54).

**Deployment**—**1.** The movement of forces within operational areas. **2.** The relocation of forces and materiel to desired operational areas. Deployment encompasses all activities from origin or home station through destination. (JP 1-02)

**Developmental Test and Evaluation (DT&E)**—Test and evaluation conducted to evaluate design approaches, validate analytical models, quantify contract technical performance and manufacturing quality, measure progress in system engineering design and development, minimize design risks, predict integrated system operational performance (effectiveness and suitability) in the intended environment, and identify system problems (or deficiencies) to allow for early and timely resolution. DT&E includes contractor testing and is conducted over the life of the system to support acquisition and sustainment efforts. (*Defense Acquisition Guidebook*)

**Early Operational Assessment (EOA)**—An operational assessment (OA) conducted before MS B. An EOA assesses the design approach sufficiently early in the acquisition process to assure it

has the potential to fulfill operator requirements. See Operational Assessment.

**Evaluation Criteria**—Standards by which the accomplishment of required technical and operational effectiveness and/or suitability characteristics, or resolution of operational issues, may be addressed. (*Defense Acquisition Guidebook*)

**Evolutionary Acquisition**—Evolutionary acquisition is the preferred DoD strategy for rapid acquisition of mature technology for the user. An evolutionary approach delivers capability in increments, recognizing, up front, the need for future capability improvements. The objective is to balance needs and available capability with resources, and to put capability into the hands of the user quickly. The success of the strategy depends on consistent and continuous definition of requirements, and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability towards a materiel concept. The approaches to achieve evolutionary acquisition require close collaboration between the user, tester, and developer. (DODI 5000.02) They include:

- **Spiral Development**—In this process, a desired capability is identified, but the end-state requirements are not known at program initiation. Those requirements are refined through demonstration and risk management; there is continuous user feedback; and each increment provides the user the best possible capability. The requirements for future increments depend on feedback from users and technology maturation. (DODI 5000.02)
- **Incremental Development**—In this process, a desired capability is identified, an end-state requirement is known, and that requirement is met over time by developing several increments, each dependent on available mature technology. (DODI 5000.02)

**Fielding**—The decision to acquire and/or release a system to operators in the field.

**First Article Test (FAT)**—Production testing that is planned, conducted, and monitored by the materiel developer. FAT includes pre-production and initial production testing conducted to ensure that the contractor can furnish a product that meets the established technical criteria. (*DAU's Test and Evaluation Management Guide*)

**Follow-on Operational Test and Evaluations (FOT&E)**—The continuation of IOT&E or QOT&E activities past the full-rate production decision. FOT&E answers specific questions about unresolved COIs or completes areas not finished during the IOT&E or QOT&E. It ensures the initial system acquisition process is complete.

**Force Development Evaluation (FDE)**—The operational test and evaluation of fielded, operational systems during the sustainment portion of the system life cycle after acceptance for operational use. The focus is on maintaining or upgrading operational systems after the initial acquisition process is complete. An FDE also supports acquisition of MAJCOM-managed systems.

**Foreign Comparative Test (FCT)**—A T&E program centrally managed by OSD which provides funding for U.S. T&E of selected equipment items and technologies developed by allied or friendly countries when such items or technologies are identified as having good

potential to satisfy valid DoD requirements. (DoD 5000.3-M-2)

**Full-Up System-Level Testing**—Testing that fully satisfies the statutory requirement for “realistic survivability testing” or “realistic lethality testing” as defined in Title 10 §2366. (*Defense Acquisition Guidebook*, Appendix 3)

**Increment**—A militarily useful and supportable operational capability that can be effectively developed, produced or acquired, deployed, and sustained. Each increment of capability will have its own set of threshold and objective values set by the user. (CJCSI 3170.01D and AFI 10-601) **NOTE:** An increment may contain multiple spirals. Generally, only increments are fielded according to DODI 5000.02, CJCSI 3170.01D, and AFI 63-101.

**Information Support Plan (ISP)**—[The plan] used by program authorities to document the IT and NSS needs, objectives, interface requirements for all non-ACAT and fielded programs. (CJCSI 6212.01C)

**Initial Operational Test and Evaluation (IOT&E)**—See Operational Test and Evaluation.

**Integrated Testing**—Any combination of two or more types of testing used to achieve greater test efficiency, reduced cost, and schedule savings without compromising the objectives and needs of the participating test organizations.

**Integrated Test Team (ITT)**—A cross-functional team of empowered representatives from multiple disciplines and organizations and co-chaired by operational testers and the program manager. The ITT is responsible for developing the T&E strategy and TEMP, assisting the acquisition community with T&E matters, and guiding the development of integrated test plans. There is one ITT for each acquisition program.

**Joint Test and Evaluation (JT&E)**—An OSD-sponsored T&E program conducted among more than one military Service to provide T&E information on combat operations issues and concepts. JT&E does not support system acquisition. (DoDD 5010.41)

**Lead Developmental Test & Evaluation Organization (LDTO)**—The lead government developmental test organization on the ITT that is qualified to conduct and responsible for overseeing DT&E.

**Lethality**—The capability of a munition or directed energy weapon to cause damage that will cause the loss or a degradation in the ability of a target system to complete its designated mission(s). (*Defense Acquisition Guidebook*, Appendix 3)

**Live Fire Test and Evaluation (LFT&E)**—The firing of actual weapons (or surrogates if actual weapons are not available) at components, subsystems, sub-assemblies, and/or full-up, system-level targets or systems to examine personnel casualties, system vulnerabilities, or system lethality; and the evaluation of the results of such testing. (*Defense Acquisition Guidebook*, Appendix 3)

**Logistics Support Elements—1.** A composite of all support considerations necessary to ensure the effective and economical support of a system for its life cycle. It is an integral part of all other aspects of system acquisition and operation. (JP 1-02) **NOTE:** The ten logistics support elements are: maintenance planning; manpower and personnel; supply support; support equipment; technical data; training and training support; computer resources support; facilities; packaging, handling, storage, and transportation; and design interface. Formerly known as Integrated Logistics Support. (AFI 10-602)

**Logistics Supportability—**The degree to which the planned logistics support allows the system to meet its availability and wartime usage requirements. Planned logistics support includes the following: test, measurement, and diagnostic equipment; spare and repair parts; technical data; support facilities; transportation requirements; training; manpower; and software. (*Defense Acquisition Guidebook*)

**Logistics Test and Evaluation—**The test methodology, criteria, and tools for evaluating and analyzing the ten logistics support elements as they apply to a system under test. The objective is to influence the design through applying the logistics support elements as early as possible in the acquisition cycle. This testing integrates the evaluation and analysis efforts of RM&A, human factors engineering, and logistics test, and is an integral part of the DT&E report.

**Lot Acceptance Test (LAT)—**A test based on a sampling procedure to ensure that the product retains its quality. No acceptance or installation should be permitted until this test for the lot has been successfully completed. (*Glossary, Defense Acquisition Acronyms and Terms*, and DAU's *Test and Evaluation Management Guide*)

**Low-Rate Initial Production (LRIP)—**Production of the system in the minimum quantity necessary (1) to provide production-configured or representative articles for operational tests pursuant to §2399; (2) to establish an initial production base for the system; and (3) to permit an orderly increase in the production rate for the system sufficient to lead to full-rate production upon the successful completion of operational testing. **NOTE:** The LRIP quantity should not exceed 10 percent of the total number of articles to be produced as determined at the milestone B decision. (Title 10 §2400)

**Maintainability—**The capability of an item to be retained in or restored to a specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and routines, at each prescribed level of maintenance and repair. (*Defense Acquisition Guidebook*)

**Major Munitions Program—**See Covered System.

**Measurable—**Having qualitative or quantitative attributes (e.g., dimensions, velocity, capabilities) that can be ascertained and compared to known standards. (See Testable.)

**Measure of Effectiveness (MOE)—**A qualitative or quantitative measure of a system's performance or a characteristic that indicates the degree to which it performs the task or meets a

requirement under specified conditions. MOEs should be established to measure the system's capability to produce or accomplish the desired result.

**Measure of Performance**—A quantitative measure of a system's capability to accomplish a task. Typically in the area of physical performance (e.g., range, velocity, throughput, payload).

**Military Utility**—The military worth of a system performing its mission in a competitive environment including versatility (or potential) of the system. It is measured against the operational concept, operational effectiveness, safety, security, and cost/worth. Military utility estimates form a rational basis for making management decisions. (*Glossary, Defense Acquisition Acronyms and Terms*)

**Multi-Service**—Involving two or more military Services or DoD components.

**Multi-Service Operational Test and Evaluation (MOT&E)**—OT&E conducted by two or more Service OTAs for systems acquired by more than one Service. MOT&E is conducted according to the T&E directives of the lead OTA, or as agreed in a memorandum of agreement between the participants.

**Objective**—An operationally significant increment above the threshold. An objective value may be the same as the threshold when an operationally significant increment above the threshold is not significant or useful. (AFI 10-601)

**Operational Assessment (OA)**—An analysis of potential operational effectiveness and suitability made by an independent operational test activity, with operator support as required, on other than production systems. The focus of an operational assessment 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 operational testing. Operational assessments may be made at any time using technology demonstrators, prototypes, mockups, engineering development models, or simulations, but will not substitute for the dedicated OT&E [sic] necessary to support full production decisions. (*Defense Acquisition Guidebook*)

**Operational Effectiveness**—Measure of the overall ability to accomplish a mission when used by representative personnel in the environment planned or expected for operational employment of the system considering organization, doctrine, tactics, supportability, survivability, vulnerability and threat. (CJCSI 3170.01D)

**Operational Suitability**—The degree to which a system can be placed and sustained satisfactorily in field use with consideration given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, habitability, manpower, logistics, supportability, logistics supportability, natural environmental effects and impacts, documentation, and training requirements. (CJCSI 3170.01D)

**Operational Test Agency (OTA)**—An independent agency reporting directly to the Service Chief that plans and conducts operational tests, reports results, and provides evaluations of effectiveness and suitability on new systems. (DoDD 5000.1) **NOTE:** Each Service has one

designated OTA: The Air Force has the Air Force Operational Test and Evaluation Center (AFOTEC). The Navy has the Operational Test and Evaluation Force (OPTEVFOR). The Army has the Army Test and Evaluation Command (ATEC). The Marine Corps has the Marine Corps Operational Test and Evaluation Agency (MCOTEA).

**Operational Test and Evaluation (OT&E)**—**1.** The field test, under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability of the weapons, equipment, or munitions for use in combat by typical military users; and the evaluation of the results of such test. (Title 10 §139(a)(2)) **2.** Testing and evaluation conducted in as realistic an operational environment as possible to estimate the prospective system's operational effectiveness and operational suitability. In addition, OT&E provides information on organization, personnel requirements, doctrine, and tactics. It may also provide data to support or verify material in operating instructions, publications, and handbooks.

**Operational Testing**—A generic term describing the test and evaluation options and levels of effort available to an operational test organization.

**Operational Utility Evaluation (OUE)**—OUEs are evaluations of military capabilities conducted to demonstrate or validate new operational concepts or capabilities, upgrade components, or expand the mission or capabilities of existing or modified systems.

**Operator**—Refers to the operating command which is the primary command operating a system, subsystem, or item of equipment. Generally applies to those operational commands or organizations designated by Headquarters, US Air Force to conduct or participate in operations or operational testing, interchangeable with the term "using command" or "user." In other forums the term "warfighter" or "customer" is often used. (AFI 10-601)

**Oversight**—Senior executive-level monitoring and review of programs to ensure compliance with policy and attainment of broad program goals.

**Oversight Program**—A program on the OSD T&E Oversight List for DT&E, LFT&E, and/or OT&E. The list includes all ACAT I (MDAP) programs, ACAT II (major system) programs, and any other programs selected for OSD T&E oversight. These programs require additional documentation and have additional review, reporting, and approval requirements.

**Participating Test Organization (PTO)**—Any test organization required to support a lead test organization by providing specific T&E data or resources for a T&E program or activity.

**Pre-Production Qualification Test (PPQT)**—The formal contractual tests that ensure design integrity over the specified operational and environmental range. These tests usually use prototype or pre-production hardware fabricated to the proposed production design specifications and drawings. Such tests include contractual reliability and maintainability demonstration tests required prior to production release. (*Glossary, Defense Acquisition Acronyms and Terms*, and *DAU's Test and Evaluation Management Guide*)

**Production Acceptance Test and Evaluation (PAT&E)**—Test and evaluation of production items to demonstrate that items procured fulfill requirements and specifications of the procuring contract or agreements. (DAU’s *Test and Evaluation Management Guide*)

**Production Qualification Test (PQT)**—A technical test conducted prior to the full rate production decision to ensure the effectiveness of the manufacturing processes, equipment, and procedures. These tests are conducted on a number of samples taken at random from the first production lot, and are repeated if the manufacturing process or design is changed significantly, or when a second source is brought on line. (*Glossary, Defense Acquisition Acronyms and Terms*, and DAU’s *Test and Evaluation Management Guide*)

**Program Manager (PM)**—**1.** The designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user’s operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the MDA. (DoDD 5000.1) **2.** Applies collectively to system program directors, product group managers, single managers, acquisition program managers, and weapon system managers. Operating as the single manager, the PM has total life cycle system management authority. **NOTE:** This AFI uses the term “PM” for any designated person in charge of acquisition activities prior to MS A (i.e., before a technology project is officially designated an acquisition program).

**Prototype**—**1.** A model suitable for evaluation of design, performance, and production potential. (JP 1-02) **NOTE:** The Air Force uses prototypes during development of a technology or acquisition program for verification or demonstration of technical feasibility. Prototypes may not be representative of the final production item.

**Qualification Operational Test and Evaluation (QOT&E)**—A tailored type of IOT&E performed on systems for which there is little to no RDT&E-funded development effort. Commercial-off-the-shelf (COTS), non-developmental items (NDI), and government furnished equipment (GFE) are tested in this manner.

**Qualification Test and Evaluation (QT&E)**—A tailored type of DT&E for which there is little to no RDT&E-funded development effort. Commercial-off-the-shelf (COTS), non-developmental items (NDI), and government furnished equipment (GFE) are tested in this manner.

**Recoverability**—Following combat damage, the ability to take emergency action to prevent loss of the system, to reduce personnel casualties, or to regain weapon system combat mission capabilities. (*Defense Acquisition Guidebook*, Appendix 3)

**Reliability**—The capability of a system and its parts to perform its mission without failure, degradation, or demand on the support system. (*Defense Acquisition Guidebook*)

**Research, Development, Test and Evaluation (RDT&E)**—The type of funding appropriation (3600) intended for research, development, test and evaluation efforts. (DoD 7000.14-R, Vol 2A, and AFI 65-601, Vol I) **NOTE:** The term “research and development” (R&D) broadly covers

the work performed by a government agency or the private sector. “Research” is the systematic study directed toward gaining scientific knowledge or understanding of a subject area. “Development” is the systematic use of the knowledge and understanding gained from research for the production of useful materials, devices, systems, or methods. RDT&E includes all supporting test and evaluation activities.

**Risk**—**1.** A measurable probability of consequence associated with a set of conditions or actions. (*Glossary, Defense Acquisition Acronyms and Terms*) **2.** Probability and severity of loss linked to hazards. (JP 1-02) **3.** A subjective assessment made regarding the likelihood or probability of not achieving a specific objective by the time established with the resources provided or requested. It also refers to overall program risk. (*Defense Acquisition Guidebook*)

**Seamless Verification**— A concept for structuring test and evaluation (T&E) to more effectively support the requirements and acquisition processes so new capabilities are brought to operators more quickly. Seamless verification promotes using integrated testing procedures coupled with tester collaboration in early requirements definition and system development activities. It shifts T&E away from the traditional "pass-fail" model to one of providing continuous feedback and objective evaluations of system capabilities and limitations throughout system development.

**Specification**—A document intended primarily for use in procurement which clearly and accurately describes the essential technical requirements for items, materials, or services, including the procedures by which it will be determined that the requirements have been met. Specifications may be prepared to cover a group of products, services, or materials, or a single product, service, or material, and are general or detail specifications. (*Glossary, Defense Acquisition Acronyms and Terms*)

**Spiral**—One subset or iteration of a development program within an increment. Multiple spirals may overlap or occur sequentially within an increment. **NOTE:** Generally, spirals are not fielded according to DODI 5000.02, CJCSI 3170.01D, and AFI 63-101.

**Survivability**—The capability of a system and crew to avoid or withstand a man-made hostile environment without suffering an abortive impairment of its ability to accomplish its designated mission. Survivability consists of susceptibility, vulnerability, and recoverability. (*Defense Acquisition Guidebook, Appendix 3*)

**Susceptibility**—The degree to which a weapon system is open to effective attack due to one or more inherent weaknesses. (Susceptibility is a function of operational tactics, countermeasures, probability of enemy fielding a threat, etc.) Susceptibility is considered a subset of survivability. (*Defense Acquisition Guidebook, Appendix 3*)

**Sustainment**—**1.** The provision of personnel, logistic, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or of the national objective. (JP 1-02) **2.** The Service's ability to maintain operations once forces are engaged. (AFDD 1-2) **3.** Activities that sustain systems during the operations and support phases of the system life cycle. Such activities include any investigative test and evaluation that extends



the useful military life of systems, or expands the current performance envelope or capabilities of fielded systems. Sustainment activities also include T&E for modifications and upgrade programs, and may disclose system or product deficiencies and enhancements that make further acquisitions necessary.

**Tactics Development and Evaluation (TD&E)**—TD&E is a tailored type of FDE specifically designed to further exploit doctrine, system capabilities, tactics, techniques, and procedures during the sustainment portion of the system life cycle. TD&Es normally identify non-materiel solutions to tactical problems or evaluate better ways to use new or existing systems.

**Testable**—The attribute of being measurable with available test instrumentation and resources.

**NOTE:** Testability is a broader concept indicating whether T&E infrastructure capabilities are available and capable of *measuring* the parameter. The difference between testable and measurable may indicate a test limitation. Some requirements may be *measurable* but not *testable* due to T&E infrastructure shortfalls, insufficient funding, safety, or statutory or regulatory prohibitions.

**Test and Evaluation (T&E)**—The act of generating empirical data during the research, development or sustainment of systems, and the creation of information through analysis that is useful to technical personnel and decision makers for reducing design and acquisition risks. The process by which systems are measured against requirements and specifications, and the results analyzed so as to gauge progress and provide feedback.

**Test and Evaluation Master Plan (TEMP)**—Documents the overall structure and objectives of the T&E program. It provides a framework within which to generate detailed T&E plans and it documents schedule and resource implications associated with the T&E program. The TEMP identifies the necessary developmental, operational, and live-fire test activities. It relates program schedule, test management strategy and structure, and required resources to: COIs; critical technical parameters; objectives and thresholds documented in the requirements document; and milestone decision points. (DAU's *Test and Evaluation Management Guide*)

**NOTE:** Where the word "TEMP" appears in this AFI, the SAMP T&E annex is also implied. The TEMP may be included in a SAMP as a T&E annex.

**Test and Evaluation Organization**—Any organization whose designated mission includes test and evaluation.

**Test and Evaluation Strategy**—The overarching integrated T&E plan for the entire acquisition program that describes how operational capability requirements will be tested and evaluated in support of the acquisition strategy. Developed prior to Milestone A, the T&E strategy addresses modeling and simulation, risk and risk mitigation, development of support equipment, and identifies how system concepts will be evaluated against mission requirements, among other things. The T&E strategy is a precursor to the test and evaluation master plan.

**Test Deferral**—The delay of testing and/or evaluation of a specific critical technical parameter, operational requirement, or critical operational issue to a follow-on increment.

**Test Integrated Product Team (TIPT)**—Any temporary group consisting of testers and other experts who are focused on a specific test issue or problem. There may be multiple TIPTs for each acquisition program.

**Test Limitation**—Any condition that hampers but does not preclude adequate test and/or evaluation of a critical technical parameter, operational requirement, or critical operational issue during a T&E program.

**Test Team**—A group of testers and other experts who carry out integrated testing according to a specific test plan. *NOTE:* A combined test force (CTF) is one way to organize a test team for integrated testing.

**Threshold**—A minimum acceptable operational value below which the utility of the system becomes questionable.

**User**—See Operator.

**Verification, Validation and Accreditation (VV&A)**—VV&A is a continuous process in the life cycle of a model or simulation as it gets upgraded or is used for different applications. (AFI 16-1002)

- **Verification:** Process of determining that M&S accurately represent the developer’s conceptual description and specifications.  
**Validation:** Rigorous and structured process of determining the extent to which M&S accurately represents the intended “real world” phenomena from the perspective of the intended M&S use.
- **Accreditation:** The official determination that a model or simulation is acceptable for use for a specific purpose.

**Vulnerability**—The characteristic of a system that causes it to suffer a definite degradation (loss or reduction of capability to perform its designated mission) as a result of having been subjected to a certain (defined) level of effects in an unnatural (man-made) hostile environment. Vulnerability is considered a subset of survivability. (*Defense Acquisition Guidebook*, Appendix 3)

### **3. REVIEWING CAPABILITIES-BASED REQUIREMENTS DOCUMENTS**

**A3.1. Basic Requirements Policy.** This attachment covers what testers should know prior to making inputs to capabilities-based requirements documents (CBRD). It is based on policies in CJCSI 3170.01, *Joint Capabilities Integration and Development System [JCIDS]*, CJCSM 3170.01, *Operation of the Joint Capabilities Integration and Development System*, and AFI 10-601, *Capabilities-Based Requirements Development*. These policies, along with all available studies, analyses, concepts, threat documents, and other information about the proposed system, should be reviewed prior to attending high performance team (HPT) meetings. This attachment contains checklists for use during and after HPT meetings.

**A3.2. Types of Requirements Documents.** Requirements documents are now collectively known as capabilities-based requirements documents (CBRD). CJCSI 3170.01 and AFI 10-601 describe five main types of CBRD: the Joint Capabilities Document (JCD); the Initial Capabilities Document (ICD); the Capability Development Document (CDD); the Capability Production Document (CPD); and the DOTMLPF (*see definition below*) Change Recommendation (DCR). The Air Force has several alternative methods of documenting capabilities-based requirements: the Air Force Capabilities Document (AFCD); the Combat Capability Document (CCD); and the AF Form 1067, *Modification Proposal*. Some older programs may still have an Operational Requirements Document (ORD) if the user has not updated it since the JCIDS process was introduced.

*Note: DOTMLPF is the acronym for “doctrine, organization, training, materiel, leadership and education, personnel, and facilities.”*

**A3.3. Traditional Tester Involvement in Requirements.** Operational testers have traditionally been key contributors in the development of new operational requirements for future acquisition programs. Users drafted new requirements documents and then multiple organizations, to include the testers, reviewed them for feasibility and accuracy. Testers reviewed many areas such as projected threats, operational concepts and scenarios, operational realism, mission tasks, and system capabilities. Testers helped ensure system parameters were accurately stated so these areas could be properly tested with available T&E infrastructure. The requirements process was slow and often took up to four years to complete. Users and developers expected the test community to provide clear, decisive answers about the new system’s capabilities and limitations. However, some requirements were highly problematic if they were not clearly stated, set unrealistic goals, or inadvertently set up the system for failure during test. These problems often surfaced during test planning or after testing was finished, putting the system and possibly the warfighters’ lives in jeopardy when the system did not perform as expected. Good requirements were difficult to write, and once written, were difficult to change.

**A3.4. Testers Must Be Involved Much Earlier.** The need for earlier tester involvement became more urgent as the requirements and acquisition processes were transformed in 2003 to more rapidly deliver new capabilities to warfighters. Testers had to begin their involvement in developing JCIDS documents as early as possible, preferably before the Concept Refinement phase began. However, the increasing technical complexity of systems and more challenging operational environments demanded new skills and knowledge from all testers. Past policies were inadequate because they focused only on operational testers to address operational realism and “testability” issues. The new environment required developmental testers’ technical knowledge of advanced technologies and test infrastructure capabilities. Today’s T&E policy requires operational and developmental testers, functioning as “core” HPT members, to address the “testability,” feasibility, and operational relevance of all new requirements. The goal remains to ensure systems acquired today would be effective in combat tomorrow.

**A3.5. Results of Inadequate Tester Involvement.** These results may not appear immediately, but begin showing up as system development progresses. The results of inadequate or no tester involvement are:

**A3.5.1.** CBRDs may be challenged and/or rejected at the Air Force Requirements for Operational Capabilities Council (AFROCC), the Joint Requirements Oversight Council (JROC), or by DOT&E staff. DOT&E is allowed to challenge requirements they believe to be inadequate.

**A3.5.2.** Requirements may be misinterpreted in RFPs and contract specifications and system development goes off track. Contractors are not required to consult the Air Force for areas they do not understand.

**A3.5.3.** Requirements “creep” occurs or unforeseen late changes are needed. Testers cannot eliminate these phenomena, but they can reduce the impacts if they do occur.

**A3.5.4.** The threat evolves unexpectedly which diminishes the utility of the new system. Testers can ensure threat descriptions are properly bounded, but may need to test against critical new threats nonetheless. The risk is in fielding a new system that is obsolete in the face of this new threat.

**A3.5.5.** System development is delayed or the system is not ready for IOT&E. Non-production representative articles are tested to recoup schedule despite known limitations.

**A3.5.6.** IOT&E is halted or the system fails IOT&E. Systems do not deliver the promised mission capabilities.

**A3.5.7.** Even if IOT&E is successful, OSD may challenge the results based on unintended interpretations of an ambiguously stated requirement.

### **A3.6. HPT Tester Membership.**

**A3.6.1.** The designated operational testers, as designated in the PMD or other direction, must attend HPT meetings. Generally this is AFOTEC/AS, but will be the MAJCOM operational test organization if AFOTEC involvement is not planned. HQ USAF/TEP will also attend HPTs when possible or if the designated operational tester(s) cannot attend. AF/TEP will function as a backup HPT member if the primary operational test organization has not been determined.

**A3.6.2.** The designated Center Test Authority (CTA) or Responsible Test Organization will attend as the DT&E representative. HQ AFMC/A3 or AFSPC/A3 will serve as backup in case the CTA or LDTO has not been designated.

**A3.7. Preparation for HPT Meetings.** Long before the first HPT, testers should assist in developing the Analysis of Alternatives (AoA) to help develop properly stated measures of effectiveness (MOE) and measures of suitability (MOS). These measures will likely be the same measures used in later JCIDS documents and in T&E plans. Testers should review requirements policies (see paragraph **A3.1**) along with all available studies, analyses, concepts, threat documents, and other information about the proposed system.

## **A3.8. General Guidance.**

**A3.8.1. Testers Do Not Set Requirements.** While testers must advocate for changes and clarifications for poorly-stated requirements, it is up to the user to actually set the requirement. Testers should consider whether the requirements are operationally realistic, attainable, testable, and reasonable for the system. Requirements should reflect the operational capability needed, not the technical parameters of that capability.

**A3.8.2. Recognize Poorly Stated Requirements.** Some examples follow:

**A3.8.2.1.** Requirements that call for 100% of anything are often not reasonable and generally not testable. Even if 100% is attainable, it can never be verified in test. Simply switching to very high numbers like 99.9% can drive testing to unattainable and unaffordable numbers of trials to correctly verify the requirement. It's a statistics thing.

**A3.8.2.2.** Requirements that exceed the T&E infrastructure's capability to test. For example, an air-to-air missile to engage targets at 300' above ground level (AGL) may not be testable since current drones do not have the capability to fly that low. A manned target is not a feasible alternative, thus proper T&E support is not available to demonstrate the capability. Other examples that exceed our capability to test: 1) AMRAAM an "all weather missile" -- OSD wanted to know why we didn't test it in a thunderstorm; 2) AMRAAM kill a "bomber-sized target" -- we don't have any bomber drone targets.

**A3.8.2.3.** Overly broad statements and generalizations such as, "AMRAAM not affected by ECM." There are too many types of ECM to ever fully test with new varieties showing up constantly, so the requirement cannot be verified. Making this requirement more specific, such as listing the threats that must be defeated, would be a better strategy.

**A3.8.2.4.** Stating requirements for which other support will be provided. An example is the programmable fuze which lacked the intel support to determine the depth. The following pages contain information specific to each type of CBRD. This review sheet includes information common to reviewing all CBRDs and some information relevant to each specific type of CBRD. More information about CBRDs can be found at HQ USAF/A3/5's website, <https://www.afreqs.hq.af.mil/>

## **A3.9. Initial Capability Document (ICD)**

The ICD development is broken into two stages. Stage I captures a capability gap and highlights the gap to senior leadership. The intent is to identify capability gaps upfront and early, in order to enhance the opportunity to investigate viable alternatives to fill the gap. The ICD Stage I encompasses the information required in Sections 1-5 of a complete ICD, as described in CJCSM 3170.01. The ICD Stage I document is not normally reviewed from a test standpoint.

ICD Stage II builds upon ICD Stage I, captures the results of the FSA, provides a final recommendation for a materiel approach(es), and enters the JCIDS process as a complete ICD (Sections 1-7). The ICD Stage II supports the AoA, the Technology Development Strategy

(TDS), the Milestone A decision, and subsequent Technology Development activities. This is usually the first CBRD reviewed from a test perspective. ICDs are generated very early in the acquisition process. Most of the time an acquisition program has not been identified before the ICD is approved. This makes the identification of test issues difficult. One area of interest surrounds testability. In this case the concern is not limited to unrealistic or unattainable situations, but whether the test infrastructure is in place to support the anticipated testing for the program. In this sense, the testers may “take away” more information than they provide to the HPT. It is important that necessary test infrastructure issues are communicated to AF/TER as soon as possible to maximize the opportunity for developing or otherwise acquiring the needed resources.

### **A3.10 Capability Development Document (CDD)**

AF/XOR may direct a MAJCOM/Agency to develop a CDD however, in most cases, sponsors will have already developed an ICD Stage I/ICD Stage II prior to development of CDD.

#### **A3.10.1 CDD Strategy Development Initiated**

The requirements strategy lays the foundation for CDD development and supports the System Development and Demonstration phase for a single increment. The sponsor, along with operators, continues the collaboration initiated in ICD development with Air Force acquisition, test, and logistics communities (and other appropriate SMEs). The preferred materiel solution is based on mature technologies demonstrated during the Technology Development phase. The sponsor applies lessons learned during the Concept Refinement and Technology Development phases plus any other appropriate risk reduction activities such as experimentation, T&E, and capability/schedule tradeoffs.

#### **A3.10.2 CDD High Performance Team (HPT)**

The HPT is the preferred method to develop a CDD and is used unless waived by AF/XOR at the RSR. A CDD HPT consists of a lead (normally the sponsor), core and support team members. During the RSR, AF/XOR approves the core team (ideally 8-10 members) and consists of SMEs from the Air Force, government agencies, and other Services as required. Support team membership provides "reach-back" expertise in areas not represented by the core team. The HPT accelerates the documentation process and increases the potential for a quality document. Its overarching objective is to capture, articulate, and document the operator's operational requirements in minimum time, while achieving stakeholder buy-in. The HPT leverages the expertise of all stakeholders by inviting them to participate in the development of the document. Although the sponsoring MAJCOM/Agency maintains ownership of the document, the HPT lead maintains responsibility for writing and ensuring document coordination until approval. One major benefit of a document generated by an AF/XORD-facilitated HPT is the approval to conduct simultaneous Air Force, Joint Staff, Service, and Agency coordination; whereas, non-HPT documents are staffed sequentially.

#### **A3.10.3 CDD Development**

The CDD, guided by the ICD, the AoA, and the TDS, captures the information necessary to initiate an acquisition program to develop a proposed capability, normally using an evolutionary acquisition strategy. The CDD outlines an affordable increment of capability using mature technology and supports Milestone B.

**Capability Development Document (CDD)**  
Review Procedures/Checklist and Lessons Learned

Para 1 - *Capability Discussion*

- Review this section to make sure it is an overarching discussion that encompasses the KPPs, thresholds and objectives. No new capabilities should be introduced/discussed in this section that are not addressed in section 6.

Para 3 - *Concept of Operations Summary*

- Review this section to make sure the concepts discussed are directly tied to requirements in section 6. Make sure there are no new concepts that could be construed by DOT&E as testable requirements.

Para 4 – *Threat Summary*

- Make sure that any discussion regarding *Threats to be Countered* addresses threats to the proposed system that the system is expected to counter. Many times this section erroneously addresses enemy systems that the proposed system will neutralize. For example, a new bomber might be expected to counter surface to air missiles with flares or chaff. This is the appropriate discussion for this section, not that the bomber is expected to counter massed enemy artillery or centers of gravity. The point is that this section help identify what, if anything, needs to be considered during LFT&E.

Para 6 - *System Capabilities Required for the Current Increment*

- This section is of primary importance during tester review
- Note the focus is on the *current* increment
- AFI 10-601 also governs this section
  - Increases requirement by adding KSA's (key system attributes)
  - If this section contains an effectiveness requirement that includes reliability it should be commented on. Not having a separate reliability requirement makes it difficult for AFOTEC and DOT&E to assess suitability. It can also confound the T&E results by allowing a low reliability to be compensated by high effectiveness. This can cause problems down the road leading to additional testing.
  - Review this section making sure only a minimum number of requirements are KPPs. Failing KPPs in test is bad for the program and threshold/objective requirements leave the contractor with room for trade space, which will impact testing.
  - The Requirements Correlation Tables (RCT's) must include paragraph numbers and rationale with analytical references.
  - Attributes should be validated for testability and check rationale with analytical reference.
    - Review this section for requirements that include *All*, *100%*, or even *99.9%* as these have proven difficult if not impossible to test.

- ❑ Know the difference between KPP / KSA / Attribute (AFI 10-601).
- ❑ Performance attributes apply only to a single increment so ensure testing can be accomplished on current planned increment.
- ❑ Follow on increments require new CDD.

Para 12 - *Schedule and IOC/Full Operational Capability (FOC) Definitions*

- ❑ Make sure IOT&E/FOT&E is discussed here if appropriate.

Para 14 - *Other System Attributes*

- ❑ Check this section for additional testability of System Attributes.

*\*There are now several mandatory KPPs including net-readiness, survivability, and force-protection.*



### **A3.11 Capability Production Document (CPD)**

Like the CDD, AF/XOR may direct a MAJCOM/Agency to develop a CPD although sponsors will, in most cases, have developed an ICD Stage I/ICD Stage II, and CDD prior to development of CPD.

#### **A3.11.1 CPD Strategy Development Initiated**

AF/XOR approves the requirements strategy before initiating the CPD. The requirements strategy lays the foundation for CPD development and supports the Production and Deployment Phase for a single increment. The sponsor, along with operators, continues the collaboration initiated in CDD development with Air Force acquisition, test, and logistics communities (and other appropriate SMEs). Strategy development includes the sponsor's interaction with other Services and agencies (as required), including the appropriate lead FCB working group. The sponsor applies lessons learned, findings of design reviews, test results to refine performance attributes for a single increment. The requirements strategy establishes operational performance expectations for the capability to be produced and fielded.

#### **A3.11.2 CPD Development**

- [CPD Template](#)

Again, the HPT is the preferred method to develop a CPD and is used unless waived by AF/XOR at the RSR.

The CPD supports Milestone C and is developed after the Design Readiness Review (DRR). The CPD must be approved before Low Rate Initial Production (LRIP) and Initial Operational Test & Evaluation (IOT&E).

### **Capability Production Document (CPD)** Review Procedures/Checklist and Lessons Learned

#### *Para 6 - System Capabilities Required for the Current Increment*

- This section is of primary importance during tester review
- Note: The CPD must be written to the *current* increment – that is, regardless of how the program has defined it, the portion of the program about which the fielding or production decision is about. So if the program says they are fielding Spiral 1.0 of Increment 1, the CPD must be written strictly to Spiral 1.0 as this is what will be operationally tested.
- AFI 10-601 also governs this section
  - Increases requirement by adding KSA's (key system attributes)
  - If this section contains an effectiveness requirement that includes reliability it should be commented on. Not having a separate reliability requirement makes it difficult for AFOTEC and DOT&E to assess suitability. It can also confound the T&E results by allowing a low reliability to be compensated by high effectiveness. This can cause problems down the road leading to additional testing.
  - Review this section making sure only a minimum number of requirements are KPPs. Failing KPPs in test is bad for the program and threshold/objective requirements leave the contractor with room for trade space, which will impact testing.
  - The Requirements Correlation Tables (RCT's) must include paragraph numbers and rationale with analytical references.

- ❑ Attributes should be validated for testability and check rationale with analytical reference.
  - Review this section for requirements that include *All*, *100%*, or even *99.9%* as these have proven difficult if not impossible to test.
- ❑ Know the difference between KPP / KSA / Attribute (AFI 10-601).
- ❑ Performance attributes apply only to a single increment so ensure testing can be accomplished on current planned increment.
- ❑ Follow on increments require new CPD.

CPD not typically updated.

*\* There are now several mandatory KPPs including net-readiness, survivability, and force-protection.*

## 4. REVIEWING PROGRAM MANAGEMENT DOCUMENTS

**A4.1.** Direction and policy for developing PMDs is in Headquarters Operating Instruction (HOI) 63-1, *Headquarters Air Force Guidance for Preparing Program Management Directives*, 20 Nov 03. This document is designed to point out areas of the PMD that are of special interest to the test community as well as highlight areas that have been problematic in the past.

**A4.2. Section II, Program Information:** This table should be checked for accuracy with special attention paid to the following blocks.

**A4.2.1. Item m, System Survivability:** The information in this block must be based on the definition of covered systems or covered product improvement programs as spelled out in Title 10 §2366 and DODI 5000.02. Not all systems and modifications used in combat require survivability testing and could be inadvertently subjected to unnecessary OSD T&E oversight depending on how program direction is worded. Check if the system will be used in combat (as stated in the operational requirements) and consult with the program office and users to be sure if LFT&E rules apply.

**A4.2.2. Item u, OT&E Agency:** This block must identify all organizations that will be conducting operational testing. Each organization listed must have a respective paragraph in Section III that states which kind(s) of “operational testing” will be conducted as defined in AFI 99-103.

**A4.2.2.1** At a minimum, AFOTEC will always be listed unless a non-involvement decision has been made in which case the OT&E agency listed will be the organization documented in the AFOTEC non-involvement letter.

**A4.2.2.2** For systems in sustainment undergoing multiple modifications, more than one type of operational testing involving more than one operational test organization may be required. In this case each organization should be listed.

**A4.3. Section III, Program Specific Management Direction:** This block must separately address each of the acquisition programs or modifications embedded in the PMD. Each program or modification is different and has specific T&E requirements to support various senior leader decisions (e.g., fielding, full-rate production (FRP), continue development, or declare IOC). Lumping all programs or modifications together is unsatisfactory because T&E organizations and responsibilities may vary for each one, and key decisions are different for each one.

**A4.3.1.** The PMD must direct the program office and the operational tester (i.e., AFOTEC or MAJCOM tester) to co-chair the integrated test team (ITT). The term “test plan working group” is no longer used. Multiple programs or modifications may come under a single ITT (e.g., the same ITT could have charge of all programs in the PMD). The ITT must:

**A4.3.1.1.** Design a T&E strategy that uses integrated testing as much as possible.

**A4.3.1.2.** Write a test and evaluation master plan (TEMP) if required. Small programs or modifications may not require a TEMP.

**A4.3.1.3.** Identify the responsible test organization (LDTO) if one has been selected.

**A4.3.2.** The PMD should state if acquisition programs will use an evolutionary acquisition (EA) strategy. These programs will be in multiple phases of development at the same time, thus a more complex T&E strategy will be required. If the PMD covers multiple increments of a program, the operational tester for each increment must be clearly stated.

**A4.3.3.** Tester involvement must be clearly directed for each program or modification according to AFI 99-103. Simply citing “OT&E” is inadequate because there are numerous types of operational tests that could be conducted. One or more operational test organizations (as spelled out in Section II, item u) may be directed to conduct specific types of operational tests such as IOT&E, QOT&E, FOT&E, MOT&E, OUE, and FDE.

**A4.3.4.** All required testers and their T&E activities must be logically integrated and support each program or modification with the right kinds of tests at the right times for that particular phase of system development. You may need to check the T&E Strategy, TEMP, or individual test plans to figure this out.

**A4.3.5.** Operational testing with an evaluation is required if the system will be fielded or go to FRP. If AFOTEC is not involved, MAJCOMs must be directed to conduct operational testing to support a FRP and/or fielding decision. Check the kinds of decisions supported, and check with AFOTEC about their involvement in each program or modification.

**A4.3.6.** The words “as required” must not be used when directing testing because they are vague and promote indecision. A specific kind of operational testing must be clearly directed. Using “as required” could allow test organizations to “move the goal posts after the ball is kicked.”

**A4.3.7.** If used, the LDTO must be listed. LDTOs must be government T&E organizations identified in accordance with AFI 99-103 and MAJCOM guidance.

**A4.3.8.** Participating test organizations (PTO) and their roles must be listed.

**A4.4. Distribution List:** Check the distribution lists to ensure AF/TEP and other testers that have responsibilities listed in the PMD are included.

**A4.5.** Remember, the overarching goal is to ensure that T&E logically supports the acquisition program or modification, and that T&E is as integrated as possible.

## **5. INTEGRATED TEST TEAMS (ITT) AND ITT CHARTERS**

**A5.1. Overview.** The ITT is the overarching test management team that is co-chaired by representatives from the program office and the lead operational test organization. It is responsible for the T&E grand strategy that supports the program’s acquisition process. The ITT must begin building the overall T&E strategy during the Concept Refinement and Technology Development Phases well before a program is officially started at Milestone B. If these early

phases are bypassed, the ITT must come together as soon as the new program is identified so that key T&E decisions can be made and strategies developed. Overarching direction and policy for forming ITTs and developing ITT charters is in AFI 99-103, *Capabilities-Based Test and Evaluation*, paragraphs **1.4**, **3.14**, and **4.4**.

**A5.2. General Guidance.** The ITT charter must establish the working relationships among people so they can work together efficiently as a team. It must create a partnership between the program manager (PM), the testers, and other organizations needed to support T&E and the acquisition program. The ITT charter should be short (i.e., 10 pages or less), focused on organizational responsibilities, non-controversial, and free of extraneous material that could delay coordination. It should be completed as soon as the need for an ITT becomes evident so the ITT can begin working together as early as possible. All potential organizations should assign temporary members to early ITT meetings until permanent members are designated.

**A5.3. ITT Charters, Structure, and Members.** A formal, signed ITT charter will describe ITT membership and structure, responsibilities, ITT resources, and the products for which the ITT is responsible. ITT charters must properly balance two highly important mandates: ensuring each organization's needs are properly represented; and providing the acquisition program with responsive, high quality T&E inputs. Since acquisition programs vary so much in size, content, and complexity, the ITT's membership and structure must be tailored to fit the particular conditions of individual programs, organizations, and other contingencies. Well-written ITT charters will help achieve all these factors.

**A5.3.1. ITT Structure.** The ITT will tailor their membership, structure, and protocols as necessary to help ensure program success. To achieve flexibility and efficiency, the ITT may decide to use **two levels**, such as an Executive Level consisting of O-6s and GS-15s and a Working Group Level consisting of necessary experts to fulfill ITT. See Figure A5.1 below. Only the key organizations would be at the Executive Level as agreed at the initial ITT startup meeting. Such a tiered approach would permit the Executive Level to meet less frequently (i.e., every six months) while allowing the Working Group level to handle day-to-day operational and tactical matters with more frequent meetings (i.e., monthly). One or both of these management levels may be most appropriate to deal with the issues and tasks at hand. For example, the Executive Level should handle policy and strategic issues, document approvals, etc., and the Working Group Level would write test documents such as the TEMP. Figure A5.1 shows a notional ITT structure.

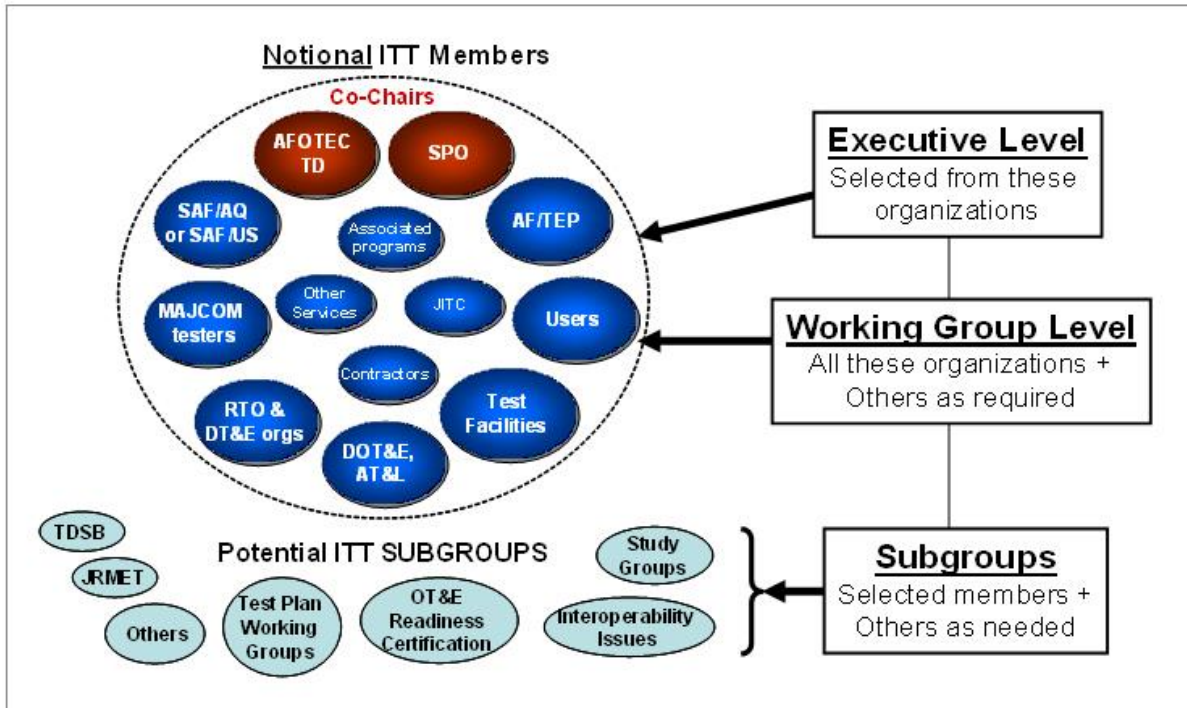


Figure A5.1 Notional ITT Structure and Members

**A5.3.2. The Executive Level.** A limited number of key organizations to provide overall direction and sign the ITT charter at the O-6 or GS-15 level. These signatures should not exceed the O-6 or GS-15 level. Limiting the level and number of signatories to the charter will speed up coordination and approval and focus on the key organizations. Signing above this level may be counter-productive if imbalances are created among Executive Level members and/or coordination is delayed.

**A5.3.3. The Working Group Level.** Working Group Level organizations are not signatories on the ITT charter, but will be accountable to and receive their authority through their Executive Level member (if they have one). This does not mean Working Group Level members are less valuable. On the contrary, they bring special skills and technical expertise to the ITT that Executive Level members may not have.

**A5.3.4. Subgroups.** The ITT may create any number of permanent or temporary subgroups to accomplish specific tasks. Test integrated product teams (TIPT) can be assigned for writing test plans, combined test forces (CTF) for test conduct, working groups for test readiness reviews and test data reviews, and study groups for specific issues and problems.

**A5.3.4.1.** The ITT charter should very briefly describe which subgroups will be formed (if known) and outline their functions. Do not embed charters for any subgroups in the ITT charter because they could unnecessarily complicate and delay the ITT charter's coordination. Additional subgroups are permitted as the circumstances warrant.

**A5.3.4.2.** The ITT construct is not the same as the CTF construct. Depending on the program, some CTFs may operate more or less independently from the ITT, but the ITT and CTF must work collaboratively in these cases. The Joint Strike Fighter CTF is an example. Some ITT members may also be part of a CTF or TIPT due to the limited number of personnel available. Management of T&E from an ITT perspective will be different than conduct of T&E at the CTF level.

**A5.3.5. Member Organizations.** ITT membership (at the Executive Level and Working Group Level) may vary depending on program needs. The ITT should include expertise from the organizations listed in AFI 99-103, paragraph 4.4.3. Potential member organizations are listed at the 2-letter level only to indicate the type of expertise from anywhere within that organizational context. The intent is to allow these organizations flexibility to select their best qualified representatives. The ITT does not require anyone higher than an O-6 or GS-15 to attend. Thus, AFOTEC may select their Executive Level representative (an O-6 or GS-15) from AFOTEC/XP or XO or AFOTEC, Det 5/CC, and select someone else for the Working Group Level. HQ USAF/TE will select an O-6 for the Executive Level and an AF/TEP action officer for the Working Group Level. Include or exclude organizations as appropriate.

**A5.3.6. Multiple Programs Under a Single ITT.** To create greater efficiency, a single ITT may cover a number of related acquisition and/or sustainment programs. For example, an aircraft system may have many ongoing modifications from small to very large, each of which requires separate test plans and test activities. A single ITT could cover all these sub-programs to ensure more efficient allocation and scheduling of limited T&E resources. Another example could be to charter an ITT to manage T&E for a family of systems or a group of similar information technology (IT) systems. If these programs have similar or interoperable components, then a single “umbrella ITT” may be the proper venue for managing T&E for all. In each case, the ITT’s span of control should be tailored to its capacity for overseeing the T&E grand strategy and assigning responsibilities to subgroups. To conserve resources, attendees should consider using video or telephone conferencing capabilities when appropriate.

**A5.4. Avoid Duplication.** The ITT Charter should not duplicate the contents and direction cited in other T&E documents such as the TEMP, test plans, or AFIs, but only reference them for the sake of brevity. The primary focus should be on items or tasks that are generally not suitable for a TEMP, test plan, or AFI. It must address the tasks that AFI 99-103 and the DOD 5000-series leave to the discretion of PMs, testers and others, and any other unique attributes of the program. The ITT charter should not be another list of previously published roles and responsibilities, nor should it include details about how the system will be tested. Extraneous materials, such as lists of items beyond the discretionary control of ITT members, should not be attached to ITT charters. If there is any doubt about including any material in the charter, leave it out and place it in more appropriate documents.

**A5.5. Conflict Resolution.** When ITT members disagree on problems or issues, they should broker agreements in the spirit of compromise for the good of the program. If an agreement cannot be readily reached, the conflict resolution flowchart shown below in Figure A5.2 should be used. If the co-chairs cannot resolve the issue within the ITT, the issue should be raised to the

organizational leadership for resolution. In all instances the ITT will comply with governing guidance and directives.

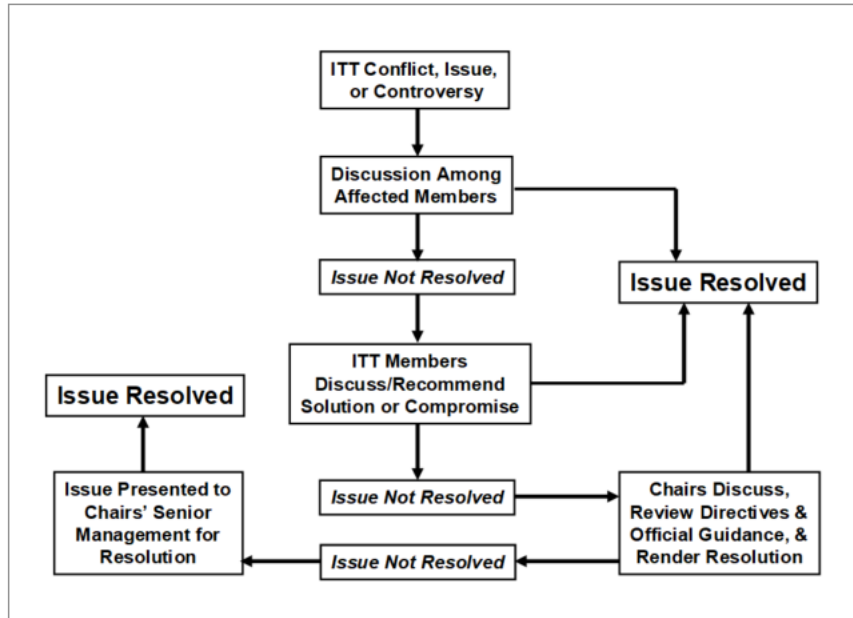


Figure A5.2 Conflict Resolution Flowchart

**A5.6. Recommended ITT Charter Outline.** The following outline covers the primary subject areas for an ITT charter. The charter should concisely cite information necessary to understand the program and how the ITT will support that program. This list is not all-inclusive and may be modified as necessary.

ITT Charter for the XXX Program

(Recommended)

### Introduction.

**Program(s) Covered.** List the program(s) the ITT will oversee and give a brief history of the ITT since program inception. If this is a standing ITT, list when additional programs were added to the original ITT charter.

**Authority.** Cite the document(s) directing formation of the ITT and its responsibilities such as:

- AFI 99-103
- Acquisition Decision Memorandum or other documents directing formation

**Program Description.** Briefly describe the program(s) covered by the charter.



- **Other Key Program Information.** Acquisition category (ACAT); on OSD T&E Oversight List; etc.
- **Acquisition Strategy Overview.** Briefly describe the acquisition strategy and how the test and evaluation (T&E) strategy supports it.

**ITT Mission, Scope, and Overarching Goals.** Outline the reasons for having the ITT (reference AFI 99-103, paragraph 3.14).

**ITT Membership and Responsibilities.** List the ITT member organizations and how they will support development of the T&E strategy and other T&E matters. Build on the list of responsibilities in AFI 99-103 (but don't repeat them), and list those that are unique to this ITT and program.

- **System Program Office (SPO).**
- **Operational Test Organization.** This is AFOTEC unless it has been determined (IAW AFI 99-103) they will not be involved in conducting operational testing. AFOTEC will be involved with all ACAT I, ACAT II, and OSD Oversight programs until the AFOTEC Involvement Determination Process determines otherwise. Operational testers from the other Services and relevant Air Force MAJCOMs should also attend.
- **Lead Developmental Test & Evaluation Organization (LDTO).** DT&E community representatives should attend early meetings until the LDTO is formally designated. Various sources are available such as the appropriate Product or Logistics Center Test Authority (CTA), or as designated by AFMC/A3F, or the Test Representative from the DT&E test organization most likely to conduct government DT&E.
- **Associated System Program Offices.** List any SPOs for associated systems that must be interoperable with the chartered system(s).
- **MAJCOM Operational Test Organization(s).** MAJCOM attendance is required if AFOTEC is not the designated operational tester, and may attend at their discretion if AFOTEC is the designated operational tester. As the program progresses, a transition from AFOTEC to MAJCOM should be anticipated and planned for.
- **Participating Test Organizations (PTO).** Describe how JITC, AFC2ISRC, etc., will support the program's T&E activities.
- **Operational User(s).** Assist with clarification of JCIDS documents and the development of CONOPS, strategies, and other operational plans.
- **HQ USAF Offices.** Describe how AF/TE, AF/XO, SAF/AQ or SAF/US, SAF/XC, and others as required will support the ITT's efforts.
- **OSD Offices.** Describe how DOT&E, USD(AT&L) and others as required will support the ITT's efforts.

**Formation of Sub-Groups.** Briefly describe the ITT subgroups that will support or conduct T&E such as CTFs, study groups, writing teams, data scoring boards, certification boards, etc. These groups will likely draw upon the same members and organizations as the ITT, but

will have distinctly different functions and may have their own charters. Do not embed these charters within the ITT charter.

**Administrative Matters.**

- Frequency of Meetings
- Attendance
- Meeting Minutes
- Action Items

**ITT Charter Updates.** Review the ITT charter for currency soon after each milestone or major decision review, for each new increment that is started, and when additional associated systems are added to or taken from the ITT.

**Coordination and Signatures.** The level of signature on the ITT charter should generally be at the O-6 or GS-15 level.

**Conflict Resolution.** Describe how conflicts will be resolved according to Figure A5.2.