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This publication implements Air Force Policy Directive (AFPD) 63-1/20-1, *Integrated Life Cycle Management* and Air Force Instruction (AFI) 63-101/20-101 *Integrated Life Cycle Management*. This Department of the Air Force Pamphlet (DAFPAM) provides guidance and recommended procedures for implementing Integrated Life Cycle Management (ILCM) for Department of the Air Force (AF) personnel who develop, review, approve, or manage systems, subsystems, end-items and services (referred to as programs throughout this document) procured under Department of Defense Directive (DoDD) 5000.01, *The Defense Acquisition System;* DoD Instruction (DoDI) 5000.02T, *Operation of the Defense Acquisition System*; DoDI 5000.02, *Operation of the Adaptive Acquisition Framework*; DoDI 5000.74, *Defense Acquisition of Services*; DoDI 5000.75 *Business Systems Requirements and Acquisition*; DoDI 5000.80, *Operation of the Middle Tier of Acquisition (MTA)*; DoDI 5000.81, *Urgent Capability Acquisition*, DoDI 5000.85, *Major Capability Acquisition* (collectively called the DoD 5000 acquisition series). Additional non-mandatory guidance on best practices, lessons learned, and expectations are available in the *Defense Acquisition Guidebook*. To ensure standardization, any organization supplementing this publication should send the implementing publication to SAF/AQX for review and coordination before publishing. This publication applies to all military and civilian AF personnel, including Air Force Reserve (AFR) units and the Air National Guard; other individuals or organizations as required by binding agreement or obligation with the Department of the Air Force (DAF). This publication applies to the United States Air Force and the United States Space Force (USSF) until such time as USSF publications are published. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction (AFI) 33-322, *Records Management of Information Governance Program*, and are disposed in accordance with Air Force Records Information Management System.This DAFPAM should be periodically reviewed and updated to reflect changes in overarching policy

directives and incorporate suggested comments from the field. Refer recommended changes and questions about this publication to SAF/AQXS using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s from the field through Major Command (MAJCOM) publications/forms managers. Forward all comments regarding this DAFPAM to: **usaf.pentagon.saf-aq.mbx.saf-aqxs-policy-workflow@mail.mil**

*SUMMARY OF CHANGES*

This revision includes significant updates to the Acquisition Strategy, Acquisition Program Baseline (APB), and Item Unique Identification (IUID) sections to reflect current processes. The revision also adds new sections on Financial Improvement and Audit Remediation (FIAR) activities, and appendices on development planning, engineering certifications, and human system integration.  Updates were made throughout the publication to reflect organizational and fact-of-life changes.

**Chapter 1**

**INTEGRATED LIFE CYCLE MANAGEMENT**

**1.1.  Purpose and Applicability of DAFPAM 63-128.**  The intent of this pamphlet is to provide a single source for descriptive, vice directive, guidance. It expands upon the directive requirements in AFI 63-101/20-101 and instead conveys expectations, best practices, lessons learned and other descriptive information to help a Program Manager (PM) initiate and expedite the development and delivery of systems. The DAFPAM also helps define the interrelationships between the PM and other functional areas throughout the life cycle. All members of the acquisition and sustainment community should use this document in partnership with higher level guidance previously cited, other DAFPAMs and the Defense Acquisition Guidebook to facilitate program success. The terms "weapon" and "weapon system" are used in this document to represent all systems managed through Integrated Life Cycle Management.

**1.2.  Program Execution Responsibilities.**

1.2.1.  Service Acquisition Executive (SAE). The term "service acquisition executive" means the civilian official within a military department who is designated as the service acquisition executive for purposes of regulations and procedures involving acquisition and sustainment for that military department. For purposes of defining SAE responsibilities, this includes life cycle management of systems and services processes from Materiel Development Decision (MDD) to weapon system retirement. This includes research, development, test, evaluation, production, delivery, and sustainment of new systems using any pathway (traditional, Middle Tier of Acquisition, software, etc.), and modifications and support of existing systems. For Acquisition Category (ACAT) ID programs, the Milestone Decision Authority (MDA) is the Defense Acquisition Executive (DAE). For ACAT IC/IB the MDA is the SAE. The acquisition chain of command responsibility should flow directly from the (MDA) (who could be the DAE, the SAE, the PEO or another qualified individual) to the PM. Management responsibility flows directly, without intervention, from the MDA to the PEO to the PM, unless directed differently by the MDA in an Acquisition Decision Memorandum (ADM).

1.2.2.  Program Executive Officers. The PEO is responsible for total life cycle management of activities in their assigned portfolios, ensures collaboration across the ILCM framework, and is the MDA for delegated programs. The PEO conducts activities identified within the following core areas:

1.2.2.1.  Portfolio Oversight. A key role of the PEO is to collaborate and achieve balance between the acquisition, requirements, test, and resource communities for all programs in the portfolio and throughout the life cycle. This is supported by maintaining a continuous dialogue with the operational, test, lead, and implementing commands. The PEO seeks to establish an environment promoting steady progress in process efficiency/effectiveness improvements and overall reduction in program total ownership costs across the portfolio. The PEO is also responsible for ensuring compliance with status and regulation to include programs compliance with Financial Improvement and Audit Remediation (FIAR) processes. The PEO evaluates the portfolio to ensure it is aligned with integrated architectures, implements solutions to support the business and mission need, and looks

for opportunities to optimize programs by identifying gaps and redundancies within the portfolio. The PEO continuously assesses portfolio health to identify programs with programmatic issues and implement solutions based on best practices and lessons learned.

1.2.2.2. Program Oversight. The PEO has an active role in the definition and development of program strategies in order to ensure operational needs are translated into affordable and executable programs, while identifying and managing risk and ensuring programs are accurately tracking their assets. As part of oversight, the PEO evaluates trade-offs made early in the life cycle and their impact on achieving affordability targets within current fiscal reality. The PEO also monitors the programs' collaboration with the warfighter on technical feasibility, alignment of programs with overall AF priorities, and cycle time (evolutionary acquisition) to meet a changing threat. The PEO evaluates programs' efforts to reduce cost as an integral component to overall strategy and execution throughout the life with an emphasis on reducing O&S costs. This often includes monitoring requirements baseline control creep and schedule (a critical requirement on par with performance and life cycle cost). The PEO looks to maximize competition throughout the life cycle and recommends appropriate resources and strategies early in the acquisition providing the PM maximum flexibility across the life of the program. If competition is facilitated, prices are usually lowered, small business participation is often enhanced, and new technologies and innovation can benefit the warfighter. By continuously assessing individual programs, as well as overall portfolio strategies, the PEO may be able to identify requirements, performance, accountability, and schedule adjustments resulting in benefits to the warfighter, program, or portfolio.

1.2.2.3. PM Oversight. The PEO charters or assigns PMs with the appropriate responsibilities and authorities to execute to an agreed baseline. The PEO is able to promote a more efficient and effective workforce by fostering an environment that relies on a PM's judgment and creativity, eliminating unnecessary functions and management layers, concentrating core functions at appropriate levels, and consolidating related functions like FIAR compliance into program processes. By assigning PMs with the appropriate functional skills and experiences based upon risks, priorities, incorporating processes that are compliant, and utilizing flexible personnel management approaches, the PEO can minimize turbulence on critical programs and ensure tenure of critical personnel to enhance execution performance and accountability.

1.2.2.4. Business Intelligence. Another important role of the PEO is to understand the portfolio from the contractor perspective by maintaining knowledge of prime and major subcontractor efforts within the portfolio. This knowledge often needs to be at the contractor business segment level or the facility level to maintain adequate insight into the corporate activity of primes/major subcontractors including corporate leadership, incentives, and financial health. Understanding their corporate counterparts forms the basis for bargaining for advantage and building common goals. The PEO also maintains awareness of other AF and sister service PEOs with program content within the same contractor/business segment portfolio(s) in order to identify shared concerns, seek opportunities for leverage, develop informed positions of contractor performance of his portfolio, and help facilitate PM awareness and insight. Additionally, the PEO often seeks out the Defense Contract Management Agency (DCMA) and Defense Contract

Audit Agency (DCAA) perception of contractor performance at department, service, PEO, and program levels in order to leverage awareness of subcontractor performance gained by programs across the department.

1.2.3.  PM. The PM is responsible for integrating all program activities and constraints into an affordable, executable, and effective program to deliver the required capability to the warfighter. The PM balances multiple requirements levied upon the program including performance, schedule, cost, statue, compliance, oversight, and documentation requirements to achieve program objectives while minimizing risk. The PM properly allocates and utilizes program resources including time, budget, manpower, and directs the path forward to complete the program. To be successful, the PM is knowledgeable of all higher level guidance, organizational opportunities and constraints, financial conditions, user expectations, and technological opportunities and limitations that may impact the program. The PM is the connection between the user, oversight authorities, and the program management office to manage expectations and guide execution of the program. For more information, detailed PM requirements are covered in AFI 63-101/20-101, but some general rules and expectations are covered below.

1.2.3.1.  Communication. The PM communicates all aspects of the program to stakeholders. To do this, the PM takes a comprehensive look at all aspects of the program by communicating with all personnel who touch the program including, but not limited to operators, maintainers, functional experts, contractors, oversight authorities, and program office personnel. The PM is able to take this knowledge and communicate with individuals and organizations that are totally unfamiliar with the program by simplifying and eliminating unique "jargon." This allows the PM to position the program in the best possible light and use established communication lines to all stakeholders.

1.2.3.2.  Trust. The PM generates trust, both horizontally and vertically, and is transparent and forthcoming in everything said and done. The PM guards against even the slightest appearance of integrity lapses to maintain the trust and confidence of mission partners and stakeholders. The PM acts and makes decisions with the best interests of the program in mind and treats contractors, staff, and stakeholders in a forthright manner.

1.2.3.3.  Control. The PM controls the program through decision making; factually supported by clear and complete knowledge of the program; and ensuring accountability of resource expenditures. The PM is action oriented and delegates decision making as appropriate to ensure the program office operates effectively.

**1.3. ILCM Purpose.** As the world's premier global, multi-dimensional maneuver force, the DAF safeguards the United States and its interests by maintaining technical, air, space, and cyberspace superiority. The goals of ILCM are to recapitalize DAF capabilities through maximum acquisition cycle time efficiency, provide agile support by optimizing fielded capabilities and the supply chain, minimize the logistics footprint, and reduce total ownership cost. Critically important is the assurance these new capabilities are acquired and sustained without duplication and overlap in acquisition, procurement, and sustainment. Synergy across the enterprise is imperative as the DAF invests in the future through recapitalization, which includes any combination of new development, refresh, and overhaul through the ILCM process.

**1.4. ILCM Framework.** ILCM is the overarching system of concepts, methods, and practices used by the AF to effectively manage systems from need identification through final disposal and

should be applied to AF acquisition and sustainment activities. ILCM is composed of seamless and transparent governance and core and enabling processes to acquire and sustain systems, subsystems, end-items, and services to satisfy validated needs. The framework provides an overarching management structure integrating across multiple dimensions, systems, portfolios, and management levels in order to effectively influence and execute life cycle decisions in response to capability shortfalls. The ILCM tenets outlined below provide the governing management principles necessary for the execution of the ILCM Framework. The Acquisition Process Model at **https://www.afacpo.com/apm/** highlights these concepts.

**1.5. Key Leadership ILCM Tenets.** There are a number of leadership tenets that can be applied to programs, but these tenets are mentioned in many acquisition documents discussing ILCM. These tenets are life cycle planning and integration; expectation management; collaborative and continuous requirements management; life cycle systems engineering; technology planning and insertion; continual, integrated testing; and outpacing adversary threats. These leadership tenets are highlighted in **Figure 1.1** Enabling principles necessary for successful application of the ILCM tenets are listed.

**Figure 1.1.  Leadership Tenets of ILCM.**
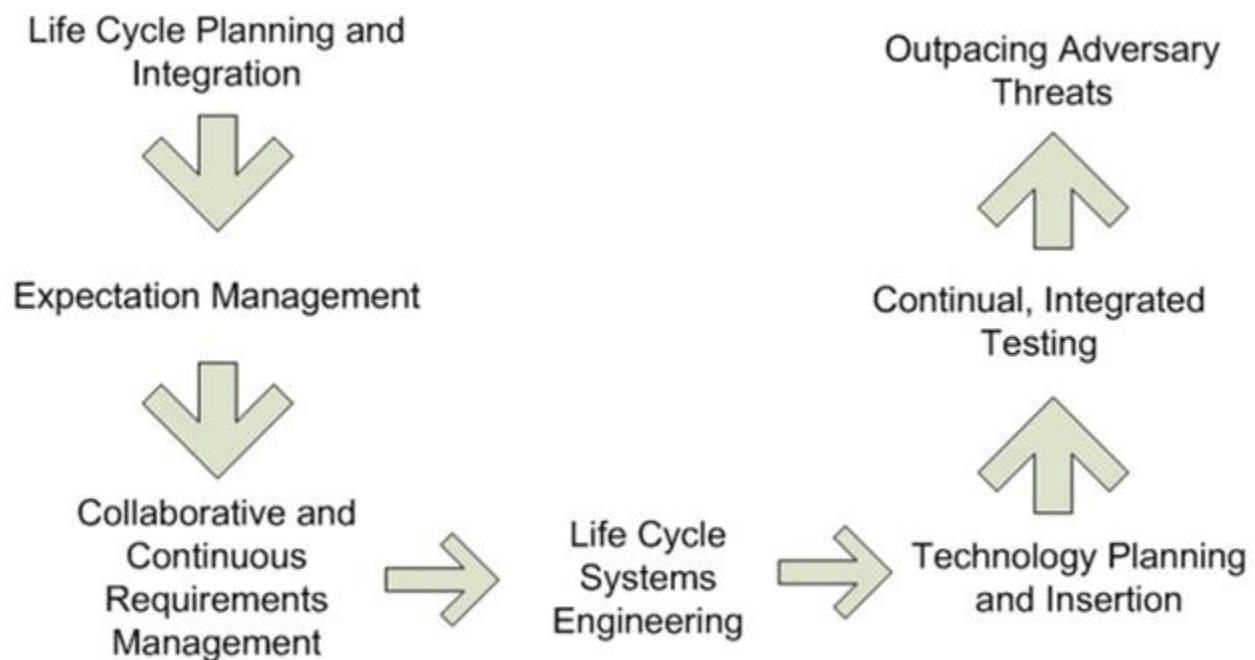


1.5.1.  Life Cycle Planning and Integration. ILCM ensures the program is actively managed, accounting for all resources to ensure FIAR compliance, throughout its entire lifespan, from conception and requirements generation, to technology and product development and testing, and throughout manufacturing and field operations until the system or product is retired and disposed. Three major parallel management and execution structures support life cycle planning and integration: Capabilities Based Requirements Development, System Acquisition and Sustainment, and Capabilities Based Test and Evaluation. This execution framework provides a roadmap for the ILCM stakeholders and process owners to use in the integrated management of programs across their entire life cycle.

1.5.2. Expectation Management. Expectation management establishes program credibility and accountability through formal, recurring communication among stakeholders and is the cornerstone of the ILCM process. Significant reasons to actively manage expectations are 1) developers, users, and sustainers often interpret requirements differently, 2) program changes occur throughout development and are not always documented with impacts to cost, schedule, performance, and risk affecting end-item deliverables, 3) different users may have different views of probability of success, and 4) expectations can drift apart over time through leadership/personnel changes.

1.5.3. Collaborative and Continuous Requirements Management. Collaborative requirements development requires the user, acquirer, enterprise architect, developer, tester, and sustainer to operate as one team. Continuous management is monitoring and controlling the weapon system or services requirements baseline throughout the program life cycle. While the user is responsible for identifying the required capability, this should be accomplished in a collaborative environment with all stakeholders in order to understand and communicate the "art of the possible." The Joint Capabilities Integration and Development System (JCIDS) process identified in CJCSI 5123.01H, *Charter of the Joint Requirements Oversight Council (JROC)* and Implementation of the Joint Capabilities Integration and Development System (JCIDS), is closely integrated with the acquisition process and exists to identify, develop, and validate defense-related requirements

1.5.4. Life Cycle Systems Engineering. Life cycle systems engineering is the overarching process governing the transition from a stated capability need to an operationally effective and suitable system. Systems engineering addresses architecture, requirements development and management, design, systems and software security, technical management and control, and test and evaluation (T&E)/verification and validation (V&V). It is the integrating mechanism for balanced solutions. The systems engineering process begins early in concept definition and covers all efforts across all life cycle phases, to include sustainment and disposal.

1.5.5. Technology Planning and Insertion. Technology planning and insertion is the timely maturation and incorporation of relevant technology throughout the program life cycle ensuring an operationally effective and suitable system. Technology planning and the assessment of technology readiness levels include consideration of such factors as reliability, producibility, testability, sustainability, and operational performance. Successful technology planning and insertion, as part of program life cycle management, results in higher fidelity time phased requirements with a more realistic schedule and improved cost estimates.

1.5.6. Continual, Integrated Testing. Continual, integrated testing structures to reduce the time it takes to field effective and suitable systems by providing qualitative and quantitative information to decision makers throughout the program's life cycle. Integrated testing minimizes the distinction between contractor, developmental, and operational testing by implementing integrated testing techniques and objectives to the maximum extent possible. Key stakeholders share all information in open T&E databases, identify problems early, engage contractors to fix deficiencies sooner, and ensure systems are ready to enter dedicated operational testing and fielding with a high probability of success.

1.5.7. Outpacing Adversary Threats. Based on the 2018 National Defense Strategy emphasis on competition in highly contested environments, continuous monitoring of current and

emerging threat capabilities is critical to fielding relevant and effective weapon systems. Threat monitoring enables proactive performance risk mitigation. Design, development, acquisition, testing, and sustainment activities informed by current threat information and projections ensure viable weapon systems are available to meet warfighter needs.

**1.6. ILCM Principles.** The seven guiding principles of Integrated Life Cycle Management are balance, responsiveness, credibility, streamlined and efficient management, innovation, collaboration, and affordability/reduced ownership costs. Stability is an enabling principle not fundamental to ILCM, but it enhances the acquisition process.

1.6.1.  Balance. When practical, the goal is to balance the basic elements of acquisition - cost, schedule, and performance as well as the remaining ILCM principles to provide a balanced capability that meets an operational need. Additionally, the user community may be required to balance near-term needs with long-term needs.

1.6.2. Responsiveness. Speed matters. The ILCM community needs to be responsive to warfighters' needs and be able to provide timely, accurate, and complete information to decision makers.

1.6.3. Credibility. Credibility in the way the ILCM community does business is essential. The ILCM community creates and maintains realistic expectations by applying expertise for accurate and transparent communications with accurate and audit compliant processes. This is true between the program offices and the warfighters for whom the systems are being developed, the PM and the MDA and other senior acquisition officials. All stakeholders involved in a program know what is and is not achievable, and the potential risks involved.

1.6.4. Streamlined and efficient management. The ILCM community develops and implements initiatives to streamline and improve management strategies. Acquisition and life cycle strategies are to be flexible to fit the conditions of the particular weapons systems program. Specific process requirements have to 1) make sense in the context of the program and 2) contribute something worthwhile to the process.

1.6.5. Innovation. Innovation in what the ILCM community does - the ILCM community adapts the best practices they find both in and outside of government to their needs; however, innovation does not mean adapting every practice in the name of change. Innovation in what the ILCM community delivers - the ILCM community finds ways to incorporate technologies expeditiously, both into our weapons systems and into the acquisition, sustainment, and maintenance processes.

1.6.6. Collaboration. Collaboration and teamwork is required from the very beginning and continues throughout the life cycle. The warfighting, requirements, scientific and technical, testing, sustaining, and development communities should work together. A program having requirements that cannot be acquired or tested makes no sense. Furthermore, an acquisition strategy that ignores the needs of the warfighter, operations, support needs, and program costs is detrimental to the overall mission.

1.6.7. Affordability and Reduced Ownership Costs. The right systems to meet validated needs are those affordable over their expected life. In 2017, the DoD IG reported that from 1998 to 2015, DoD had $21 trillion dollars of unaccounted transactions. The ILCM community has to remember that the decisions made up front generally drive costs for a long time in the future, and programs are accountable to ensure all transactions are properly

accounted. Financial audits of Air Force programs are being performed each year until Air Force has demonstrated that its processes are FIAR compliant. PMs, working with the PEO, may make adjustments in design to account for future sustainment concerns, and at times, it may make sense to save the modifications for later. The ILCM community keeps a total force view on priorities and funding – budgets are not treated as an allowance that should be spent, or money that can be adjusted as needed. Programs should stand the test of a balanced consolidated financial statement. These are tax dollars, so affordability, accountability, and reduced ownership initiatives are national security objectives AF ILCM strives to achieve.

**Chapter 2**

**LIFE CYCLE DOCUMENTATION DEVELOPMENT**

**2.1. Introduction.** This section of the pamphlet does not replace or supersede regulatory or statutory requirements found in other documents. This pamphlet outlines procedures, processes, and guidance that are used to support the life cycle of an acquisition.

2.1.1. Acquisition policy is moving towards a new Adaptive Acquisition Framework that is currently in a state of transition. While United States Code (USC) Title 10 serves as the basis for most statutory requirements, DoDD 5000.01; DoDI 5000.02T; DoDI 5000.02; DoDI 5000.74; DoDI 5000.75; DoDI 5000.80; DoDI 5000.81; DoDI 5000.85 (and the referenced Milestone Document Identification (MDID) Tool); Federal Acquisition Regulation (FAR), as supplemented; AFI 63-101/20-101; AFI 65-501, Economic Analysis, and other guidance documents listed in this DAFPAM provide regulatory guidance are used to develop the appropriate documentation and content. Although documentation is not the same for all pathways, the intent and purpose for these policy documents are may be similar. This chapter presents key points helpful in the preparation and coordination process for life cycle acquisition development and supporting documentation.

2.1.2. All new and existing AF programs requiring Office Secretary of Defense (OSD) oversight should prepare documentation consistent with the OSD approved templates and outlines appropriate for the chosen pathway (Acquisition Strategy (AS), Life Cycle Sustainment Plan (LCSP), Program Protection Plan (PPP), and the Systems Engineering Plan (SEP), etc.). However, it is expected PMs to utilize the OSD templates, when available, when developing program documentation. Regardless of the format used to document the results, PMs ensure the content of the submitted documentation meets all applicable statutory and regulatory requirements.

2.1.3. OSD approved templates are documented in the Defense Acquisition Guidebook. Other tools provide templates for the PM to use as a starting point in the development of programmatic documentation.

**2.2.  Scoping Documentation.**

2.2.1. Documentation is initially written at a strategic level and updated with an increasing level of detail as the program matures. Documentation crafted at a strategic level provides the vehicle by which the Air Force Secretariat and OSD can provide overarching guidance, while maintaining empowerment of the implementation strategy with the PM and PEO.

2.2.2. The discussion in the documentation is limited to the information required to adequately describe the overall strategy and support the requested decision. With few exceptions, the summary information required to meet statutory requirements is incorporated into the body of the documentation, and the detailed document referenced. Attachments are minimized and essential to support the program strategy (per Defense Acquisition Guidebook). When using attachments or embedded information to meet multiple regulatory or statutory requirements, clearly identify these sections/attachments, in order to determine tailoring limitations and additional or unique coordination requirements. When determining the scope of the documentation, consider if using the documentation to address other requirements may have the unintended consequences of delaying approval.

**2.3.  Preparing the Documentation.**  The most effective approach to developing documentation is through the use of Integrated Product Teams (IPTs).

2.3.1.  The collaborative efforts of a multifunctional team results in well-written and useful documentation. In many respects, the process used to develop the documentation is as important as the documents themselves. All stakeholders are active participants in the process. This is best accomplished through the establishment of a document IPT.

2.3.2.  The document IPT, led by the PM or designated leader, develops a proposed life cycle strategy as early in the program as possible (see **Figure 2.1**). Each program may have several document IPTs with each lead dependent on the functional area each document primarily addresses/impacts. The process begins by developing drafts of the documentation appropriate for the program phase. This process could take several months, based on program complexity and the number of stakeholders involved. It is important to record the activities, issues, agreements, and comments as well as the disposition of issues and comments in order to avoid revisiting them later in the development and approval process. This record can take the form of detailed meeting minutes, comment resolution matrix, or an IPT journal.

2.3.3.  In accordance with AFI 63-101/20-101, the MDA may tailor regulatory program information requirements and acquisition process procedures contained within the respective regulations to achieve cost, schedule, and performance goals. Statutory requirements cannot be tailored, except as specified by statute. Tailoring decisions need to be documented and the ability to tailor does not remove the need to process waivers from guidance in accordance with documented procedures. Tailoring may include adjusting the level of detail, format, or timing of approval of different subject areas. Another way of tailoring is to consolidate multiple documents, for example consolidating the Acquisition Plan (AP), AS, and LCSP into one overarching document/plan. In addition to cost, schedule, and performance considerations, examination of tailoring documentation considers the complexity and scope of the program. Larger, more complex programs, for example, would likely benefit from keeping documentation such as the AS and LCSP separate, due to the amount of information and overall planning effort required for each activity.

2.3.4.  The PM considers if the documentation is planned for release to the public and/or contractors when preparing the document. Required content is not avoided or talked around, but identified for review prior to release. If the documentation contains sensitive information (such as source selection, Scientific and Technical Information ((STINFO), etc.), the documentation is reviewed and necessary sections removed, prior to releasing to the public, contractors, or to other restricted personnel (such as foreign nationals). Removed sections are clearly identified and a reference and/or Point of Contact (POC) are provided.

2.3.5.  As a result of the collaborative effort of the IPT, each version has the appropriate level of detail and emphasis. The MDA and SAE expectations are that all relevant issues have been discussed and any alternative program management, acquisition, and sustainment strategies have been explored during the preparation process. The final version of the document focuses on the best alternative for the program.

2.3.6.  Updated documentation (or amended annexes) includes a statement summarizing the changes.

**Figure 2.1.  Development Process.**
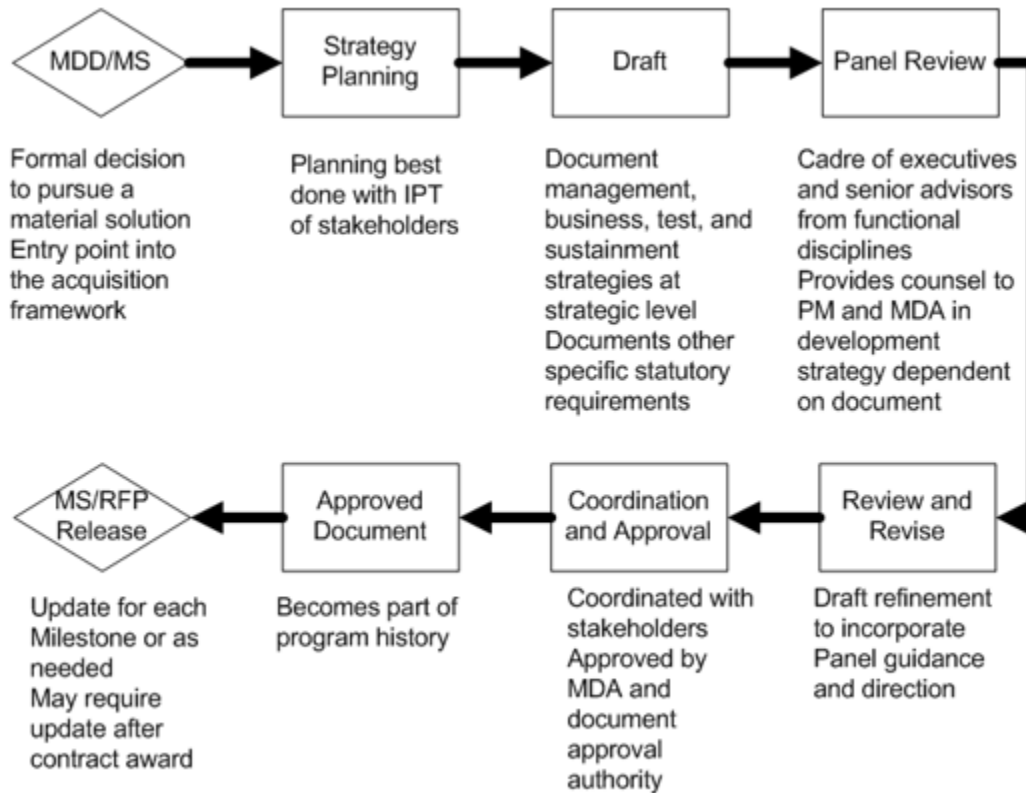


2.3.7.  When determining participants on the IPT, PMs should take into account the context of the program, the content and maturity, and the level of involvement of the functional areas and stakeholders. As a minimum, the PM considers representatives for the following functional areas on the IPT: comptroller/finance (including financial personnel, familiar with financial audit compliance), cost analysis, contracting, systems engineering (to include National Infrastructure asset requirements), nuclear certification manager for any nuclear system, human systems integration (HSI), small business, safety, occupational health, intelligence (consider information needs for both adversaries as well as friendly entities), legal, life cycle (acquisition and sustainment) logistics, acquisition and information protection (to address the Program Protection Plan and Cybersecurity), small business, test, and the Acquisition Center of Excellence (ACE) (for advice and guidance). In addition, representatives from the lead command, the primary using Major Command (MAJCOM), and the sustainment organization is invited. In most cases, the local representatives from these functional areas are adequate to start the process, but Headquarters Air Force (HAF) functional involvement in the IPT may be needed as program approaches the Acquisition Strategy Panel (ASP) decision, especially for Major Defense Acquisition Program (MDAP). For assistance in preparation for the ASP, contact SAF/AQXE or your local ACE.

2.3.7.1. The PM should have a keen sense of how standard supporting processes are integral to the program. Standard supporting processes are processes applied continuously across the life cycle from requirement generation to concept development, to system development, to fielding, to sustainment, modification/modernization, and to verification/validation. These are the working-level processes producing the critical

information that is the basis of decision-making. The level of standardization required varies by process, and is the determination of the process owner. **Table 2.1** shows an initial list of those standard supporting processes.

**Table 2.1.  Standard Supporting Processes.**

| 1. | Integration and System Engineering |
|----|-------------------------------------|
| 2. | Life Cycle Risk Management |
| 3. | Cost Estimating |
| 4. | Acquisition Intelligence |
| 5. | Test and Evaluation |
| 6. | Product Support |
| 7. | Modeling, Simulation, and Analysis |
| 8. | Identification and Management of Requirements |
| 9. | Information Protection (Cybersecurity) |
| 10. | Scheduling |
| 11. | Data Management |
| 12. | Configuration Management |
| 13. | Nuclear Certification |

2.3.7.2. The functional area representatives identified in 2.3.7 represent most of the owners of the standard processes. The PM identifies any gaps in coverage of the standard processes and adds representation to the IPT to ensure standard processes are integrated. Successful integration of these processes allow the PM and the team to enter a program with a known level of risk, develop early cost estimates refined throughout the life cycle, manage their programs more effectively, and provide consistent advice and recommendations to decision makers based upon information generated through application of these processes.

**2.4. Stakeholders.**

2.4.1. Each of the program's stakeholders is involved in the preparation process. A stakeholder is an individual or organizational entity (users, developers, acquirers, technologists, testers, budget analysts, sustainers, and industry) that is, or will be, associated with implementing and supporting the associated system, subsystem, or end-item capability requirements. This includes representation from all appropriate staff levels (Secretariat, Air Staff, OSD, etc.), MAJCOMs, Direct Reporting Units (DRU), Field Operating Agencies (FOA), as well as the local Center staff (including ACE). PMs contact the Program Element Monitor (PEM) to identify HAF-level staff elements and agencies participating in the preparation and approval process. Particular consideration is given to the functional areas (listed in the previous section on IPT membership), but the specific stakeholders are based on the individual program. In addition, representation from other participating services or governmental agencies is solicited to ensure interoperability and consistency with future joint operations. Early and continuous involvement with both operational and sustainment organizations have proven to enhance a cooperative relationship and maximize the opportunity for a successful program. The level of representation from these organizations may vary according to the categorization level of the program (e.g. ACAT, BCAT, or Tier).

2.4.2. The nature of the stakeholders' involvement in the process depends primarily on the size and complexity of the program. Not all stakeholders want to be involved from the very start. However, the PM invites them to be part of the process as early as possible to ensure active, early participation of the right mix of individuals is the real key to program success.

**2.5.  Coordination and Approval.**

2.5.1. The IPT, signature authorities, and local procedures recommend which offices coordinate on the package. All signature agencies are represented on the IPT to ensure early involvement and thus minimize coordination time during the coordination phase. Signature agencies are identified early in the acquisition planning process to ensure their participation is obtained.

2.5.2.  Step 1: Local/Internal Coordination.

2.5.2.1. As a minimum, coordination with the following "local" organizations takes place: the competition advocate, procuring contract office, the legal office, the Small Business Office, the appropriate logistics complex/organization representative, functional representatives at the program level (Product Support Manager (PSM), Chief Engineer, etc.), and the using/lead MAJCOM representative. Additionally, depending on the type of program, signatures may be required from the buying office, contracting, or Senior Contracting Official. For programs in the sustainment phase, local coordination would also be with appropriate AFMC and Space Systems Command (SSC) or (United States Space Force) USSF functional offices. Consult your center-level ACE for local coordination and approval procedures.

2.5.2.2. Once the initial documentation is completed and considered ready for coordination, the PM sends it to the PEO staff (or as instructed per local procedures). The PEO staff distributes it to local advisors for final review and comment. Once all comments are addressed to the satisfaction of the PM, the PM seeks PEO review and coordination. If Headquarters Air Force (HAF) review is required (see below), the PM prepares a HAF staff package for PEO signature.

2.5.3.  Step 2:  HAF Staff Review/External Coordination.

2.5.3.1. For ACAT I, IA, and non-delegated II programs requiring SAE approval, SAF/AQE, using the SAF/AQ workflow, is the single entry point for acquisition documentation staffing packages requiring SAF/AQ coordination or approval. The PEO and their staffs complete preliminary coordination (to include any appropriate 4-letter Air/Secretariate Staff coordination, MAJCOM or other external organization coordination, and internal coordination below the PEO level) prior to sending packages to SAF/AQ Workflow. PEOs are authorized to streamline coordination and are urged to coordinate with the appropriate stakeholders and required organizations.

2.5.3.2. Delegated sustainment programs do not require HAF coordination unless requested to address interoperability issues, meet statutory requirements, or needed to satisfy unique program considerations. If uncertain, the PM may request the PEM to assess and provide recommendations regarding HAF coordination. Following local coordination and any required external coordination, the documentation is submitted to the PEO or the designated approval authority.

2.5.3.3.  As part of the coordination process during this step, documentation is provided to HQ AFMC or Chief of Space Operations, US Space Force (USSF/CSO) in order to support enterprise planning and allow AFMC/CC or USSF/CSO (or their designee) the opportunity to make recommendations supporting milestone decisions. Note: If a program uses resources from another MAJCOM (e.g. a space program managed by AFMC resources), it should be provided to the resourcing command for information and planning purposes.

2.5.4.  Step 3: Other Statutory/Regulatory Approvals.

2.5.4.1.  Depending on the decisions requested or statutory information provided, as outlined in AFI 63-101/20-101, additional signatures may be required. For example, in procurement of conventional ammunition, the Single Manager for Conventional Ammunition (SMCA) in the Army is required to review and provide written concurrence with all DoD ASs using conventional ammunition.

2.5.4.2.  Step 4: Final Approval by the MDA. Dependent upon the MDA, PEO/SAE follows either local PEO or SAE coordination procedures. Minimum required approvals are indicated in AFI 63-101/20-101.

**2.6.  Regulatory Contracting Approval (RCA) Documents.**

2.6.1.  RCAs are additional Secretariat approvals required for a variety of situations. Working with SAF/AQC, the contracting officer determines which RCAs apply. These may include, but are not limited to: Indemnification Requests, Special Termination Cost Clause Approvals, Source Selection Delegation Requests, Source Selection Plans, Fixed Price Determinations, Organizational Conflict of Interest Waivers, Truth in Negotiations Act Waivers, and Justification and Approvals. A program may need one or more RCAs concurrent with the AS approval in order to implement its acquisition strategy.

2.6.2.  Approval of some RCAs is dictated by statute and is often above SAF/AQ. Use of acquisition documentation does not change the preparation and submittal of the various RCAs. The approving official's awareness of the overall management strategy usually hastens the coordination and approval process of the RCA, if processed in parallel.

**2.7.  Solicitation Release.**  The MDA approves the AS prior to the Contracting Officer's release of the final solicitation (DoDI 5000.02T, DoDI 5000.02) in accordance with agency procedures. Other approvals (e.g., approval of the source selection plan in a competitive acquisition) may also be required prior to solicitation release. Consult all current guidance prior to releasing the solicitation.

**2.8. Preparing Acquisition Documentation.** Refer to the appropriate Acquisition Pathway issuance and the FAR for a complete listing of statutory, regulatory, and contract reporting information and milestone requirements.

2.8.1.  The content is a direct result of the unique circumstances of the program and the membership of the IPT. Special Access Programs, which are submitted through the appropriate channels, and the entire contracting package remains unclassified and free of any source selection sensitive information. Incorporate classified or source selection sensitive information by reference.

2.8.2. The format and content in the templates provide a guide to the PM to ensure all areas are considered. New to this process is accounting and tracking of funds and resources, i.e., hardware and software, to meet FIAR compliance. Program documentation can be tailored based on the phase, categorization level, and type of program with concurrence from the MDA while still meeting the minimum requirements outlined in statue and DoD guidance. As a best practice, all sections identified as not applicable to the program, should state "Not Applicable" and provide justification. This communicates the area was considered and not just overlooked. If something needs to be added that is unique to the program, add it, but try to retain the standard format. The use of the standard format helps streamline coordination by helping reviewers easily locate specific information.

2.8.3. Referencing Other Documents. Rather than paste large sections from other documents, reference supporting or related documents if additional detail is required. The following are examples of documents that may contain information, which needs to be summarized or referenced (either all or in part). (Note: Depending on the size and complexity of a business system, non-developmental or software intensive programs that elect to use business systems acquisition processes, per DoDI 5000.75, the Capability Implementation Plan (CIP) may be tailored to cover some or all of the documents below.)

2.8.3.1. Acquisition Program Baseline (APB)

2.8.3.2. Analysis of Alternatives (AOA)

2.8.3.3. Aircraft Information Management Plan (AIMP)

2.8.3.4. Capability Development Document (CDD)

2.8.3.5. Capability Production Document (CPD)

2.8.3.6. Collaboration and Measurements Requirements Summary (CMRS)

2.8.3.7. Concept of Operations (CONOPs)

2.8.3.8. Cost Analysis Requirements Description (CARD)

2.8.3.9. Information Support Plan (ISP)

2.8.3.10. Information System Initial Capabilities Document (IS-ICD)

2.8.3.11. Initial Capabilities Document (ICD)

2.8.3.12. Integrated Technology Roadmap

2.8.3.13. Force Structure Analysis

2.8.3.14. Life Cycle Cost Estimates (LCCE)

2.8.3.15. Lifecycle Mission Data Plan (LMDP)

2.8.3.16. Life Cycle Sustainment Plan (LCSP)

2.8.3.17. Manpower Estimate Reports (MER)

2.8.3.18. Memorandums of Understanding (MOU)/Memorandums of Agreement (MOA) (for joint programs)

2.8.3.19. Modeling & Simulation Support Plan

2.8.3.20. Programmatic Environment, Safety, and Occupational Health (ESOH) Evaluation (PESHE)

2.8.3.21.  Program Protection Plan (PPP)

2.8.3.22.  Source Selection Plan (SSP)

2.8.3.23.  Systems Engineering Plan (SEP)

2.8.3.24. System Threat Analysis (STA)/ Validated On Line Life Cycle Threat (VOLT)/Information Operations Capstone Threat Assessment/Capability Threat Assessments (CTA)

2.8.3.25.  Technology Readiness Assessments (TRA)

2.8.3.26.  Technology Transition Plan (TTP)

2.8.3.27.  Test and Evaluation Master Plan (TEMP)

**Chapter 3**

**PROGRAM INTEGRATION**

**3.1.  Overview.**

3.1.1.  The goal of Program Integration is to synchronize and analyze the array of technical, cost, and schedule information, so the AF can communicate program concerns with a single and streamlined voice. Program Integration provides the AF with consistent insightful and synchronized recommendations, improved data reporting and analysis, and maximized utilization of resources. It is not only a source for more robust decision-support to PMs, it is also a bridge to a more collaborative relationship between HQ and the field. Therefore, the objective is to strengthen decision-making across AF Acquisition leadership.

3.1.2. The integration of cost, schedule, and performance requires a single management process and/or organizational structure. Depending on the size and complexity of the program, different integration management approaches are necessary for each acquisition program. Each PEO and PM determine appropriate organizational structures/processes deemed appropriate to meet the needs of the respective programs, while simultaneously addressing the intent of this guidance.

3.1.3. Each respective PEO/PM should designates (as a minimum) a Program Integration Manager for all ACAT I programs. The PEO should consider a Program Integration Office at the PEO-level to help service and advise on all programs within their portfolio. The PM can serve as the Program Integration Manager. Based on program needs, complexity, and development phase, PEOs and PMs establish and manage the appropriate Program Integration staff requirements, as agreed between the PEO and PM and Program Integration Manager. **Figure 3.1** identifies program integration activities.

**3.2.  Program Integration Values.**

3.2.1. Program Integration values functional diversity and expertise and the team-based approach. Program Integration Offices and processes allow programs to maintain a strategic perspective by monitoring and coordinating the answers to the following questions:

3.2.1.1.  Which performance factors have the greatest impact on the program?

3.2.1.2.  How are environmental and programmatic issues anticipated and risk mitigated?

3.2.1.3.  What is the best way to optimize resources within a program or across an investment portfolio?

3.2.1.4.  Are programs aligned with Service and DoD strategic objectives?

3.2.2.  By illuminating these analytical questions, program integration managers, PMs, and other acquisition decision-makers are constantly comparing individual program needs and issues over its life cycle with those of the greater enterprise.

**Figure 3.1.  Program Integration Activities.**

## PROGRAM INTEGRATION
### "PROCESS THAT ADVISES PM"

Prod/Spt Log

T&E

Contracting

PM

Engineering and Technical

Program Integration

Financial Management

Strategic Communications

Program Mgmt Reviews

Program Exec Reviews

Funding Reviews

EVM

Baseline Management

Program Integration Planning

Financial Risk/ Health Analysis

Audit Finding Reviews

Program Integration Planning

Integrated Risk Analysis

Schedule Mgmt & Analysis

ITAM Inventory Reporting

Docs & Process Information Control

Cost Estimate Reviews

*Execute, assess, status, anticipate & mitigate*

3.2.3. Program Integration Organizational Structure. Because no two acquisition programs are exactly alike, each PM considers the following questions when determining the size and scope of the Program Integration staff:

3.2.3.1.  What is the nature of the product or service?  This should be the most significant determiner of program structure.

3.2.3.2.  How mature is the technology that will be included in the product?

3.2.3.3.  What will have to be done to mature that technology, and how much risk is involved?

3.2.3.4.  In addition to the included technology, how complicated will the design be?

3.2.3.5.  Is it like other designs we have experience with, or is it novel?

3.2.3.6.  How difficult are the integration aspects of building and sustaining the product?

3.2.3.7.  Is the manufacturing technology mature, or will work have to be done to advance it prior to production?  These questions on a large scale will begin the process of

determining if a technology maturation and risk reduction phase is needed prior to the start of engineering and manufacturing development. They should also affect the duration of these phases, if used, and the number of test articles and types of testing needed to verify the performance of the design.

3.2.3.8.  How urgently is the product needed?

3.2.3.9.  How prepared is industry to design and produce the product?

3.2.3.10.  How much uncertainty is there about the proper balance of cost and capability?

3.2.3.11.  What are the customer's priorities for performance and life cycle sustainment?

3.2.3.12.  What resource constraints affect program risk (not just financial resources, but also availability of competitors, time, and expertise in and out of government)?

3.2.3.13.  Is cost or schedule most important, and what are the best ways to control them on this program?

3.2.3.14.  What is the right balance of risk and incentives to provide to the contractors to get the results the government wants?

3.2.3.15.  What phase is the program in and which Program Integration activities require the most supervision and monitoring?

3.2.4. Program Integration may include, but is not limited to, the activities and processes depicted in **Figure 3.1** Listed below are some specific Program Integration activity and process descriptions:

3.2.4.1.  Audit Focal Point. This Audit Focal Point activity involves the assignment of an individual, either permanently or temporarily, to act as the liaison between program personnel and auditors. Responsibilities may include coordinating meetings and interviews between program personnel and auditors or acting as a repository for requested information and responses.

3.2.4.2. Acquisition Program Baseline Management. Acquisition Program Baseline Management is the process of establishing, monitoring, and reporting program progress in achieving the Cost, Schedule, and Performance Objectives documented in the APB. Specific functions might include:

3.2.4.2.1. Serving the PM, PEO, and/or MDA for all matters of cost, schedule, and technical performance requirements in the management of all program baselines existing for the program;

3.2.4.2.2. Collecting data, measuring and monitoring performance of internal and external suppliers throughout the organization, including small business utilization and forecasting;

3.2.4.2.3. Reporting program status internally to the PM/PEO and/or MDA and coordinating external communication and reporting;

3.2.4.2.4. Planning and Management—Providing total life cycle baseline management planning for the program/project and managing the implementation of that planning;

3.2.4.2.5. Identification—Establishing baseline information and documentation of functional and physical characteristics of each type of item (cost, technical, schedule, etc.);

3.2.4.2.6. Documenting agreed-to baselines and changes to those configurations occurring over time;

3.2.4.2.7. Change Management—Ensuring changes to a baseline are properly identified, recorded, evaluated, approved or disapproved, and incorporated and verified, as appropriate;

3.2.4.2.8. Status Accounting—Managing the capture and maintenance of product configuration information necessary to account for the configuration of a product throughout the product life cycle;

3.2.4.2.9. Verification and Audit—Establishing the performance and functional requirements defined in the baseline are achieved by the design or plan and ensuring the design or plan is accurately documented in the specific associated baseline;

3.2.4.3. Budget Management. Budget management is responsible for the PPBE (Planning, Programming, Budgeting, and Execution) process. This includes advocating for programs through the Program Objective Memorandum (POM) process feeding into the President's Budget cycle, ensuring program "should cost" estimates are accurately reported, monitoring executable dollars through system reconciliation of all years funding, coordinating distributed funds, and conducting funds analysis. Budget Management provides oversight of official budgetary documents including the writing, coordinating, and monitoring of funding documents, and schedules fiscal year phasing based on programmatic analysis. Ultimately, Budget Management activities ensure funds availability, funds execution status, and funds reprogramming for contractual vehicles.

3.2.4.4. Data Collection, Analysis, and Reporting. Data and reports collected are focused on measuring what we want to control at the enterprise level and at the program level. Therefore, data measured needs to be authoritative, accurate, complete, and analyzed at all levels without adjustment or spin.

3.2.4.5. Cost Estimating and Analysis. The Cost Estimating and Analysis activity within Program Integration involves cost estimating, sufficiency reviews, should costs reviews, business case analyses, and proposal evaluations. Cost estimating and analysis activities may include the administration of cost, economic, financial, business case analysis policy, and guidance; the development of standards and templates; and the assurance of training and education for designated individuals throughout the program. In addition, cost estimating and analysis activities involve the participating in cost and technical data collection efforts, the maintenance of a historical cost database, the selection of appropriate cost estimating methods and model development projects, and the monitoring of program costs using Earned Value Management (EVM).

3.2.4.6. Strategic Communications (Strategic Communication and Data Information, Analysis, and Reporting). Strategic Communications activities ensure consistent messages are being conveyed to higher headquarters and external organizations. In order to sustain a program, the DoD will obtains approval and appropriations from Congress.

To provide Congress with a complete and accurate picture of a program's execution, program information answers the following:

3.2.4.6.1.  Is there the right amount of money in the specific budget year?

3.2.4.6.2.  How well are programs executing in terms of performance, cost, & schedule?

3.2.4.6.3.  How do we effectively and efficiently utilize tax payer dollars?

3.2.4.6.4.  What is the priority of this program versus other Federal macro-economic issues?

3.2.4.6.5.  Is your program required, and does the logic fit the overall service plan?

3.2.4.6.6.  How have you responded to Congressional Staffers?

3.2.4.6.7.  What do your J-Books say?

3.2.4.6.8.  Constraints to be aware of include:

3.2.4.6.8.1.  Time. Time is of the essence, and if program information is not available on time, decisions should be made to support the program timeline.

3.2.4.6.8.2.  External information such as Government Accountability Office (GAO) and Congressional Research Service (CRS) reports are used to inform Congress.

3.2.4.6.8.3.  Best responses include a brief explanation of problem, realistic Statuses of Program and identification of issues and proposed risk mitigations with specific timelines.

3.2.4.7. Document Control Management. Document Management includes the collection, recording, monitoring and reporting of all official program records. Such internal documentation of programs is very important for the long-term management of the program and associated supporting functions. The program integration effort requires a high level of collaboration and sharing among all functions. Documentation helps provide consistency, continuity, and an understanding of management decisions from both internal and external perspectives. Therefore, document management procedures will define:

3.2.4.7.1.  How a program approves documents (e.g., procedures, flow-charts, process maps, etc.) prior to use (e.g. signed-off paper versions, or added to your computer network via a password protected system);

3.2.4.7.2.  How a program updates and re-approves amended documents (recommend use of computer based systems);

3.2.4.7.3.  How a program identifies changes (e.g. by date or issue number, identify changes with different fonts or colors);

3.2.4.7.4.  How a program ensures documents are available where they are needed;

3.2.4.7.5.  How a program controls documents of external origin;

3.2.4.7.6. How a program prevents the inadvertent use of obsolete documents; obsolete-but-still-in-use is the single most common non-compliance;

3.2.4.7.7. How a program handles and maintains materiel according to the classification level.

3.2.4.8. Earned Value Management. EVM is one of DoD's most powerful program, planning, and management tools. The purpose of EVM is to ensure sound planning and resourcing of all tasks required for contract performance. It promotes an environment where contract execution data is shared between project personnel and government oversight staff and in which emerging problems are identified, pinpointed, and acted upon as early as possible. EVM provides a disciplined, structured, objective, and quantitative method to integrate technical work with scope, cost, and schedule objectives into a single cohesive contract baseline plan call called a Performance Measurement Baseline for tracking contract performance.

3.2.4.9. Financial Risk/Health Analysis. Financial Risk/Health Analysis involves conducting analyses of contractors' financial health using standard finance and investment calculations to assess contractors' motivations and ability to perform. This task includes the analysis of Forward Price Rate Agreements (FPRA) as published by DCMA for impact on program baseline and fiscal health of contractor. The analysis is used as part of the integrated risk analysis for overall impacts on the program.

3.2.4.10. Integrated Risk Analysis. An Integrated Risk Analysis (IRA) is a specific series of events integrating the analysis of program risks associated with program cost, performance, and schedule dimensions.

3.2.4.11. Program Execution Reviews. Program Execution Review activities include the following:

3.2.4.11.1. Developing and briefing budget execution plans;

3.2.4.11.2. Comparing obligation and expenditure rates to OSD goals and analyzing any deviations; comparing obligation and expenditure rates to forecasted amounts and analyzing any deviations;

3.2.4.11.3. Comparing the annual program office cost estimate to the approved program budget and developing a workaround plan for any projected shortfalls.

3.2.4.11.4. Participating in Spring Execution Reviews/Investment Budget Reviews, PEO Reviews, and Program Management Reviews;

3.2.4.11.5. Analyzing cost and schedule variances in EVM reports;

3.2.4.11.6. Calculating an Estimated Cost at Completion (EAC) and projecting/budgeting for any cost overruns reflected in the EAC.

3.2.4.11.7. Support reporting of small business initiatives and small business achievement at the prime and subcontract levels.

3.2.4.12. Program Management Reviews (PMRs). PMRs facilitate external reviews for the program often including contractor support in such reviews.

3.2.4.13. Program Integration Planning. Program Integration Planning tasks include the verification of the quality and compliance of all program documentation in the TEMP and prior to making major programmatic decisions (e.g., Milestone Decisions). This requires the knowledge of all major functions within the program and their associated

status as well as a keen understanding of organizational issues. This activity supports acquisition planning and oversight activities such as program assessments, Request for Proposal (RFP) development, source selections, and internal reviews and assessments.

3.2.4.14. Schedule Management and Analysis. Schedule Management and Analysis ensures the program conforms to the developed program schedule and that necessary actions are taken to keep the program on schedule. Schedule Management activities include the monitoring of program progress against the program baseline (using the program schedule to measure progress). In addition, Schedule Management and Analysis includes:

3.2.4.14.1. Support for implementation of requirements for the contractor's Integrated Master Plan (IMP);

3.2.4.14.2. Representation as the OPR for implementation of the contractor's Integrated Master Schedule (IMS);

3.2.4.14.3. Independent assessment of the IMS by analyzing and reporting on the IMS via analysis tools;

3.2.4.14.4. Schedule Risk Assessments (SRAs) in support of program decisions and milestone events.

3.2.4.15. Program Integration Staff Knowledge and Skills. Program Integration knowledge and experience takes time to cultivate. Program Integration Manager should have experience in Program Management as well as in other functional areas such as Financial Management, Contracting, Engineering, and Product Support. By having personnel with breadth and depth of experience, the AF ensures that a highly trained and experienced individual is synthesizing data and providing carefully analyzed recommendations to AF leadership.

**Chapter 4**

**PRODUCT SUPPORT AND SUSTAINMENT**

**4.1. Background.** Defense Acquisition University (DAU) official program supports the Defense Acquisition Workforce Improvement Act that was passed in 1990, establishing education and training standards, requirements, and courses for civilian and military workforce. DAU also provides product support tools and resources for use by programs and defense personnel to improve program life cycles.

**4.2. Purpose.** DAU provides tools and resources meant to assist acquisition professionals and program staff as they support their program life cycle. Complemented by on-line and on-campus courses, DAU has developed a program designed to provide standardized, repeatable processes to ensure product support is incorporated early in the planning stages and throughout the life cycle. The application of tools and resources enable the acquisition and sustainment communities to field products and services with complete cradle to grave support that are affordable, reliable, and sustainable. DAU's approach improve supportability planning directly contributes to the AFPD 63-1/20-1 direction of establishing an ILCM approach to recapitalize AF capabilities through maximum acquisition cycle time efficiency. This in turn, provides agile support optimizing fielded capabilities and the supply chain, minimize the logistics footprint, and reduce total ownership cost.

**4.3. Applicability.** The DAU web site can be used by anyone performing daily acquisition and sustainment tasks on any weapon system or commodity. Use of the tools and resources aids in the development of operationally safe, suitable, and effective weapon systems and facilitate their transition to sustainment.

4.3.1.  Job support tools include:

4.3.1.1.  Product Support Analytical Tools Database. This repository profiles hundreds of government and commercial tools used to help facilitate product support decisions, with an emphasis on DoD weapon system product support. This database includes decision support tools and data sources for product support modeling, simulation, management, analysis, assessment, evaluation, and logistics product data management. For each tool, you'll find: one, a description; two, the processes the tool or data source supports; three. The Integrated Product Support Elements the tool or data source supports; four, services that use the tool or data source; and finally, five, ways to view additional information about each tool or data source.

4.3.1.2.  Product Support Strategy Development Tool. This tool supports DoD Product Support Managers and Life Cycle Management workforce members in developing affordable and executable product support strategies, while expanding on and reinforcing DoD product support guidance contained in both the *DoD Product Support Manager's Guidebook* and the *DoD Performance Based Logistics Guidebook.*

4.3.1.3.  Product Support Management is the planning, management and funding of the package of support functions required to field and maintain the readiness and operational capability of major weapon systems, subsystems, and components. It includes all functions related to weapon system readiness and is built upon the Integrated Product Support (IPS) elements. This tool is designed to assist the Defense Acquisition

Workforce understand and build the best product support package in support of the Warfighter. The tool provides detailed activity and output listings across the life cycle and by IPS Element. It provides information via a "List View", which is a compact list of Product Support activities and outputs required, as well as a "Timeline View" showing activities and outputs over the total life cycle.

4.3.1.4.  The US Army Logistics Data Analysis Center develops and maintains state-of-the-art supportability analysis and Life Cycle Logistics decision support software tools to assist acquisition Program and Product Support Managers. The US Army Logistics Analysis Center Tool Suite supports analyses, logistics data management, integrated product support program planning/execution, and development and implementation of the Post Fielding Support Analysis program. With these tools, PMs can effectively develop key program management documentation, develop their logistics management information database, conduct engineering life cycle costing, perform Level of Repair Analysis (LORA), conduct sustainment/supportability analysis, and employ the results of these analyses to reduce project cost, schedule, increase performance, and minimize risk. Although these are US Army tools, they have broad potential applicability and utility for life cycle logistics, product support, and program management professionals across each of the Components within the Department of Defense.

4.3.1.5.  The Product Support Business Model defines the hierarchical framework that supports planning, development, implementation, management, and execution of product support for a weapon system component, subsystem, or system platform that are accomplished over the life cycle. The Product Support Business Model effectively describes the methodology by which DoD intends to ensure achievement of optimized product support through balancing maximum weapon system availability with the most affordable and predictable total ownership cost. The model provides a clearly delineated description of the roles, relationships, accountability, responsibility and business agreements among the managers, integrators, and providers of product support.

4.3.1.6.  Other tools such as the Product Support Implementation Roadmap; Milestone Documentation Identification Tool; Acquisition Requirements Roadmap Tool Suite; and Performance Based Logistics Maturity Assessment Tool can also be found at the DAU website. Other tools may be used at local centers. This is not a complete list of all available tools.

**4.4.  Content.** DAU is a single body of acquisition logistics information, containing checklists and links to DoD and AF directives, instructions, policies, and guides for acquisition and sustainment procedures. Each process or task is listed under its applicable DoD 5000 acquisition phase for easy reference and is evaluated for program application. All current Air Force Instructions, the Acquisition Process Architecture Team Model, and Independent Logistics Assessment Handbook were used to develop the DAU portal and the DAU Logistics blog, the link is found in **Attachment 1**, Gateway-to-the-Future-(of-Logistics). Toolkits and resources on the portal that address product support consists of:

4.4.1.  The Integrated Product Support (IPS) Element Guidebook is a Defense Acquisition University training asset intended to augment product support guidance contained in Enclosure 6 of DoD Instruction 5000.02T. This guidebook picks up where Appendix A of the DoD Product Support Manager (PSM) Guidebook leaves off in describing the 12 IPS

Elements. The information in this guidebook is augmented by additional information on the DAU Logistics Community of Practice IPS Element site and a related ACQuipedia article containing links to separate articles on each individual IPS Element.

4.4.2. Product Support Processes Matrix. The Product Support Processes Matrix encompasses all programmatic aspects relevant to product supportability, logistics, and readiness at major acquisition milestones and other key decision points. It is a roadmap of separate logistics processes sequentially listed from pre-Milestone A through disposal. The processes matrix serves as a ready reference for ensuring product support is incorporated early in the planning stages.

4.4.3. Product Support Toolkit Checklists. Product Support Toolkit Checklists supplement the Processes Matrix and contain process descriptions, subtasks, and hyperlinks to supporting documentation for specific, complex tasks. They provide a starting point of the: who, what, where, when, and how of the matching process embedded in the Processes Matrix.

4.4.4. Product Support Toolkit Kneepad Checklist. The Acquisition Sustainment Kneepad Checklist serves as a user guide to supplement the Processes Matrix and Checklists, providing greater detail on each process. All Acquisition Sustainment Checklists are attached to an appendix in the Kneepad Checklist for quick and easy reference.

4.4.5. The *U.S. Air force Product Support Tool Kit (PSTK)*. The Product Support Tool Kit (PSTK) was developed as a quick reference tool for personnel working life cycle logistics tasks throughout a weapon system's life cycle.

**4.5. Access.** All processes and tasks within the Product Support Processes Matrix, Product Support Toolkit Checklists, and Product Support Toolkit Kneepad Checklist are linked by the same Task Identification number, providing for easy cross reference.

**4.6. Configuration Control.** As programs and products evolve to ensure AF logistics support maintains a system life cycle focus, the responsibility for update and configuration control of a program rests with the Air Force Life Cycle Management Center (AFLCMC) – LG-LZ, except for USSF which has its own configuration control organization. The Product Support Toolkit is updated to maintain consistency with emerging policy changes as required; as a minimum, the tools are updated annually. Current Product Support Tool Kit configuration is identified by a date included in all documents and file names of the tool kit materials. Proposed changes and edits should be evaluated and incorporated in accordance with the Virtual Configuration Control Process.

**4.7. Points of Contact.** Specific questions or comments on the Product Support Toolkit are addressed through AFLCMC/LG.

**Chapter 5**

**LIFE CYCLE SYSTEMS ENGINEERING**

**5.1. Primary References.** Engineering personnel supporting a SAF/AQ Acquisition and Sustainment Program Office or a SAF/AQ Rapid Acquisition activity will assign the top priority to the following documents as the primary sources of direction for Systems Engineering requirements.

5.1.1.  DoDI 5000.02T, *Operation of the Defense Acquisition System*, and 5000.02, *Operation of the Adaptive Acquisition Framework*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.2.  AFI 63-101/20-101, *Integrated Life Cycle Management*,

**https://www.e-publishing.af.mil/**

5.1.3.  DoDI 5000.74, *Defense Acquisition of Services,* **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.4.  DoDI 5000.75, *Business Systems Requirements and Acquisition*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.5.  DoDI 5000.80, *Operation of the Middle Tier of Acquisition (MTA)*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.6.  DoDI 5000.81, *Urgent Capability Acquisition*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.7.  DoDI 5000.82, *Acquisition of Information Technology*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.8.  DoDI 5000.83, *Technology and Program Protection to Maintain Technology Advantage*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.9.  DoDI 5000.86, *Acquisition Intelligence*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.10.  DoDI 5000.87, *Operation of the Software Acquisition Pathway*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.11.  DoDI 5000.88, *Engineering of Defense Systems*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.12.  DoDI 5000.89, *Test and Evaluation*, **https://www.esd.whs.mil/irectives/issuances/dodi/**

5.1.13.  DoDI 5000.90, *Cybersecurity for Acquisition Decision Authorities and Program Managers,* **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.14.  DoDI 5010.44, *Intellectual Property (IP) Acquisition and Licensing*, **https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.15.  DoDI 8330.01, *Interoperability of Information Technology (IT), Including National Security Systems (NSS),*

**https://www.esd.whs.mil/Directives/issuances/dodi/**

5.1.16. *Defense Acquisition Guidebook (DAG)*,

**https://www.dau.edu/**

**5.2. Standard References.** Using the documents identified in AFI 63-101/20-101 is the next level of priority. These documents provide a more detailed direction on providing engineering and technical support for programs in a SAF/AQ Acquisition and Sustainment Program Office or a SAF/AQ Rapid Acquisition activity.

**5.3. Additional References.** Finally, engineering personnel supporting SAF/AQ programs to use the following documents for further assistance.

5.3.1. Institute of Electrical and Electronics Engineers (IEEE) 15288, *Systems and Software Engineering – System Life Cycle Processes*,
**https://assistca.dla.mil/online/login/welcome.cfm**

5.3.2. Institute of Electrical and Electronics Engineers (IEEE) 15288.1, *Application of Systems Engineering on Defense Programs*,
**https://assistca.dla.mil/online/login/welcome.cfm**

5.3.3. Institute of Electrical and Electronics Engineers (IEEE) 15288.2, *IEEE Standards for Technical Reviews and Audits on Defense Programs,*
**https://assistca.dla.mil/online/login/welcome.cfm**

5.3.4. Memorandum for Service Acquisition Executives and Program Executive Officers, *Modular Open Systems Approach for our Weapon Systems is a Warfighting Imperative*,
**https://www.dsp.dla.mil/Portals/26/Documents/PolicyAndGuidance/Memo-Modular_Open_Systems_Approach.pdf?ver=2019-01-18-122921-933**

5.3.5. Air Force Space Command memorandum, *UCI Planning and Implementation Guidance (TS//SCI//SAP),*

5.3.6. AFSPC/CC Memo, 7 April 2017 (U//FOUO)*, Space Battle Management, Command and Control (BMC2) Operational Prototype Program Endorsement*

5.3.7. Memorandum for Air Force Program Executive Officers, *Use of Open Mission Systems/Universal Command and Control Interface*

5.3.8. Memorandum for Air Force Program Executive Officers, SAF/AQ Memorandum, *Contracting for Verifiable Modular Open Systems Approaches for USAF Systems*

5.3.9. *DoD Open Systems Architecture Contract Guidebook for Program Managers*,
**https://www.dau.mil/cop/pm/DAU** Sponsored Documents/DoD Open System Architecture (OSA) Contract Guidebook for Program Managers-version 1.1- June 2013.pdf

5.3.10. Data Item Description, DI-MGMT-82099, *Open System Management Plan*,
**https://assistca.dla.mil/online/login/welcome.cfm**

5.3.11. Open Mission Systems Standard / Universal Command and Control Interface Standard, these standards, <u>which have been mandated by the SAE for use in all programs,</u> can be downloaded from the Air Force Research Laboratory Virtual Distributed Laboratory website at **https://restricted.vdl.afrl.af.mil/programs/** or requested from **AFLCMC.XZ.OAMO@us.af.mil**

5.3.12. Air Force Data Rights Guidebook, **https://www.dau.edu/tools/t/Air-Force-Data-Rights-Guidebook**

5.3.13. DoDM 5010.12M, *Procedures for Acquisition and Management of Technical Data*, **https://www.esd.whs.mil/Directives/issuances/dodm/**

5.3.14. Air Force Systems Security Engineering Acquisition Guidebook, **https://www.milsuite.mil/book/docs/DOC-469551**

5.3.15. Air Force System Engineering Assessment Model (AFSEAM), Version 2, **https://apps.dtic.mil/dtic/tr/fulltext/u2/a538786.pdf**

5.3.16. *Corrosion Prevention and Control Planning Guidebook for Military Systems and Equipment*, **http://corrdefense.nace.org/corrdefense_Spring2014/CPCGuidbook.pdf**

5.3.17. National Aerospace Standard (NAS) 411, *Hazardous Material Management Program*, **https://assistca.dla.mil/online/login/welcome.cfm**

5.3.18. National Aerospace Standard (NAS) 411-1, *Hazardous Materials Target List*, **https://assistca.dla.mil/online/login/welcome.cfm**

5.3.19. See **Chapter 6** "Human Systems Integration" for HSI references

5.3.20. A growing list of modular open systems approach (MOSA) enabling standards can be found on the ASSIST standards database under the reports tab. These MOSA enabling standards should be considered early in the lifecycle, **https://assistca.dla.mil/online/login/welcome.cfm**

**5.4. Assistance.** For questions or additional assistance, please contact SAF/AQRE, Engineering and Force Management Division, Deputy Assistant Secretary (Science, Technology, and Engineering) by using the following email address: **usaf.pentagon.saf-aq-mbx.saf-aqre-workflow@mail.mil** or by calling (571) 256-0303.

**Chapter 6**

**HUMAN SYSTEMS INTEGRATION (HSI)**

**6.1. HSI Description.** Human Systems Integration (HSI) is the interdisciplinary technical and management processes for integrating human considerations within and across all system elements. Those human-centered elements, or "domains," are manpower, personnel, training, safety and occupational health, human factors engineering, force protection and survivability, and habitability. The HSI domains embody all the dimensions of human characteristics needing to be addressed to ensure systems can be operated and sustained in a manner that accomplishes the objectives of the Adaptive Acquisition Framework. The goal is to optimize total system performance and total ownership costs, while ensuring the system is designed, operated, and maintained to effectively provide all personnel with the ability to complete their mission, and when required, incorporating compliance for Section 508 of the Americans with Disabilities Act (36 CFR §1194) to provide accessibility in design for electronic and information technology (EIT) systems.

6.1.1. An optimal system design harmonizes system hardware/software with the physical and cognitive abilities and limitations of humans. System designs consider the planned number of users, their planned knowledge, skill and abilities. Planned training to safely operate and maintain the system, for the intended duration, in the intended environments, and survive without adverse health effects is another important factor. Section 508 compliance is required for EIT systems including computer hardware, software, websites, phone systems, and copiers that have been developed, procured, operated, or maintained by a federal agency, for use by the general public or federal employees with physical, sensory, or cognitive disabilities.

6.1.2. The expected results are systems reducing the potential for human error, increasing operational availability, and improving safety and performance. Best practice is to maintain relationships across the domains to continuously address HSI issues, risks, and concerns and log, coordinate, track, and document resolution decisions in applicable program documents. HSI is not a discipline or program in- and-of-itself, but an integral part of the capability-based planning and materiel development processes from conception to design to operation and maintenance. See the DAG, Chapter 5, and SAE 6906 for more information on HSI.

**6.2. HSI Responsibility.** AFI 63-101/20-101 places the responsibility for HSI across the system's life-cycle with the PM. National Security Systems (NSS) and some military systems are exempt from implementing Section 508 compliance in the design as outlined in FAR 39.204. However, most EIT systems are not exempt from compliance; this includes Internet and Intranet published information and possibly many business systems. The PM should address Section 508 compliance in system design as required unless an undue burden justification has been established. There are offices, organizations, and functional communities responsible for the HSI "domains" and the integration contributing to the PM's task of optimizing the human contribution to total system performance. HSI contributors from these HSI domain functional communities provide expertise in professional disciplines like Environmental Engineering, Engineering Psychology, Human Factors Engineering, Occupational Medicine, Operations Research, System Safety, Manpower, etc. These functional communities have technical and management processes, specialty expertise, standards, and guidance contributing to the safety,

personnel survivability, performance, and health of the warfighter. All offices, organizations, and functional communities addressing human considerations throughout the life cycle of the system contribute to Human Systems Integration. Ideally, a program office should employ/utilize Human Systems Integrators, personnel trained and/or experienced in HSI / HSI domains, to execute the HSI processes.

**6.3. HSI in Capabilities-Based Planning.** HSI planning begins with concept development. HSI is most effective when incorporated early in the planning phase of each new or enhanced capability and is considered in rapid prototyping & acquisitions, Advanced Technology Demonstrations (ATDs), and early Modeling and Simulation (M&S) opportunities. Lessons learned from related developments or deployed systems are considered, entering each life cycle phase, and are updated at the end of each phase.

6.3.1. Threat Assessments. Threat assessments address force protection and personnel survivability and are the basis for the CONOPS; i.e., how the warfighter intends to use the capability in the projected environments.

6.3.2. Capability Based Assessments (CBAs). Outputs from the CBA include: an analysis of doctrine, organization, training**,** materiel, leadership & education, personnel, facilities, and policy (DOTmLPF-P) capability gaps, and courses of action (COAs) to mitigate the capability gaps. While "T" (training) and "P" (personnel) are direct elements of HSI, "D, O, m, L, F and -P" considerations often affect HSI. Therefore, DOTmLPF-P analyses include human considerations in all COAs.

6.3.3. Capability [Requirements] Development. As the capability solution matures, HSI considerations identified during the CBA process are reflected in the Joint DOTmLPF-P Change Recommendation (JDCR), Initial Capabilities Document (ICD), Capabilities Development Document (CDD), and Capabilities Production Document (CPD). Information Systems (IS) use the IS-ICD and the IS-CDD which are addressed in the following guidance, within ICD and CDD, respectively. Best practice is to provide language in the appropriate JCIDS document to ensure human considerations are addressed adequately. However, avoid thinking in terms of "HSI requirements" suggesting there should be unique requirements specifically named "HSI." Any requirement may highlight human considerations that logically result as part of good and effective capability-based requirements. The standardization documents in **Attachment 2, Table A2.1** and the questions in **Attachment 2**, **Tables A2.2** and **A2.3**, are useful resources for writing meaningful HSI-related requirements. The following sub-paragraphs highlight key areas for maintaining the HSI perspective in requirements documents.

6.3.3.1. HSI implications from the CBA are found in all sections of the ICD.

6.3.3.1.1. ICD Section 1—Operational Context: Describes operational outcomes the capability provides and include the enabling human-centered capabilities needed to achieve those operational outcomes.

6.3.3.1.2. ICD Section 2—Threat Summary: Includes a description of all adversarial threat capabilities, tactics, and doctrine, in the expected operational environment; the threats to personnel should be included.

6.3.3.1.3. ICD Section 3—Capability Requirements and Gaps/Overlaps: Describes the Capability Gaps: missions, tasks, and functions that cannot be performed or are

unacceptably limited. Section 3 documents the required capability. This is where the human-related implications identified in the CBA are documented. The limitations of human performance are included in this section. For example, personnel survivability concepts include personnel protection from threat event primary and secondary effects (e.g. egress).

6.3.3.1.4. ICD Section 4—Final Recommendations: Describes materiel and non-materiel recommendations for responding to the capability gaps. HSI recommendations related to these approaches are documented in this section.

6.3.3.2. HSI implications evolving from the ICD are addressed in the CDD/CPD. The CDD/CPD is written to define threshold and objective values for a single increment of the capability being developed. The primary objective of the CDD/CPD is to specify the operational performance criteria of the system being developed to deliver the required capability. The CDD/CPD considers and integrates the full range of joint materiel and DOTmLPF-P solutions. Documenting HSI-related requirements and attributes in the CDD/CPD is key to getting user/maintainer needs effectively translated into system specifications. There are several sections of a CDD/CPD where HSI can directly shape capability definition:

6.3.3.2.1. CDD/CPD Section 1—Operational Context: Describes operational outcomes the capability provides and should include the enabling human-centered capabilities needed to achieve those operational outcomes.

6.3.3.2.2. CDD/CPD Section 2—Threat Summary: Includes a description of all adversarial threat capabilities, tactics, and doctrine, in the expected operational environment; the threats to personnel should be included.

6.3.3.2.3. CDD/CPD Section 3—Capability Discussion. This section provides a description of system characteristics, identifies supporting rationale for the capability, and cites analytic references to support the specific needs for attribute threshold and objective values.

6.3.3.2.4. CDD/CPD Section 5—Performance Attributes: This section contains the required system performance attributes (not physical design attributes) that have implications for HSI. These attributes are prioritized as Key Performance Parameters (KPPs), Key System Attributes (KSAs), or Additional Performance Attributes (APAs). The JCIDS Manual provides guidance on required and selectively applied KPPs and KSAs. The mandatory Force Protection KPP is evaluated to include secondary and tertiary effects as it relates to personnel and system survivability.

6.3.3.2.5. CDD/CPD Section 6—Other System Attributes (OSA): OSA addresses other attributes of the proposed capability, including many that tend to be design, cost, and risk drivers. These attributes include ESOH and HSI considerations that are not addressed elsewhere. Considerations include: applicable safety parameters, such as those related to system, nuclear, explosive, and flight safety as well as physical and operational security needs. In addition, HSI considerations such as conventional and initial nuclear weapons effects; chemical, biological, radiological and nuclear (CBRN) survivability; natural environmental factors (such as climatic, terrain, and oceanographic factors, and impact of the systems on the environment and the

environment on the systems/personnel); and unplanned stimuli (such as fast cook-off, slow cook-off, bullet impact, fragment impact, sympathetic detonation, and shape charge jet) are discussed in this section. This section can also include additional security requirements, embedded instrumentation, electronic attack, anti-tamper, information protection standards and Cybersecurity, and wartime reserve mode requirements. CDD/CPD Section 6 does not include Thresholds and Objectives, because items in this section are "other system attributes," not performance parameters. Documenting HSI-related considerations or implications associated with particular system attributes is usually a sufficient level of detail for the CDD/CPD.

6.3.3.2.6. CDD/CPD Section 10—Weapons Safety: ensure HSI considerations are addressed in accordance with the Weapons Safety Guide in the JCIDS Manual.

6.3.3.2.7. CDD/CPD Section 12—DOTmLPF-P Considerations. This section describes any DOTmLPF-P implications associated with fielding the system that have not already been addressed in the CDD/CPD, to include: those approaches impacting CONOPS or plans within a combatant command's area of responsibility, status highlights (strategy and timing) of the other DOTmLPF-P considerations, and implications for likely changes to any aspect of DOTmLPF-P. This section discusses HSI considerations having a major impact on system effectiveness, suitability, and affordability. Include key logistics criteria (system reliability, maintainability, transportability, and supportability) to help minimize the system's logistics footprint, enhance mobility, and reduce the total ownership cost. Additionally, any basing needs (forward and main operating bases, institutional training base, and depot requirements), specific facility, shelter (habitability), supporting infrastructure and environment, safety and occupational health (ESOH) asset requirements are addressed. This section is the primary location for Manpower/Personnel/Training considerations.

6.3.3.2.8. CDD/CPD Section 13—Program Affordability: Consider HSI implications in program affordability. High cost drivers include *M, P, T,* and system sustainment are evaluated when estimating/optimizing life cycle costs.

**6.4. HSI in Materiel Development.** HSI planning in concept development becomes HSI execution in materiel development.

6.4.1. Development Planning (DP). HSI-related requirements are explicitly addressed in DP to ensure the human is included in the trade space evaluation of emerging capability needs, system-of-systems assessments, risk drivers, and life cycle planning.

6.4.2. Analysis of Alternatives (AoA). The HSI perspective during the AoA is to evaluate alternative solutions to determine the alternative that maximizes human performance, minimizes HSI-related costs and supports safe and effective operations, maintenance, and support functions. Best Practice is to take mission tasks lists identified during the CBA, develop and translate them into assumptions, limitations, measures of effectiveness (MOE), and measures of performance (MOP) to evaluate solution alternatives. The AoA is also the forum to develop justifications for thresholds to be documented for use in later phases.

6.4.3. System Requirements Development and Acquisition Efforts. A human centric perspective is represented when developing acquisition documents. Inputs to RFPs,

Statements of Work (SOW), Contract Data Requirements Lists (CDRLs), and the System Requirements Document (SRD) contain adequately requested HSI-related requirements, derived and translated from the operational capabilities documents to system specifications. Best practice is to include a review by the HSI representatives and where possible provide recommendations to the source selection evaluation criteria. It is important to capture HSI-related requirements, tasks, and deliverables on contract to ensure a human-focused engineering approach to system, equipment and facility design, development and test. HSI-related requirements and tasks are included in contract documents for the contractor to perform the work, such as developing an HSI Program Plan. The standardization documents in **Attachment 2, Table A2.1** are useful resources for contracting activities.

6.4.4. HSI Planning. The Government program office's plan for HSI is documented in a HSI plan (HSIP). The HSIP is a standalone document; however, it may be incorporated within the SEP. If the HSI plan is a separate document referenced in the SEP, the Human Systems Integrator ensures adequate HSI planning and implementation on contract. The contractor coordinates HSI planning with SE planning; the contractor's HSI planning is documented in a separate HSIPP and summarized in the SEMP. The government may have the contractor document HSI planning in the SEMP. There are DIDs providing structure and description of the content for HSI planning and reporting: DI-HFAC-81743 – Human Systems Integration Program Plan (HSIPP) and DI-HFAC-81833 Human Systems Integration Report (HSIR).

6.4.5. Systems Engineering Plan (SEP). The Human Systems Integrators ensure the SEP addresses HSI planning and interacts with Systems Engineering. The ODASD/SE SEP outline requires the following content: 1) a descriptive summary of the HSI planning (best practice is to describe key HSI domain interactions and trade analyses); 2) identification of the cognizant official responsible for HSI in the program; and 3) any contractual requirements (by CDRL #) addressing HSI. Reference **paragraph 2.3.7** of this instruction for more details regarding HSI representation in IPTs.

6.4.6. Technical Reviews. HSI is a key focus area of technical reviews such as System Requirements Review (SRR), System Functional Review (SFR), Preliminary Design Review (PDR), and Critical Design Review (CDR). Statutory and regulatory phase-specific entrance criteria for programs are found in the tables of DoDI 5000.02T, providing guidance for technical reviews of program progress. The DAG discusses exit criteria. Best practice is to have the HSI perspective represented in the activities to evaluate the technical reviews, exit criteria development, and risk assessment.

6.4.6.1. AFI 63-101/20-101 requires PMs to report on the status of ESOH risks and acceptance decisions at technical reviews and clearly articulates that ESOH not only deals with the system impact on the environment, but includes the impact on the human. User concurrence and acceptance by appropriate decision authority is documented, along with the associated risks, before accepting for serious- and high-risk items.

6.4.6.2. All decisions made to address risk management or balance competing requirements impacting the HSI domains are documented in post-technical review reports and the SEP.

6.4.7. Test and Evaluation. AFI 99-103, *Capabilities-Based Test and Evaluation,* and AFMAN 63-119, *Certification of System Readiness for Dedicated Operational Testing*, address developmental test (DT), operational test (OT), and specialized testing performed by

the Test and Evaluation community. The TEMP captures the approach to testing, including HSI items, prior to Milestone A. These human-centric test criteria are further developed in the TEMP updates, where they are reflected in critical operational issues (COIs), critical technical parameters (CTPs), objectives and thresholds. Eventually, test plans use MOEs, MOPs and MOSs to quantitatively evaluate the system's capability; the human part of the system is included in this evaluation.

**6.5. HSI in Operations & Support.** Human Systems Integrators should incorporate the HSI perspective within modifications and upgrades to fielded systems resulting from operational deficiency reports, lessons learned, safety reports, etc. Modifications and upgrades, including Commercial Off-the- Shelf (COTS) solutions, can have a significant impact on the human; e.g., hardware accessibility, software upgrades that change the operator interfaces, changes in operator workload, performance in extreme environments, changes to emergency operation and egress, changes to visibility and anthropometrics, training procedures and training systems, maintainability, safety, etc. AFI 63-101/20-101 describes the modification management preprocess to initiate a modification proposal to fielded systems using the AF Form 1067, *Modification Proposal*.

**6.6. HSI in Disposal.** It is important to maintain the HSI perspective during disposal of the system; such as disassembly, detoxification, decontamination, disposal of hazardous waste, and transportation to and from disposal site. See the DAG Chapter 3 for more information.

**6.7.  Best Practice - Tools, Standards, and Samples.**

6.7.1. SAE 6906, Feb. 2019, Standard Practice for Human Systems Integration provides requirements and guidance for implementing HSI in DoD acquisition.

6.7.2.  The Defense Acquisition Program Support (DAPS) methodology includes a section on HSI. The DAPS methodology provides a standardized framework to assist PMs and decision makers assess readiness for milestone decision reviews. The DAPS methodology is available in the public domain, see: Defense Acquisition Program Support (DAPS) Methodology, 2009, Washington, D.C: Office of Deputy Under Secretary of Defense for Acquisition and Technology, Systems and Software Engineering.

6.7.3. MIL-STD-882, *DoD Standard Practice System Safety*; MIL-STD-1472, *DoD Design Criteria Standard Human Engineering*; and MIL-STD-46855, *DoD Standard Practice Human Engineering Requirements For Military Systems, Equipment, and Facilities*, are three suitable military standards to address HSI.

6.7.4. MIL-HDBK-338, *Electronic Reliability Design*; MIL-HDBK-470, *Designing and Developing Maintainable Products and Systems*; and MIL-HDBK-759, *Human Engineering Design Guidelines*, are three suitable military handbooks and guidebooks to address HSI.

6.7.5. The ASSIST web-site provides more Data Item Descriptions (DIDs), standards, specifications, etc., commonly used to address, plan, or manage HSI activities. **Attachment 2** of this publication includes **Table A2.1**, which contains a sample, non-exhaustive list of HSI-related standards and DIDs. **Table A2.2** is a sample phase-based HSI checklist and **Table A2.3** a sample HSI domain-based checklist, and a list of key HSI-related terms.

**Chapter 7**

**CONTRACTOR INCENTIVES**

**7.1. Purpose of Incentives.** One of the primary responsibilities of a PM is the development of an effective acquisition strategy to achieve cost, schedule, and performance objectives. This chapter provides insight into industry motivation, possible incentive tools/approaches, and a series of questions to guide the PM in developing incentives appropriate to his or her particular effort. Additional information can be found in the in the FAR and under the AF Incentive Contracting Resources SharePoint in the Award Fee Guide, the DoD and NASA Incentive Contracting Guides, and in the FAR.

**7.2. Contractor Motivations.** Money (or profit) is usually the first motivator considered, but it is not the only motivation. Contractors are also concerned with:

7.2.1. Company growth (new business, new products, increased market share);

7.2.2. Enhanced public image and prestige;

7.2.3. Opportunity for follow-on business;

7.2.4. Cash flow and internal rate of return (IRR);

7.2.5. Keeping available skills and capacity (keeping personnel on the payroll for future business);

7.2.6. Intangibles - Intangibles include a number of psychological and sociological factors. Companies are run by "people" and their individual and group motivations play a basic role in how well an incentive works in a company.

7.2.7. Small business programs can often be used to support many important service areas such as small business innovation research. Contracting Officers are encouraged to use and recommend small business vehicles in areas with qualified small businesses.

**7.3. What to Incentivize.** The government normally incentivizes three factors: cost control, technical performance, and schedule. However, in order for an incentive to be effective, the contractor should perceive it is achievable—and tied to an appropriate motivator. Per the FAR, no incentive contract may provide for performance or schedule incentives without also providing a cost incentive (or constraint). Note: Regardless of incentives, the contract reflects a schedule that meets "mission needs." Normally a delivery date would not be put in the contract and then contractor asked to "beat" that date; however, there may be situations where we evaluate the contractor on how efficiently they respond to unusual circumstances requiring an accelerated response (needed surge capability for example).

7.3.1. A cost incentive relates profit or fee directly to results achieved by the contractor. These incentives are normally based on a sharing formula between the Government and the contractor (i.e., fixed-price incentive (FPI) or cost plus incentive fee (CPIF) contracts) or the payment of a fee from an award fee pool within specified cost and schedule parameters. To be most effective the incentives should be quantitative, clearly related to the desired outcome, and within a reasonable range.

7.3.2. Technical incentives have been used to motivate contractor superior technical performance. Emphasis can focus on design (improved reliability/maintainability, increased capability of a product, reduction in manufacturing time and/or equipment, or improvement in services (improved maintenance processes, reduced supply chain timelines).

7.3.3. Schedule incentives are used to incentivize the contractor to meet mission critical and FIAR compliance as outlined in Defense Federal Acquisition Regulation Supplement (DFARS) into their schedule requirements.

7.3.4. In order to obtain the full benefit of open system approaches on Air Force systems, we should partner with industry and adequately incentivize contractors to ensure that we obtain and verify compliance with MOSA enabling standards. This can be accomplished by linking industry's cash flow and profitability on future systems to implementing MOSA in a verifiable manner through contractual mechanisms/structures such as award fees or incentives. For example, an award/incentive fee or a Contractor Logistics Support/sustainment option could be tied to verified compliance with MOSA enabling standards or with the delivery of technical data with sufficient rights to compete future system upgrades.

**7.4.  Contract Types.**

7.4.1. The government has a range of contract types available for its use. The spectrum covers firm fixed price (FFP) contracts offering the most incentive to control cost to Cost Plus type contracts providing for less motivation to control costs (risk shifts to the government). By including an incentive profit or fee, with emphasis on cost, the contractor has the opportunity to earn additional profit or fee by controlling costs.

7.4.2. A determination and finding, signed by the head of the contracting activity, approved in accordance with agency procedures, is completed for all incentive and award-fee contracts justifying the use of this type of contract is in the best interest of the Government.

7.4.3. If a program's primary incentive focus is on objectively verifiable cost, schedule, or performance criteria, then fixed-price incentive (firm target) (FPIF) or cost-plus incentive fee (CPIF) contract types are generally good choices. As a general rule, acquisition teams should consider the FPIF type first, then CPIF. The acquisition team should select a cost-plus award fee (CPAF) or fixed-price contract with award fee (FPAF) only upon determining that FPIF and CPIF type contracts are not appropriate.

7.4.4. Award fee contracts may emphasize multiple aspects of a contractor's performance in a wide variety of areas, such as quality, timeliness, technical ingenuity, overall management of the contract, and cost. Award fee incentive payments are tied to acquisition objectives with emphasis on cost, schedule, and technical performance.

7.4.4.1. Subjective evaluation of the contractor's performance allows the government to use "judgment" such as "anticipation of problems" or "problem solving" to reward a contractor. Award fee type incentive arrangements may only be used when it is not possible to establish objective criteria to evaluate contractor performance; use of award fee requires documented justification and approval.

7.4.4.2. Award Fee Plans are structured to motivate excellent contractor performance. The Award Fee Plan sets forth the evaluation criteria for assessing contractor's

performance; how well the contractor performed determines the amount of the fee that may be paid. The plan should provide a structured approach to how contractor's performance is evaluated (Award Fee Evaluation Board members, monitors, fee determining official responsibilities, etc.); reference the AF Award Fee Guide for more information.

7.4.4.3. An award fee is to be earned—each evaluation period the contractor starts at zero percent of potential award fee pool available for that period. Depending on performance, the contractor may earn up to 100% of the available award fee pool for that period.

7.4.4.4. Use of an award fee incentive is labor intensive in that it requires a management structure to oversee and evaluate the contractor's performance, which adds administrative costs and management effort to oversee the program. Therefore, award fee contracts are only recommended when the contract amount, performance period, and expected benefits warrant the additional administrative effort and when it is not possible to identify objective performance/ schedule measures. A cost benefit analysis is required (should be documented in the contract file) to justify the use of an award fee type arrangement.

7.4.5. In instances where objective criteria exist, and the Contracting Officer and PM decide to also evaluate and incentivize subjective elements of performance by including an award fee, the most appropriate contract type would be a multiple incentive type contract containing both incentive and award fee criteria (e.g., cost-plus-incentive/award fee, fixed; fixed-price-incentive/award fee) or a fixed price/award fee contract.

7.4.6. Non-Monetary Incentives. Award Term contract can be a useful incentive for recurring products or services. It allows a contractor, through superior performance, to earn additional work—the potential for future revenue can be a very effective incentive. Note: Award term should be drafted to address funding availability if used for annually funded work.

7.4.7. **Figure 7.1** provides general guidance on types of contracts with fees and types of uses for them. *Note:* Actual requirements are based on specific needs.

**Figure 7.1. General Overview of Incentives, Contract Type and Risk.**

## Contract Type Spectra

| FFP | FP/EPA | FPAF | | FPIF.FPIS | CPIF | CPAF | CPFF |
|-----|--------|------|---|-----------|------|------|------|

| HIGH RELIABILITY OF COST ESTIMATE | LOW RELIABILITY OF COST ESTIMATE |
|---|---|

| HIGH CONFIDENCE OF OUTCOME | LOW CONFIDENCE OF OUTCOME |
|---|---|

| PRICE ANALYSIS | COST ANALYSIS |
|---|---|

| RISK TO CONTRACTOR | RISK TO GOVERNMENT |
|---|---|

| Micro Purchase | Simplified Acquisition | Commercial Acquisition | Systems Development |
|---|---|---|---|
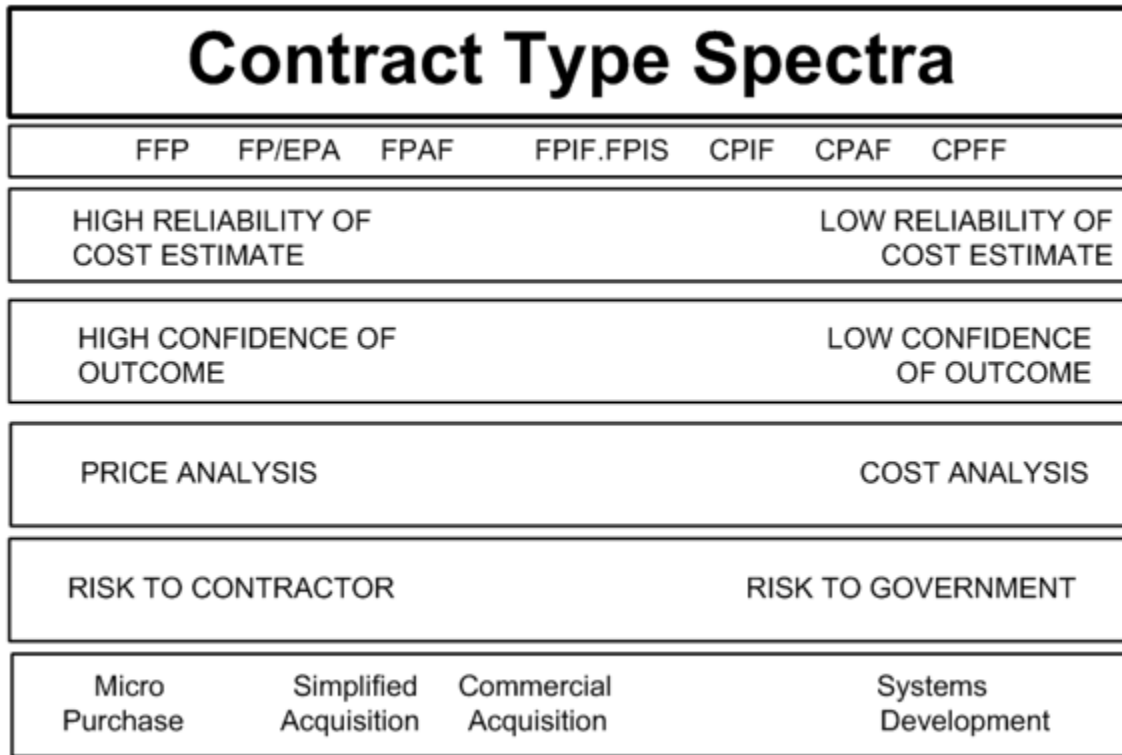
**7.5. Selecting an Incentive.**

7.5.1. The first question the PM asks is, "Do I need an incentive?" The answer could very easily be "no" if the contract is short-term, or the contractor has a proven history of superior performance on similar efforts and can deliver the required product without an incentive. If the program has critical delivery dates, tight cost targets, technology issues, software risks, or challenging performance requirements, an incentive may be a good business decision. Decide what result you are seeking and then chose the incentive tool or combinations of tools to achieve the desired results.

7.5.2. In constructing a business arrangement and incentive package, there is no substitute for planning, knowledge, and research. PMs should work with their Contracting Officers, as well as other program team members, when considering choices for contract incentives.

7.5.3. Use market research, to include early one-on-one meetings with potential contractors, to gain information on product knowledge, technology status, industry practices and business arrangements. Contact SAF/AQX for business intelligence on potential contractors or the business sector. The Defense Contract Management Agency (DCMA) can provide information on the company's long-term objectives and current and anticipated business base and performance experiences.

7.5.4. Take care to ensure that different incentives in the plan work together and do not conflict. For example, look at how the different criteria are related to ensure you are not incentivizing a contractor to focus solely on performance, while ignoring cost and schedule. No incentive contract may provide for other incentives without also providing a cost incentive (or constraint).

7.5.5. In order for an incentive to be effective, the contractor should perceive that it is achievable. Remember that a "reward" that cannot be gained is no reward. Conversely, incentives are not "gifts." Incentives should be earned through performance. However, an incentive that does not motivate the contractor may not be much of an incentive. Effective incentive arrangements should be large enough to motivate performance, and should provide a meaningful return to the contractor. Enhanced performance should add value to the mission. Reward should be commensurate with risk. Incentives should be worth the contractor's investment. Overall, incentives should be challenging, but realistic and attainable.

7.5.6. Motivational theory indicates that tying rewards to specific behaviors (or events) and choosing rewards that are paid "immediately" can be the most effective way to motivate. An incentive paid years from event completion will probably not motivate a company, particularly since companies (or at least the people) tend to have a short term focus (generally quarterly and/or yearly) and the personnel currently running the company have moved to other jobs or into retirement. However, in long term arrangements, immediate rewards may not be the best incentive either. A reward, nearer the end of a longer term arrangement (e.g. in subsequent options) may incentivize continued focus on "this work", with potential for keeping the "A" team in place, instead of a shift in focus to find "new work."

7.5.7. The following series of questions can help guide the decision when selecting an incentive:

7.5.7.1. What is important to the program—technical, schedule, cost—for program success? What are the key elements for success in the area deemed important to the program- technical talent, sub-tier supplier performance, etc.?

7.5.7.2. What are the key program risks, and how can incentives help to mitigate risks and improve probability of success?

7.5.7.3. Is the effort you want to incentivize realistic given the state of the art for technology?

7.5.7.4. Are there objective criteria that can be used to measure how well the contractor is performing towards meeting incentive targets?

7.5.7.5. Is it within the contractor's control to meet the identified goals?

7.5.7.6. Is incentive amount adequate to provide sufficient motivation?  How is that known?

7.5.7.7. What is the contractor's environment?

7.5.7.8. Where does this particular program fit within the contractor's overall portfolio of work?  Is it one of many contracts, or is it a major contract and plays a key role in the company's/business segment's profit future?

7.5.7.9. What role do the employees play in the development of the product?  Will (and how will) the incentive flow to employees? As an example, software is very manpower dependent—some contractors have been successful in identifying that a portion of the incentive will go directly to their program personnel. This gives the financial incentive to

the people who are doing the work, encouraging "buy-in" at all levels throughout the contractor's organization.

7.5.7.10. Does the subcontractor play a critical role in program success? Will (and how will) the incentive flow to the subcontractors?  Will (and how will) the prime communicate with the sub?  Understanding the prime's relationship with their subcontractors may help determine how to use incentives to achieve the desired results. However, the government cannot dictate or negotiate subcontract types.

7.5.7.11. What is the government environment?  Is the budget extremely limited?  Are there outside pressures for early delivery?

7.5.7.12. Is there something in the contract administration process that works against the incentive?

7.5.7.13. Should a negative incentive be considered?  In the event of non-performance, a negative incentive could require the contractor to return a portion of the fee paid (comptrollers of companies hate to write checks returning money to the government) or could have provisions for early termination of the contract or for contract options to not be exercised.

7.5.7.14. If you decide you need an incentive, the next step is to work with your Contracting Officer, attorney advisor, and other team members as appropriate, to develop the necessary approval documentation for the use of an incentive type contract, crafting of the most effective incentive and creation of appropriate contract language. The ACEs can be good sources of information and expertise for this.

**7.6. Follow Up/Execution.** Awarding the contract does not mean the efforts to implement a successful incentive strategy are complete. The effort includes managing and administering the program and contract, monitoring and evaluating the contractor's progress against the identified metrics, and providing feedback to the contractor on progress.

7.6.1. Effective and timely communication with the contractor is key to the success of the incentive. If the incentive has been selected and crafted correctly, the PM should be "on message" in communicating regularly with the industry counterpart. What is said can impact the contractor's efforts.

7.6.2. Effective incentives motivate the contractor toward program success. PMs are mindful of incentive programs being an opportunities to assess contractor performance. Contractor performance is assessed in other ways such as program reviews, annual Contractor Performance Assessment Reports (CPARs), and EVM. Discrepancies among various assessments of contractor and program performance can indicate there is a problem in contracting/acquisition strategy, incentive planning or evaluation alignment. The PM should understand and be able to explain the reason for the discrepancies. The PM considers whether the incentive program is properly driving the desired behaviors in the contractor.

**7.7. Considerations for Successful Implementation of Incentives.**

7.7.1. There are examples of programs successfully using incentives. A clear understanding of critical mission needs combined with the development of sound evaluation criteria to measure contractor's performance are key to a successful relationship leading to excellent contractor performance. Competition, as well as positive and negative incentives, has been

used to improve contractor performance. Consider that low award or incentive fees for poor performance may result in contractor management changes and improved performance.

7.7.2. There are cases where incentives do not work. There are programs where the contractor does not have the capability to perform the work or an incentive was structured poorly and/or was not attainable (e.g., an unachievable unit cost goal).

7.7.3. It is important to realize when an incentive plan is working and when it is not working. Plan to collect metrics and documentation to determine whether criteria are being met; this can be supported with a well-crafted Quality Assurance Surveillance Plan. If the incentive plan is not working, work with the contracting officer, and consider changing it. Restructuring a contract after award is a time consuming and expensive undertaking; it is critical to do the work up front before award.

7.7.4. The PM is responsible for developing the incentive strategy starting with determining the government needs. Be prepared to ask questions of the requirements community as well as the technical and business staffs to ensure incentivizing performance that is important to the government and worth the money. Be prepared to assist the contracting officer in negotiations with the contractor to achieve the government objective. Communicate openly with the contractor in an atmosphere of trust and mutual respect in order to achieve the goal. Stay away from complicated incentive approaches and use objective criteria whenever possible. Management is important—the contractor should focus on what the PM focuses on—make sure it relates to the incentives.

7.7.5. When creating an incentive, consider a "war-game" approach. Look at how the incentive is planned to work, and then create several possible test cases to anticipate the potential trade-offs. As an example, the contractor seeks to increase reliability by 100 hours and as a result spends $10M extra dollars. Is it of value to the government and to the contractor for that trade off? Does the increase in reliability save well beyond the expended $10M? Is this an outcome you want and need to incentivize?

**7.8. Additional Information and Training.**

7.8.1. Acquisition Centers of Excellence (ACE):  For additional information on contract incentives, please contact your local ACE, contracting office, or SAF/AQXE.

7.8.2. Training:  See the DAU website for training.

7.8.3. For additional information reference the AF Incentives Contracts Resources SharePoint, DoD Contracts Incentive Guide, and the Air Force Award-Fee Guide.

## Chapter 8

## ITEM UNIQUE IDENTIFICATION IMPLEMENTATION PLANS

**8.1. Introduction.** This chapter is written to be used with AFI 63-101/20-101, DoDI 8320.03, *Unique Identification (UID) Standards for Supporting Information Enterprise*; DoDI 8320.04, *Item Unique Identification (IUID) Standards for Tangible Person Property*; DoDI 4151.19, *Serialized Item Management (SIM) for Materiel Maintenance*; DoDM 4140.01, *DoD Supply Chain Material Management Procedures, Volumes 1, 3-5, 7, and 9-11*; Federal Acquisition Regulation (FAR) Part 45, *Government Property*, Defense FAR Supplement 211.274; DoDI 5000.64, *Accountability and Management of DoD Equipment and Other Accountable Property*; and DoDI 4161.02, *Accountability and Management of Government Contract Property*.

8.1.1. Purpose of IUID. IUID is a Department of Defense program requiring the marking and registering of assets enabling easy access to information about DoD possessions in order to make acquisition, repair, and deployment of items faster and more efficient. Tangible assets are marked and associated with a globally unique and unambiguous set of data, ensuring data integrity and data quality throughout the life of the component, and supporting multi-faceted business applications and users.

8.1.2. Terms.

8.1.2.1. DoD Item Unique Identification – A system of marking items delivered to the DoD with Unique Item Identifiers (UII) having machine-readable data elements to distinguish an item from all like and unlike items. Items are marked with a Data Matrix, the contents of which are encoded in a syntax of International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 15434 and the semantics of ISO/IEC 15418 or the Air Transport Association Common Support Data Dictionary (ATA CSDD) for Text Element Identifiers (TEIs). The data matrix contents may be either a Unique Item Identifier (Construct#1 or Construct #2) or a DoD recognized IUID equivalent.

8.1.2.2. Data Matrix – A two-dimensional matrix symbology containing dark and light square data modules based on ISO/IEC 16022. It has a finder pattern of two solid lines and two alternating dark and light lines on the perimeter of the symbol. Data matrix is used for item marking applications using a wide variety of printing and marking technologies. The Data Matrix ECC 200, using Reed-Solomon error correction, is the specified symbol for a UII when physically marked on an item.

8.1.2.3. Enterprise Identifier – A code uniquely assigned to an enterprise (the manufacturer, vendor, etc.) responsible for assigning item unique identifiers to items.

8.1.2.4. Item – A single hardware article or unit formed by a grouping of subassemblies, components, or constituent parts.

8.1.2.5. Marking – The application of legible numbers, letters, labels, tags, symbols, or colors to ensure proper handling and identification during shipment and storage.

8.1.2.6. Unique Item Identifier (UII) – A set of data elements marked on an item globally unique and unambiguous. For items serialized within the enterprise identifier, the UII data set includes the data elements of enterprise identifier and a unique serial number

(Construct #1). For items serialized within the part, lot, or batch number within the enterprise identifier, the UII data set includes the data elements of enterprise identifier, the original part, lot, or batch number, and the serial number (Construct #2).

8.1.3. Additional information and guidance including information specifically geared to PMs, depots, and industry can be found at the DoD IUID Toolkit at **https://dodprocurementtoolbox.com/site-pages/unique-id-tools**.

**8.2. Applicability of Item Unique Identification Implementation Plans.** The PM is responsible for preparing an IUID implementation plan for all programs that result in the delivery of tangible personal property items to the Department of Defense. Where there is no designated PM, such as in the case of re-procurements or contracted Maintenance, Repair, and Overhaul (MRO) of common spares, follow the AFMC/A4NL guidance for delivery of IUID compliant replacement and repaired assets. The PM identifies and addresses all items meeting the IUID criteria in the IUID Implementation Plan as defined in DoDI 8320.04. The implementation plan addresses cost, schedule, impacts on legacy assets in service and in inventory, existing ongoing contracts, engineering drawing update strategy, budget requirements, and impacts to foreign military sales. Plans reflect coordination between program acquisition and sustainment activities, and industry. An IUID Implementation plan involving IT/business systems includes a strategy to integrate IUID data collection, storage, and transmission across Automated Information Systems (AIS) using data syntax specified in DoDI 8320.03 and MIL-STD 130, *Identification Marking of U.S. Military Property*.

8.2.1. The PM prepares an initial IUID implementation plan. The approved IUID implementation plan is included in the SEP as an annex.

8.2.2. To ensure IUID design consideration, the PEO/MDA approved IUID implementation plans are routed for review and approval as an annex to the SEP. IUID implementation plans are updated for each MS review or when configuration changes drive new IUID marking and tracking requirements. (This is also required in the information support plan (ISP). 10 USC §2223, DoDI 5000.02T, DoDI 4151.19)

8.2.3. During post Initial Operational Capability (IOC) reviews, The PM ensures satisfactory progress toward completion of the program's IUID Implementation. The PM initiates management actions to address progress issues/concerns until all items meeting IUID criteria have been uniquely identified and registered in the IUID registry.

8.2.4. Implementation plans for ACAT programs with existing legacy items coordinate with the sustainment activities for those items and reference any existing or projected plans for IUID implementation.

8.2.5. Program planning for Automatic Identification Technology (AIT) infrastructure requirements and/or Automated Information Systems (AIS) enhancements to enable IUID occur only if the program is responsible for the management and/or maintenance of AIT and/or AIS.

8.2.5.1. Plans identify the items used by the program meeting the IUID criteria. This includes items managed by the AF, other DoD Components and Agencies, Government agencies outside the DoD, or support contractors. DoDI 8320.04 Figure 1 provides a decision flowchart for determining if an item meets the criteria for IUID marking.

8.2.6.  The PM is responsible for determining IUID requirements for program assets meeting criteria of updated core language outlined in DoDI 8320.04:

8.2.6.1.  Items with the Government's unit acquisition cost is $5,000 or more. For existing items already owned by the Government, this value should be construed as the acquisition value to replace the item.

8.2.6.2. Items with the Government's unit acquisition cost is less than $5,000, when identified by the managing or requiring activity as serially managed, mission essential, controlled inventory, or requiring permanent identification unless the terms and conditions of the contract state otherwise.

8.2.6.2.1.  Serially managed items (items the DoD elects to manage by means of its serial number). An item serialized by the manufacturer, but not designated by the DoD (usually the PM or Item Manager) to be uniquely tracked, controlled or managed in maintenance repair and/or supply by means of its serial number.

8.2.6.2.1.1. Serial management includes requirements for unique item traceability. Unique item traceability is a requirement to establish the authenticity of an individual item or group of items at any time during their life. The ability to discover life cycle information for an item is known as traceability and is enabled by IUID.

8.2.6.2.1.2. Unique item level traceability is the requirement to trace life cycle management events related to acquisition, property accountability, storage, operation, maintenance, safety, physical security, retirement, and disposal by each individual item.

8.2.6.2.1.3. Serially managed items include reparable items down to and including the sub-component reparable unit level, life-limited items, time controlled items, items requiring individual records, and items requiring technical directive tracking at the part level.

8.2.6.2.2. Mission essential is a measure of an item's military worth in terms of how its failure (if a replacement is not immediately available) would affect the ability of a weapon system, end item, or organization to perform its intended functions. This determination, relative to UID, is made by the PM in coordination with the user.

8.2.6.2.3. Controlled inventory are items designated as having characteristics requiring identification, accountability, segregation, or special handling ensuring their safeguard and integrity. Includes classified items, sensitive items (such as precious metals, hazardous items, etc.), pilferable items (see DoD 4100.39-M, *Federal Logistics Information System (FLIS) Procedures Manual, Vol 10*, Table 61), and safety controlled items.

8.2.6.3.  Regardless of value, (a) any DoD serially managed subassembly, component, or part embedded within a delivered item and (b) the parent item containing the subassembly, component, or part, and any warranted serialized item per DoDI 8320.04.

8.2.6.4. Nuclear Weapons-Related Materiel (NWRM). All individual NWRM items are accounted for and managed by serial number. These NWRM assets meet the requirements of DoDI 8320.04 and require IUID. Consistent with engineering analysis,

individual NWRM items in the DoD Supply System are marked with a machine readable UII or assigned a virtual UII. Coordinate IUID Implementation Plans involving nuclear critical components with AFSEC/SEW and AFNWC/NTS (Surety and Certification Division). Refer to AFI 91-101, *Air Force Nuclear Weapons Safety Program* and AFI 20-110, *Nuclear Weapons-Related Materiel Management* for additional guidance.

8.2.6.5. Government Furnished Property (GFP). The PM should ensure the PCO enters the DFARS clause 252.211-7007 and FAR 52.245-1*, Government Property* in new contracts that involve government furnished property in possession of the contractor, without regard to the availability of funding. Overarching requirements for GFP management are contained in FAR Part 45 and DoDI 8320.04. DoDI 8320.04:

8.2.6.5.1.  Establishes the DoD IUID register as the master data source for GFP.

8.2.6.5.2.  Requires the AF to identify and track GFP via CDRL through the use of UIIs in transaction-derived data from electronic business transactions.

8.2.6.6.  Contractor Acquired Property (CAP). CAP assets are excluded initially from the IUID registry. CAP assets meeting the IUID criteria of DoDI 8320.04 are marked and registered in the DoD IUID registry only upon delivery to DoD in accordance with the clause at DFARS 252.211-7003. Requiring activities update paragraph (c) (1) (ii) of the clause to insert the exhibit line item numbers of those items.

8.2.6.7.  Tooling for MDAP unique tooling associated with the production of hardware for an MDAP is stored and preserved through the end of the service life of the related weapon system per FY 2009 P. L 110-417, Title VIII, Subtitle B, Section 815. Unique tooling designated for preservation is identified in the Life Cycle Sustainment Plan (LCSP) at MS C or prior to MS C in the Systems Engineering Plan is considered DoD serially managed and be IUID compliant.

8.2.6.8.  The PM may apply for exception to contractor application of IUID as described in DFARS2.11.274-2(b).

**8.3.  Preparing the IUID Implementation Plan.**  IUID Program Implementation Plans apply to all programs resulting in the delivery of tangible personal property items to the DoD. A template for IUID implementation plans includes detailed guidance for each section can be found at **Attachment 3**. In general the plan should:

8.3.1. Incorporate IUID requirements for all new end items meeting the IUID criteria identified in AFI 63-101/20-101 and DoDI 8320.04. Identify the items and the plan to mark and register the items. Initial plans may not be able to include a detailed list of items meeting the criteria, but the PM is able to identify expected categories and have a plan/schedule to ensure all items requiring marking are identified.

8.3.2. Address IUID requirements for legacy items. Legacy items are DoD owned items that have been produced and deployed for use, or have been produced and placed in inventory or storage pending issue for use. These assets are marked as the opportunity permits. Marking legacy assets follow strategies consistent with sustainment business process, priorities, and availability opportunities as prescribed by AFMC/A4NA and USSF.

8.3.3. Incorporate IUID requirements for all embedded items meeting the IUID criteria, including all serially managed embedded items.

8.3.4.  Apply IUID requirements to Contracted Logistics Support Agreements. Specify how DFARS clause 252.211-7003 is being applied to include marking and registering of spares, repaired items, and other items managed or procured under Contractor Logistics Support (CLS).

8.3.5.  Identify IUID requirements for Foreign Military Sales (FMS) and Security Assistance Programs.

8.3.6.  Support Performance Based Logistics objectives for total asset visibility, life cycle inventory management, and serialized item management.

8.3.7.  Integrate IUID in configuration and document management.

8.3.8.  Address organic manufacturing.

8.3.9.  Address AIT infrastructure requirements, to include:

   8.3.9.1.  Maintenance and supply support,

   8.3.9.2.  Organic manufacturing, and

   8.3.9.3.  Deployable assets.

8.3.10.  Address compatibility with and impact to Automated Information Systems (AIS). Include:

   8.3.10.1.  Program-specific information.

   8.3.10.2.  Cross-program/cross-service information systems.

8.3.11.  Identify the capability requirements necessary to accommodate IUID data for the identified assets. If the system is AIS, use it for the management of property.

8.3.12.  Be consistent with financial accounting and property management objectives.

**8.4.  Coordination Process for IUID Implementation Plans.**

8.4.1. The PM prepares the plan collaborating with industry, sustainment, local ACE personnel ensure standardization and aid in identification of cross-cutting implementation activities.

8.4.2. Prior to final PEO signature coordination, coordinate plans with AFMC/A4NL, USSF/SSC SAF/AQX, and AF/A4LR to ensure standardization and aid in identification of cross-cutting implementation activities. This review is optional, but recommended.

8.4.3.  After obtaining PEO signature, ACAT I and non-delegated programs work with their PEMs to obtain SAE coordination (ACAT ID/IB) or approval (ACAT IC or non-delegated II). Following SAE signature, ACAT ID and IB program plans are forwarded by the PEM to OUSD (A&S) or DoD CIO for approval.

   8.4.3.1.  Changes such as updates to schedule, IUID item lists, and status updates do not require a re-coordination of the IUID Implementation Plan unless they drive a significant change in the approved strategies or resources required for implementation. Updates to existing plans do not need to change to revised templates or formats, but be reviewed to ensure all new statutory or regulatory requirements are addressed during periodic SEP reviews.

**8.5. Registration and Implementation.** The marking and registration of the items in the IUID registry is normally accomplished by the contractor through implementation of DFARS clause 252.211-7003, *Item Identification and Valuation*. However, it is still the responsibility of the PM to ensure all items are marked and registered. This includes verification that the data submitted to the IUID registry is accurate and usable for future asset management purposes. Some consideration for the PM to ensure correct and complete registration and marking are:

8.5.1. How the Contract Line Item Number (CLIN) and CDRL structure supports IUID. Separate CLINs or Sub CLINs for items requiring marking make it easier to determine value and to register at delivery. Requiring a CDRL to identify IUID items and/or embedded items provides a tracking mechanism and promotes early IUID planning by the contractor.

8.5.2. When and how the contractor is going to mark items. Make sure the contractor is aware of the International Organization for Standardizations' standard and related DFARS Clause inserted into the contract. Look for the activity in the Integrated Master Plan/Integrated Master Schedule and request status as a part of routine reporting.

8.5.2.1. Understand how the contractor is going to register items. Preferred method is to use Wide Area Workflow (WAWF) and submit the IUID information at the time of acceptance (completion of the electronic Form DD250, *Material Inspection and Receiving Report*). The PM ensures the person responsible for accepting the delivery is aware of what is in the IUID section of WAWF. Assign an IUID lead and make sure the lead is aware of common mistakes (like using a subcontract number instead of the government contract number or failure to follow the DoD standard.)

8.5.2.2. Data Item Descriptions (DID). The DIDs referenced in Attachment 3: DI-MGMT-81803, *IUID Marking Plan*, and DI-MGMT-81804, *IUID Marking Activity, Validation, and Verification*, offer standardized tools for executing IUID Plans. Reference **https://assistca.dla.mil/online/login/welcome.cfm**.

8.5.2.2.1. IUID Marking Plan DID. This DID aids the contract officer, contractor, and government quality assurance personnel to define and understand the scope of meeting MIL-STD-130. It requires the contractor to deliver the marking details and UII management (UII Uniqueness and DoD registration approach) in a plan prior to the actual item marking.

8.5.2.2.2. IUID Marking Activity and Verification Report DID. This DID aids the contract officer, contractor, DCMA, and government quality assurance personnel to understand the data elements associated with the IUID mark and to summarize the data as a deliverable. The mark verification information represents mark quality and allows PMs to verify the integrity of the data in the DoD registry and management system records.

**8.6. Foreign Military Sales (FMS) IUID Requirements.**

8.6.1. Implementation Planning. The Product Support manager (PSM) may tailor IUID implementation planning on FMS assets per established FMS case direction. Such tailoring is documented in the IUID Implementation Plan to include detailed justification for any waiver or exemption and planned course of action for FMS IUID requirements. Updated IUID Implementation plans reflect impacts on cost, schedule, or availability/reliability and be approved by the PEO.

8.6.2. Scope. The scope for application of FMS IUID requirements includes acquisition/legacy programs with approved IUID implementation plans detailing specified course of action. The scope includes items being procured under new solicitations and on-going contracts, in operational use, inventory and/or undergoing depot maintenance, or overhaul by DoD repair activities. The PM ensures IUID Implementation planning for FMS Unique assets is consistent with AF and DoD guidance.

8.6.3.  Budget Requirements. PMs ensure Planning, Programming, Budgeting, and Execution (PPBE) includes nonrecurring IUID cost.

8.6.4. FMS Unique IUID Requirements. In accordance with DoDI 8320.03, *Unique Identification Standards for a Net-Centric Department of Defense*, DoDI 8320.04, *Item Unique Identification Standards for Tangible Personal Property*, and the *DoD Guide to Uniquely Identifying Items*, the following guidelines apply:

8.6.4.1.  Follow on Operations and Support. Contracting officers omit the IUID DFARS Clauses 252.211-7003 and 252.211-7007 from contracts where the requesting activity provides an approved IUID Implementation Plan that specifying assets not migrating to DoD inventories and therefore not requiring IUID marking or registration in the DoD IUID Registry. The requesting activity may also provide an approved LCSP clearly reflecting that DoD has no follow on role in the operations and support of deployed/fielded FMS assets

8.6.4.2.  FMS Asset Migration to Inventory Control Point (ICP). The ICP takes action to comply with IUID requirements and recover all nonrecurring cost from the FMS Customer per DoDD 2140.02, *Recoupment of Nonrecurring Costs (NC) on Sales of U.S. Items*. If not, the ICP obtains instruction from the program office on returning the asset to the FMS customer without action. Upon receipt of an FMS asset not complying with IUID requirements, the ICP should suspend the asset in stock until DoD support requirements are verified with the Program Office. The ICP confirms the LCSP calls for a DoD repair, overhaul, etc. and includes IUID marking and registration.

8.6.4.3. Direct FMS Case/Contractor Logistics Support (CLS). After successful implementation of an FMS Case, the US Government may enter into a contract with an Original Equipment Manufacturer (OEM) to provide systems, spares and equipment directly to an FMS customer. FMS countries may also elect to procure systems, spares, and equipment directly from the OEM and not establish an FMS Case. Both of these situations constitute a direct contractual relationship between the sovereign country and the OEM. These systems, spares and equipment are outside the DoD inventory and not required to comply with IUID markings. The PM ensures the IUID Implementation Plan and LCSP clearly reflects that DoD has no follow on role in the operations and support of deployed/fielded FMS assets. Upon receipt of an FMS asset that does not comply with IUID requirements, the ICP processes the asset as described in AFMAN 16-101, *Security Cooperation (SC) and Security Assistance (SA) Management*. CLS services funded by the FMS case adheres to the requirements as defined in AFMCI 16-101, *Security Cooperation, Security Assistance and FMS Management*.

8.6.4.4.  FMS Repair and Return. This unique FMS process provides serialized repair of specific country spares which are returned to the country of origin and maintained within the FMS processes and controls. The repair sources include direct Contractor Logistics

Support, FMS Processed Repair/Return processed at the DoD sources, or through the FMS Parts Repair Ordering System (PROS). During the repair process, these assets tracked as property of sovereign countries and are earmarked for return to the respective FMS countries. They are not designed to enter the US inventory and therefore are exempted from the requirements of IUID.

8.6.4.5. Non-Standard spares and equipment purchased through Parts Repair Ordering System (PROS). These assets are unique to the FMS country specific systems/end items and do not enter the US inventory. They are exempt from IUID requirements.

8.6.4.6. Acquisition Advice Code "P", Security Assistance Items. Spares and equipment with National Stock Numbers (NSNs) that are identified with Acquisition Advice Code "P" are no longer used in the US inventory and are exempt from IUID.

**Chapter 9**

**PROGRAM REALIGNMENT**

**9.1. Purpose and Overview.** This chapter further explains the program realignment process and responsibilities prescribed in AFI 63-101/20-101. It describes a collaborative process designed to ensure a seamless (within ILCM community) and transparent (to the user) workload transition if the location for executing AF systems and acquisition programs is formally transferred (or split) between geographically separate locations and/or MAJCOMs. This chapter outlines the process and criteria for assessing the readiness of a given weapon system or acquisition program to transition, details the steps for accomplishing the transfer action, and describes the roles and responsibilities of parties involved in the program realignment process. *Note:* This chapter does not explicitly apply to the transfer of programs between PEO portfolios. However, it could be used to aid in preparation of a PEO transfer request.

**9.2. Background and Framework.** Executive management responsibilities for acquisition programs remain with the PEO, and day-to-day responsibility for managing the development and sustainment needs of the system throughout its life cycle remain with the PM, regardless of program realignment. Workload may be realigned between locations to take advantage of efficiencies and resource savings achieved by co-locating similar work.

9.2.1. Workload for systems and acquisition programs is not transferred unless, at a minimum, the system, subsystem, component, or increment of capability has been certified as interoperable within its intended operational environment, has achieved IOC and Full Rate Production (FRP), and is logistically supportable per the user's requirement, and the transfer can align the program office responsibilities to co-locate with the organization(s) responsible for the system's/program's depot maintenance and supply chain management.

9.2.2. The PM is responsible for identifying and documenting if and when a program realignment or split is to occur (usually in the AS or LCSP). The PM should also work with all stakeholders, including resource personnel as appropriate to ensure transition requirements, activities, and timeframes associated with a proposed program realignment are fully coordinated and the gaining location has secured sufficient resources (manpower, funding, facilities, etc.) to accept workload so as not to impact mission success. **Table 9.1** contains specific criteria to address when considering program realignment.

**Table 9.1.  Program Realignment Assessment Criteria.**

| Assessment Criteria | Considerations |
|---|---|
| System Technical Maturity | Has the system achieved IOC and been deemed interoperable in its intended operational environment? Have all deficiencies identified during developmental and operational testing been satisfactorily resolved so that there are no remaining substantial or severe impacts to the operational mission? Will ongoing or planned system development activities (e.g., post-production modifications) substantially change the system's performance characteristics or supportability requirements? |

| | Are there any security issues for the program? |
|---|---|
| System Production Status | Is the program nearing the end of, or has it completed, full-rate production?[1] <br> Are additional production contracts planned or anticipated? <br> Have a significant percentage of production articles been delivered to the operational command(s)? |
| System Supportability | Have (or will) the relevant product support elements been (or be) deemed ready[2] to support the system at the planned transfer point? <br> Has adequate technical data been obtained to support sustainment activities? |
| Program Management Status[3] | Is the preponderance of system/program management effort being expended on acquisition/product development tasks or sustainment/product support tasks? Has the production configuration been baselined? <br> Is the system/program management environment stable? Are there outstanding contractual issues? <br> Are significant system/program leadership changes underway or envisioned? |
| Program Funding Status[3] | Is the preponderance of system/program funding being expended on acquisition/product development tasks or sustainment/product support tasks? <br> Is significant investment still required to field or mature the planned system sustainment infrastructure? <br> Are sufficient funds available or programmed to support the system as planned after transfer? |
| **Assessment Criteria** | **Considerations** |
| External Program Factors | Are any planned sustainment support service contracts projected to exceed $100M in total contract value? Have they been designated "special interest" contracts by SAF/AQ?[4] <br> Would any other technology or product development programs be negatively impacted if the system/program were transferred? <br> Are there any other internal or external special interests that may preclude or be negatively impacted by system/program transfer? |

[1] In this context, "production" applies to the articles intended for employment by AF organizations. In some cases, a system's production line may continue beyond the run for AF articles, e.g., foreign military sales.

The 12 Product Support Elements are further described in the *DoD Product Support Manager Guidebook* which provides specific evaluation criteria that may be useful in determining a system's sustainment posture and readiness for transfer of management responsibilities.

Do not consider activities outside the scope of the AF program.

[4] If the answer to either of these questions is "yes", these services should be coordinated by the PEO for Combat and Mission Support (AFPEO/CM).

**9.3. Program Realignment Process.** The following description depicts the process by which weapon system and program management program realignment occurs.

9.3.1.  Prepare Transition Support Plan (TSP).

9.3.1.1.  The transition process begins with the PM. Consistent with meeting a target date identified in acquisition documentation, the PM develops a TSP to document the actions, responsibilities, and timelines necessary to transfer workload. If the transfer is concurrent with fielding, transfer planning is accomplished as early as possible during the production and deployment phase (post-Milestone C). The exact timing depends on the specific needs and actions required to transfer the workload. The PM leads the TSP preparation effort, and is supported by other applicable functional organizations at the gaining location. The PM should also solicit support from the operating command(s) as necessary to develop the TSP. The TSP is drafted with ample time for approval and completion of any other work required prior to transfer.

9.3.1.2.  The PM develops a TSP to fit the system's unique management environment and satisfy long-term requirements. While the TSP focuses on program realignment, it also reflects post-transfer organizational roles and responsibilities, manpower considerations, and funding requirements, residual system development and acquisition responsibilities, and system sustainment responsibilities for the operating command(s). The TSP also incorporates any unresolved issues and/or action plans associated with the program realignment assessment considerations.

9.3.1.3.  The PM coordinates the TSP as necessary to solicit comments and resolve any outstanding issues precluding a successful program realignment. If necessary, the PM forwards any unresolved transfer issues to the PEO for resolution. Once the TSP is developed and all issues have been resolved, the PM forwards it to the PEO, AFMC, and/or USSF/SSC for approval.

9.3.2. Approve Transition Support Plan. The PEO, Center Commander, and AFMC/CC and/or USSF/SSC approves the TSP for program realignment to occur; approval of document is delegable. If either the PEO or the impacted MAJCOM(s) does not approve the TSP, it should be returned to the PM for continued development and resolution of issues. It is a best practice to have a fully approved TSP in place three years prior to the target transfer date. This ensures there is adequate time for all actions required of both the losing and gaining organization to be completed prior to transfer.

9.3.3. Transition Support Plan Executive Review. The PEO and center commander(s) are signatories on the TSP. The AFMC/CC or SSC are the final signatory on the TSP prior to forwarding the plan to SAF/AQ. If the SAE has concerns with the TSP, the concerns are addressed and the TSP updated as necessary or as directed by this executive review. Once all issues have been resolved and the TSP has been finalized, the PM coordinates any changes with the MDA, the gaining organization, and the appropriate MAJCOM.

9.3.4. Transition Workload. Once the TSP has been signed, transition activities prescribed in the TSP flow per the timeline(s) contained in the plan. The PEO and PM continue to manage and report on system/program activities. If a "show-stopper" occurs prior to the planned transition date, the PM takes the lead to resolve it.

## Chapter 10

## FIELDING PROCEDURES

**10.1. Purpose and Overview.** This chapter further explains the materiel fielding process and responsibilities directed in AFI 63-101/20-101. It describes a collaborative process designed to ensure the seamless and transparent transition of AF materiel from product development, modification, and manufacturing entities to operational users in the field. This chapter provides planning criteria and considerations for developing materiel fielding strategies and plans, and it describes a process for coordinating and conducting materiel deliveries to operational units.

**10.2. Background and Framework.** The principal objective of every AF acquisition program is to field an operationally effective and logistically supportable product1 to the organization(s) that identified the need for the materiel. Two in five persons in the US have some form of disability, 508 compliance increases the number of personnel who can effectively support your program. As the product is being developed and produced, PMs should concurrently undertake activities to ensure the product makes a "smooth landing" at its intended user's operating location. This chapter is designed to help PMs in this regard, and to:

10.2.1. Ensure sufficient planning is conducted in advance of anticipated materiel delivery dates, allowing both the materiel developer and the user(s) to identify, understand, and resolve issues associated with the materiel.

10.2.2. Ensure sufficient time is available to develop the infrastructure necessary to operate and sustain the materiel, including the operations, maintenance, and mission support personnel who employ, repair, and support the materiel in the field.

**10.3. Materiel Fielding Process Overview.** The materiel fielding process that is outlined in **Table 10.1** can be characterized as: *supported and supporting commands collaboratively planning and executing the delivery and beddown of an operationally effective and suitable platform or system, or a major system modification/upgrade, from a total system capability perspective, that is sustainable over its planned life cycle.* This multi-dimensional process requires close and frequent coordination among the acquisition, sustainment, and operational communities in order to field materiel that meets users' needs.

**10.4. Materiel Fielding Planning and Assessment Criteria.** The materiel fielding process, outlined in **Table 10.1**, overlays a foundation of planning and analysis criteria that serves to frame potential issues and enable the timely delivery of materiel to field organizations. The following materiel fielding planning and assessment criteria may provide PMs with "conversation starters" leading to the identification of potential materiel fielding issues for their program. They may also be used as a framework for PMs to develop program specific materiel fielding strategies and plans for their weapon systems or products.

**Table 10.1.  Materiel Fielding Planning and Assessment Criteria.**

| Planning & Assessment Criteria | Considerations |
|---|---|
| Materiel System/ Product Overview | Who are the principal participants involved in developing, manufacturing, delivering, operating, and sustaining the materiel to be |

| Planning & Assessment Criteria | Considerations |
|---|---|
| | fielded? Example: AF; DoD; US Government; industry; foreign interests.<br>How will the materiel be used in the field? Example: operational employment concepts; deployment/forward basing scenarios; mission frequency/utilization rates.<br>Are existing repair networks able to absorb new workload with existing capability and capacity? (Infrastructure of Intermediate level repair backshops can be assessed by reviewing capability and capacity data available from the repair network manager.) |
| Materiel Fielding Methodology | What actions should be accomplished prior to initiating delivery of the materiel? Do these requirements change over time? Example: product acceptance testing; certification and accreditation; operational site and/or depot activation tasks; interim contractor support agreements.<br>How will the materiel get from the manufacturing facility(ies) or product acceptance site(s) to the user's beddown location(s)? Who will deliver the materiel and by what method? Example: AF flight crews; contractor personnel; commercial shipping company, standard base supply.<br>Who will accept and inspect the materiel at the user's beddown location(s) or the original equipment manufacturer? Is government acceptance, certification and accreditation, or other additional testing required as part of acceptance by the user? |
| Materiel Fielding Schedule | How many systems/products are to be delivered and at what interval? Does this delivery schedule change over time?<br>Where/to what organization(s) will the materiel be delivered?<br>Does the user have a priority order for delivery of the materiel?<br>What are the impacts of delivery, integration, installation, and acceptance schedule changes to the user? The PM? Example: delays in delivery require PM to find sufficient classified storage space. |
| Materiel Support Concepts | |
| Sustainment Concepts | What sustainment concepts are associated with the materiel? Do these concepts change over time? Example: levels of maintenance (organizational, intermediate, depot); sources of repair; sustainment partnering relationships (government-government, government-contractor); use of interim contractor support and/or contractor logistics support.<br>Are there any performance based logistics requirements that should be met prior to delivering the materiel? Do these requirements change over time? (Example: Reliability, Availability Maintainability and Supportability (RAMS), product performance agreements, etc.) |
| Manpower/ Personnel Requirements | How many operations, maintenance, and mission support personnel are needed to operate, sustain, and support the materiel? Who provides them? What skill sets/certifications are required? Will these requirements |

| Planning & Assessment Criteria | Considerations |
|---|---|
| | change over time, or based on the number of systems/products delivered?<br>Will contractor personnel operate or sustain the materiel? In combat environments as well as at home station? Does their involvement change over time? |
| Maintenance Planning and Management | Are there any standard processes that should be completed prior to fielding/acceptance? Example: establishing system elements within Integrated Maintenance Data System (IMDS) for maintenance reporting.<br>Have program interdependencies been recognized and documented? Example: components or sub-systems used in major platforms/systems with separate funding or governance. |
| Training | How many, and to what level or standard will the operations, maintenance, and/or mission support personnel be trained prior to, or after the materiel is delivered?<br>Who develops courseware materials and administers the requisite training? When will training be provided?<br>Are there any training support systems/devices (e.g., flight simulators) that accompany the materiel? When should these systems be fielded in relation to the planned materiel delivery schedule? |
| Technical Publications | Are validated and verified technical manuals required prior to materiel deliveries? What manuals (e.g., flight, maintenance) are necessary at what point in time?<br>Are there any other forms of technical information or documentation necessary to operate or sustain the materiel in the field?  When should these artifacts be delivered? Example: engineering drawings; software licenses/user guides. |
| Support Equipment | What types of, and how many pieces of support equipment should be delivered prior to, or along with the materiel? Example: AF/DoD-common; system peculiar; contractor-provided tools and test equipment.<br>Are there any other types of government-furnished and/or contractor-furnished equipment or property that should be delivered prior to, or along with the materiel? |
| Supply Support | What types of, and how many spare parts should be delivered prior to, or along with the materiel? Example: initial or replenishment spares, deployment kits.<br>How and where will the spare parts be stored and delivered? Example: at the user's beddown location; in organic AF/DoD depots; in acontractor-operated spares site. |
| Packaging, Handling, Storage, & Transportation (PHS&T) | Have unique PHS&T requirements associated with the materiel characteristics been properly identified IAW DODM 4140.01, Vol 9, AFMCI 24-201, *HQ AFMC Material and Handling Policy and Procedures,* and MIL-STD 2073-1E?  Should these products or capabilities be procured with the materiel and delivered prior to |

| Planning & Assessment Criteria | Considerations |
|---|---|
| | induction in the supply chain? How will "total asset visibility" requirements associated with the materiel be assured? |
| Computer Resources/ Support | Are there any operations or logistics data collection, analysis, or production systems associated with the materiel? Should they be delivered prior to or along with the materiel? Example: mission planning systems; command and control systems; logistics management systems. Are there any AF or DoD electronic databases requiring modification or creation in order to deliver and support the materiel? Example: PMRT (Program Management Resource Tool). |
| Facilities & Environment | What operations, maintenance, and mission support facilities are necessary to house, operate, and/or sustain the materiel at the user's operation location(s)? When will these facilities be provided in relation to the materiel fielding schedule? Example: aircraft hangars and parking ramps; environmentally controlled storage or repair facilities; hazardous material/ explosive storage areas. Are the user's existing facilities sufficient? Are modifications to existing facilities necessary? Do new facilities need to be constructed? When will these actions take place relative to the planned materiel fielding schedule? Will environmental impact assessments be performed, and/or mitigation procedures undertaken prior to delivery of the materiel? Are there any new, unique, or recurring environmental protection requirements associated with the materiel? Will Real Property Installed Equipment (RPIE) need to be in place prior to materiel fielding? Will a support package for maintaining (RPIE) be provided? |
| Ancillary Systems, Equipment, & Supplies | Are there any systems or equipment this materiel should interface to, or be interoperable with? (including communication or command and control) If so, what is the fielding plan for these products? Are/will these systems be in the proper location(s) and quantities necessary to provide the requisite operational or sustainment interfaces? What other products are necessary to support operation and/or sustainment of the materiel? Example: petroleum, oil, lubricant products; avionics systems or components; weapons; ammunition. |
| Materiel Defect Reporting | How will materiel defects noted during or after delivery to the user be reported? (i.e., IAW T.O. 00-35D-54-WA-1, *USAF Deficiency Reporting, Investigation, and Resolution*). Who processes and adjudicates these deficiency reports? Who determines if these materiel defects warrant stopping or slowing the materiel delivery schedule? |
| Materiel Safety & Occupational | Have the materiel's safety hazards been identified and satisfactorily mitigated? Are there any new or unique system safety-required products |

| Planning & Assessment Criteria | Considerations |
|---|---|
| Health | associated with the materiel which should be delivered along with the system/product? Are there any potential adverse operational/occupational health risks or other readiness impacts associated with the materiel? Have/will these risks be satisfactorily resolved prior to delivery? |
| Materiel Security | Are there any unique materiel controls or accountability procedures that should accompany the product during and/or after delivery? Are there any physical or electronic security requirements necessary to store, handle, or limit access to the materiel? |
| Materiel Post-Production Support | Who maintains configuration control of the materiel during and after delivery? Will this responsibility transfer at some point after deliveries have begun or been completed? How will the materiel be modified or upgraded after delivery? Who will perform this work? How will the upgraded materiel be fielded? |
| Materiel Disposal | Are there any existing systems or equipment, to include communications and information network assets, to be retired or relocated as a function of system/product deliveries? Are these activities synchronized with the delivery of the new materiel? When and how will the new materiel be disposed of after it has completed its service life? Are there any de-militarization procedures, electronic media sanitization procedures, product disposal equipment, etc. that should accompany delivery of the materiel? |

**10.5. Materiel Fielding Process.** Though every acquisition program will have unique materiel fielding considerations and challenges, PMs design programs to satisfy the following three overarching and fundamental requirements inherent to the materiel fielding process.

10.5.1. The need to develop comprehensive and coherent materiel fielding plans.

10.5.2. The need to coordinate materiel fielding issues, action plans, responsibilities, and schedules with the materiel's intended user(s).

10.5.3. The need to conduct a thorough assessment and review of the materiel's readiness for delivery to the user(s).

**10.6. Technology Maturation and Risk Reduction Phase.** The materiel fielding process could begin in earnest at MS A, once the materiel solution(s) resulting from the Materiel Solution Analysis (MSA) phase has been determined. Toward the end of the Technology Maturation and Risk Reduction phase, the user produces a Capability Development Document (CDD) and maintenance or support CONOPS describing the user's intended operational employment concept(s), beddown considerations, and maintenance/support concept(s) for the materiel being developed. In preparation for MS B, the PM uses the CDD as the basis for developing an initial Materiel Fielding Plan (MFP) that serves as a "fielding roadmap" for the upcoming Engineering and Manufacturing Development (EMD) phase and beyond. At MS B, the MFP outlines the materiel fielding-related objectives and issues to be examined, as well as any specific action plans, responsibilities, and timelines for materiel fielding-related activities to be conducted

during the EMD phase. While each program has unique materiel fielding objectives and challenges, during this phase, PMs prepares a MFP to document how and when they intend to explore the materiel fielding planning and assessment criteria discussed in **paragraph 10.4** with emphasis on long-lead issues such as:

10.6.1. Potential materiel basing and employment scenarios at the user's home station, and at forward/austere operating sites if so indicated in the user's operational concept.

10.6.2. Materiel support requirements at home station and in deployment scenarios, including the potential "logistics footprint" necessary to support the materiel at forward or austere operating bases, potential sources of product support, and "50/50" considerations.

10.6.3. The potential impact of technologies that may lessen the sustainment burden and logistics footprint for home station or deployed operations—for example: embedded diagnostics, automated failure reporting, and other similar maintenance enablers capable of reducing the logistics tail associated with the materiel.

10.6.4. Potential environmental impacts/issues, potential facility and infrastructure issues, or any other materiel fielding concerns involving complex planning activities and/or lengthy remediation actions.

**10.7. Milestone B Decision.** In the MS B documentation, the PM summarizes the projected materiel fielding methodologies and timelines, and discusses the materiel fielding-related activities to be conducted during the EMD phase—for example: Site Activation Task Force (SATAF) and Depot Maintenance Activation Working Group (DMAWG) activities, responsibilities, and timelines. At the PM's discretion and with MDA approval, the MFP may be a stand-alone document, an annex to the program documentation, or embedded within MS B documentation. Additionally, if appropriate, PMs may also recommend materiel fielding-related actions or decision criteria for inclusion in the MS B ADM.

**10.8. Engineering and Manufacturing Development (EMD) Phase.** During the EMD phase, PMs may form a materiel fielding IPT to assist them with materiel fielding planning and related activities. While such an IPT would typically consist of action officers and team leads, PMs may, if the situation warrants, consider forming a General Officer Steering Group (GOSG) when strategic level program issues might preclude successful deployment of the materiel to the field.

10.8.1. If formed, materiel fielding IPTs should include representatives from the:

10.8.1.1. Product development organization(s).

10.8.1.2. Product sustainment organization(s).

10.8.1.3. Using/operating command(s) including representatives from the National Guard Bureau (NGB) and HQ Air Force Reserve Command if applicable.

10.8.1.4. Prime contractor(s) and key materiel vendors such as engine or avionics suppliers.

10.8.1.5. Product training/training system providers, including government and contractor organizations.

10.8.1.6. Product test organizations, including the Lead Developmental Test & Evaluation Organization (LDTO), operational test agency (OTA), and contractor test team members.

10.8.1.7.  If appropriate, PMs may use SATAF and/or DMAWG teams to fulfill the need for a materiel fielding IPT.

10.8.2.  By the end of the EMD phase, the PM updates the Materiel Fielding Plan (MFP) to detail the specific actions, timelines, and organizational responsibilities necessary to transfer the materiel from the product development or manufacturing entity to the operational user.

10.8.2.1.  The final MFP is built upon the initial MFP produced at MS B, and incorporate any new or modified requirements contained in the user's Capability Production Document (CPD) and Maintenance or Support CONOPS that have bearing on materiel fielding matters. Specifically, the MFP identifies any materiel fielding-related actions necessary to satisfy initial user/cadre training needs, Initial Operational Capability (IOC) requirements, and Full Operational Capability (FOC) requirements. The MFP also reflects materiel fielding-related recommendations from Developmental Test and Evaluation (DT&E) conducted by the LDTO, and any Operational Assessments (OA) or Military Utility Assessments (MUA) conducted by the OTA.

10.8.2.2.  The MFP includes any pertinent information contained in the lead MAJCOMs site activation plan for each site receiving the weapon system or product. The MFP also incorporates considerations outlined in MAJCOM level guides and instructions.

**10.9.  Milestone C Decision.**  PMs include a materiel fielding plan in acquisition documentation for MS C.

10.9.1.  At their discretion, PMs may publish a stand-alone MFP, or embed the MFP in the acquisition documentation. If a stand-alone MFP is prepared, the PM attaches it as an annex to the MS C acquisition documentation.

10.9.2.  If appropriate, PMs may recommend materiel fielding-related actions or decision criteria for inclusion in the MS C ADM.

**10.10.  Production and Deployment Phase.**  During the production and deployment phase, PMs focus on meeting the materiel delivery and acceptance requirements contained in the acquisition documentation. For all ACAT programs, once a PM is satisfied the program has, or is on track to achieve these requirements, he/she considers conducting a Materiel Release Review (MRR) with the program's Milestone Decision Authority (MDA).

10.10.1.  The MRR is a review event preceding delivery of the materiel to the operational user. The PM initiates the MRR process by completing a materiel release decision package and forwarding it to the MDA (SAE for ACAT ID and IB). This package nominally includes:

10.10.1.1.  A "Materiel Fielding Decision" memorandum for MDA (SAE for ACAT ID and IB) signature. This memorandum formally documents the MDA's decision to authorize the materiel to be fielded. This memorandum may also convey any conditions, limitations, or restrictions the MDA wishes to place on fielding activities or timelines. Additionally, it may set conditions or establish responsibilities for subsequent materiel fielding actions.

10.10.1.2.  A copy of the PM's MFP, either as a stand-alone document or as incorporated in the most recent acquisition documentation.

10.10.1.3. Any reports, briefings, or other artifacts necessary to support the PM's assessment that materiel fielding requirements contained in the MFP have been achieved, or are on track to complete as required. These artifacts may include:

10.10.1.3.1. Interim/final test results or other assessments describing the system/product's operational effectiveness and operational suitability as measured against the user's KPPs and KSAs.

10.10.1.3.2. Materiel certifications or similar statements of assurance, such as system safety certifications, air worthiness certifications, weapon employment certifications, environmental impact certifications, system authority to operate, and/or occupational health certifications. A non-exhaustive list of DoD program and system-level technical certifications is included at **Attachment 14**.

10.10.1.3.3. Materiel deficiency reports and corrective action plans.

10.10.2. At his/her discretion, the MDA may convene a formal MRR meeting to discuss materiel fielding matters with the program management team and the user(s), or may conduct a "paper MRR" if there are no significant issues with the materiel or its fielding plan. Reference T.O. 00-35D-54-WA-1, *USAF Deficiency Reporting, Investigation, and Resolution* for more information.

**10.11. Types of Materiel Releases.** When deciding to release materiel to field units, the MDA may consider authorizing materiel releases according to the following criteria:

10.11.1. Full Release. A full release is warranted when the materiel delivery and acceptance criteria contained in the MFP can be met unconditionally, or with risk mitigation procedures that are acceptable to the using command(s). When designating a system or product for full release, the MDA authorizes all subsequent materiel deliveries to proceed in accordance with the MFP and user agreements, without any further MDA notification or approval.

10.11.2. Limited/Conditional Release. A limited/conditional release is warranted when the materiel delivery and acceptance criteria contained in the MFP can only be partially met, or met with restrictions preventing or limiting some aspect of the user's operations and/or maintenance concept. In this case, the MDA authorizes materiel deliveries to begin, but may limit the quantity of materiel to be delivered or slow down the planned materiel delivery schedule to accommodate materiel "get well" plans. Additionally, the MDA may establish additional reporting requirements and/or decision points that should be cleared before subsequent materiel deliveries can occur.

10.11.3. Interim/Training Release. An interim/training release authorizes materiel deliveries for the purpose of conducting initial Air Education and Training Command (AETC), USSF, or unit training only. In this case, the materiel may be sufficiently effective and supportable for initial system/product training purposes, but not so for "real world" operations as described in the user's Capabilities Production Document (CPD). In this case, materiel releases should only be authorized as necessary to support an AETC, USSF, or user system/product training concept/plan.

**10.12. Incremental Materiel Releases.** PMs may choose to employ an incremental materiel review concept for programs following an evolutionary acquisition strategy. In this case, MRRs may be conducted for the product baseline and each subsequent increment, as depicted in the

following illustration. Incremental materiel releases may be of any type described in **paragraph 10.11** above. For example, using the notional example depicted in **Figure 10.1**, the Baseline MRR could result in an interim/training release, the Increment A MRR could be a limited/conditional release, and the MRRs for Increment B and beyond could be full releases.

**Figure 10.1.  Incremental Materiel Release Review Concept (Notional Example).**
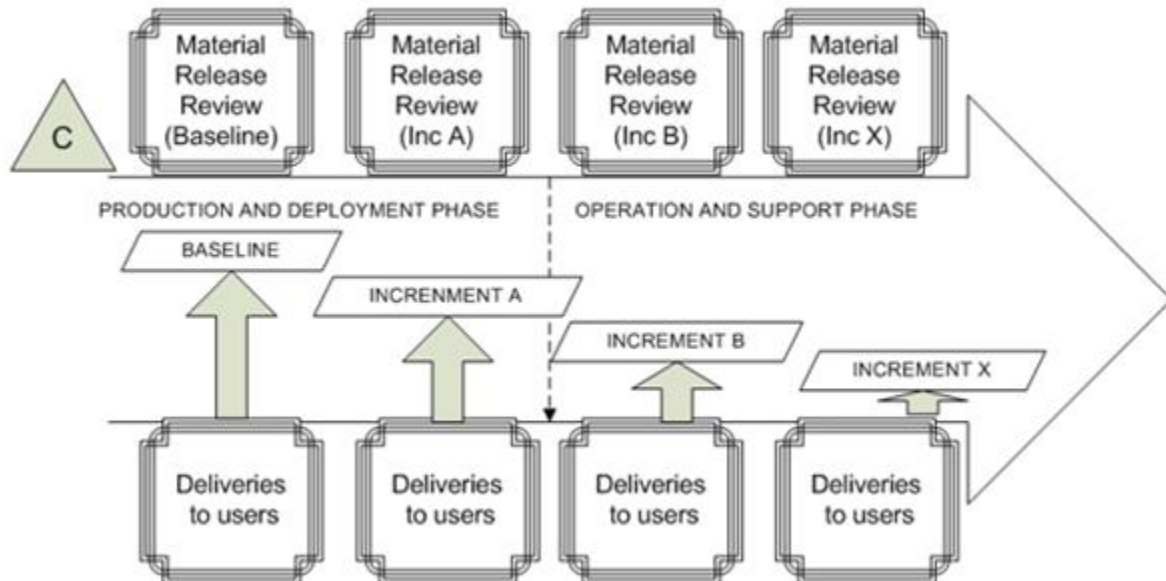


**10.13. Special Cases.** Certain acquisition activities may require unique and innovative approaches to the materiel fielding process. For example, the compressed acquisition timelines associated with Quick Reaction Capability projects may require PMs to greatly accelerate materiel fielding planning processes compared to traditional acquisition programs. Joint Capability Technology Demonstrations (JCTDs) may lead to the fielding of highly effective and urgently desired operational capabilities, but at the expense of organic logistics sustainment capabilities. Joint acquisition programs (e.g., Joint Strike Fighter) may require broader materiel fielding planning and coordination to accommodate each participating Service's unique operational requirements, support concepts, or materiel fielding processes. In each of these special cases though, PMs strive to meet the overarching materiel fielding objectives described in this chapter.

## Chapter 11

## PRODUCT AND SOFTWARE DATA ACROSS THE LIFE CYCLE

**11.1. Overview.** It is important to address product, product data and software data early in a system's life cycle in order to acquire product and product data cost-effectively and to enable a lifetime of competitive sustainment and compliance with public law. Contractors manufacture or create product, product data and software data in their development and production of a weapon system. Product, product data and software can then be used by the AF to review progress in development, upgrades, operation, and support of weapon systems.

**11.2. Product Data.** Product data is also used to provision for spares and to develop secondary sources of production. As a recommended best practice, PMs considers assigning an engineering data manager or data management specialist within the program office (referred to as "EDM" within this chapter). This individual is the OPR for day-to-day execution of the PM's responsibilities to integrate data management into program strategies and documents; to ensure appropriate product and data requirements are included in contract documents; to coordinate the review and acceptance of data delivered by contractors; and to act as liaison, on behalf of the Product Support Manager (PSM), with the AFLCMC organizations that are gatekeepers for standardized product data management systems (e.g. the Joint Engineering Data Management Information and Control System) enabling common government life cycle storage, maintenance, access, and control of digital product design data. **Table 11.1** provides a reference of program documents that can be used to support the life cycle.

**Table 11.1. Product, Product Data and Data Rights Consideration by Program Documents.**

| Program Documents | Product and Software Data & Data Rights Considerations |
|---|---|
| Technical Data Rights Strategy (TDRS), formerly the Data Management Strategy (DMS) part of AS | The TDRS documents the strategy for meeting product life-cycle data rights requirements and to support the overall competition strategy. Key sections include: Analysis of the data required to design, manufacture, and sustain the system as well as to support re-competition for production, sustainment, or upgrade. How the program provides for rights, access, or delivery of technical data, and how the program inspects, accept, and manage data the government requires for the life cycle. Include analysis of data needs to implement the product support life cycle strategy including such areas as materiel management, training, Cybersecurity, cataloging, open architecture, configuration management, engineering, technology refreshment, and maintenance/repair. The business case analysis calculation outlining the approach for using open systems architectures and acquiring technical data rights. The cost benefit analysis of including a priced contract option for the future delivery of technical data and intellectual property rights not acquired upon initial contract award. Analysis of the risk the contractor may assert limitations on the government's use and release of data, including Independent Research |

| Program Documents | Product and Software Data & Data Rights Considerations |
|---|---|
| | and Development (IRAD)-funded data. |
| Acquisition Strategy (AS) | The TDRS is a key section of the AS.<br>Resources needed from current organizational assets and items to be purchased should be outlined. |
| Cost Benefit Analysis part of AS | The business cost analysis analyzes and compares potential options through the lifecycle of the program. The PM recommends options that his analysis recommends as the most cost-effective to execute for the program. Factors that should be considered in the analysis include: acquisition, sustainment costs, supply chain, resources required by the program, program risks, schedule, and contracting strategies should be outlined in this analysis.<br><br>Additionally, the business case analysis includes calculations outlining the approach for using open systems architectures and acquiring technical data rights. Specifically, (1) clearly describe the MOSA to be used for the program, (2) differentiate between the major system platform and major system components being developed under the program as well as major system components developed outside the program that will be integrated into the major defense acquisition program, (3) clearly describe the evolution of major system components that are anticipated to be added, removed, or replaced in subsequent increments, (4) identify additional major system components that may be added later in the life cycle of the major system platform, (5) clearly describe how intellectual property and related issues, such as technical data deliverables, that are necessary to support a modular open system approach, will be addressed, and (6) clearly describe the approach to systems integration and systems-level configuration management to ensure mission and information assurance. |
| Intellectual Property (IP) Strategy part of AS | Intellectual Property Strategy should be included as part of the cost-benefit analysis for a program when discussing technical data and data rights required by the program and projected costs for obtaining these rights. |
| Life Cycle Sustainment Plan (LCSP) | The LCSP includes an assessment for each product support element (e.g., design interface, technical data management), compared to the data rights plan.<br>When specific requirements cannot be satisfied (e.g., data rights, data deliverables), the impact on the life cycle is noted (e.g., reduced support competition, higher costs). Sustainment funds needed to support the program through its life cycle are outlined. Equipment and IT hardware and software are also tracked. |
| Systems Engineering Plan (SEP) | Expectations (e.g. design and documentation maturity) for program reviews (e.g., Preliminary Design Review and Critical Design Review) are documented in the SEP.<br>Programs describe in the SEP which artifacts (e.g., product and software |

| Program Documents | Product and Software Data & Data Rights Considerations |
|---|---|
| | data) make up each technical baseline. These artifacts are aligned with requirements in other documents (e.g., AS, RFP). The SEP provides a process diagram of how the program maintains configuration control of its baselines and when the program assumes initial and full configuration control of its baselines. |
| Capabilities Development Document (CDD) and Acquisition Strategy, Information Support Plan, and or the Capabilities Implementation Plan | CDDs/CPDs include key logistics criteria in a paragraph "Rights in Technical Data and Computer Software" identifying product and software data requirements. These requirements are tailored per program and address why that data is needed to enable the system's reliability, maintainability, operational availability, and supportability, minimize its logistics footprint, enhance its mobility, and reduce the total ownership cost. The reasons for this paragraph include: The inclusion of product and software data requirements in the CDD will increase consistency between the RFP and the CDD. Requirements described in the CDD are translated for evaluation in a source selection in a clear and unambiguous way. Source selections are required to consider Government rights to technical data. CDDs include a paragraph entitled "Intellectual Property (IP) and IP Rights" that identifies critical technical baseline artifacts (e.g., technical data, computer software), what IP rights should be acquired to those artifacts, and why that IP and IP rights are needed to satisfy the system's Sustainment KPP materiel availability and operational availability. To implement MOSA, the Program Summary section should summarize the major system platform's sustainment strategy, and state what major system components located at what level of indenture of the major system platform's Work Breakdown Structure (WBS) that feature what functionality will be added, removed, or replaced in future increments consistent with that major system platform's sustainment strategy. The Joint Interoperability section should identify the artifacts that will comprise the technical baseline for those components (including the major system interfaces between major system components, between those components and the platform, and between platforms). The Competition in Contracting Act requires the program office be able to demonstrate that the requirements ultimately included in a RFP are reasonably necessary for the AF to meet its minimum needs and not restrict future competition. The inclusion of requirements and their rationale into the CDD will make it difficult for any successor PM to relax such requirements after the contract has been awarded. Each PM should uphold contractual requirements unless those requirements are deleted from the CDD by the Vice Chairman of the Joint Chiefs of Staff. |
| Systems Requirement Document (SRD) | Describe in the SRD those functional, operational, technical data and computer software requirements required for the system, including |

| Program Documents | Product and Software Data & Data Rights Considerations |
|---|---|
|  | design requirements, system internal data requirements, design constraints (e.g., data standards, programming languages), and other documentation requirements. Data requirements in the SRD are used judiciously to avoid placing undue constraints on the design team. (Detailed data requirements are not specified in the SRD but are instead specified in CDRLs in Section J of the RFP.) Also identify to what level of Work Breakdown Schedule (WBS) indenture various major system components of the major system platform will be designed and built consistent with MOSA design principles. Complete data requirements are initially captured in the TDRS. Detailed data requirements are specified in CDRLs in section C of the RFP. |

**11.3. Address Data in Program Phases.** Product and software data are addressed proactively throughout the weapon system life cycle, beginning with the Materiel Solution Analysis and going through the Operations and Support phase. **Table 11.2** highlights key considerations for each phase below.

**Note:** The PSM (or the designated EDM) is involved in the development and review of these documents. Considerations usually apply to subsequent phases, but are omitted for clarity.

**Table 11.2.  Data and Data Rights Consideration by Life Cycle Phase.**

| Life Cycle Phase | Product and Software Data & Data Rights Considerations |
|---|---|
| Materiel Development Decision (MDD) | Data is usually not addressed at the MDD, however, the data rights approach or strategy are considered. |
| Materiel Solution Analysis (MSA) | Product and software data requirements are documented, and funding identified to acquire and maintain this data. Program documents (e.g., SEP) adequately address data and data rights. Solicitation and contract documents (e.g., RFP, RFI, SOW, SOO, PWS, and contracts) adequately address data and data rights. Contracts from AF-funded prototypes include data rights and priced options for data deliverables. |
| Technology Maturation and Risk Reduction | Program documents (including the AS and CDD) adequately address data and data rights. Product and software data reviewed at the PDR is compliant with the contract requirements. Contracts for AF-funded prototypes include data rights and priced options for data deliverables. |
| Engineering & Manufacturing Development (EMD) | Program documents (including the CPD and LCSP) adequately address data and data rights. Product and software data reviewed at the CDR is compliant with the contract requirements. |

| Life Cycle Phase | Product and Software Data & Data Rights Considerations |
|---|---|
| Production & Deployment | Inspect delivered product and software data to verify content and markings are compliant with the contract.<br>Manage product and software data and ensure the data is under configuration control.<br>Begin delivery of digital product design data to standardized product data management systems (e.g. the Joint Engineering Data Management Information and Control System (JEDMICS)) for government storage, maintenance, access, and control. |
| Operations and Support (O&S) | Manage product and software data and ensure the data supports end users and systems which depend upon it.<br>Maintain and update digital product design data in standardized product data management systems.<br>Dispose/archive product and software data as part of the completion of the program. |
| Contract Language | Defense Acquisition Regulations System clauses specifically called out apply to that contract. The Air Force supplements these regulations with Air Force Federal Acquisition Supplement. For this reason, DFARs clauses should be specifically called out to ensure potential bidders realize that these clauses are monitored for compliance. Among some of the clauses that should be called out are:<br>52.245-1 – Government Property;<br>203-10 – Contractor code of ethics;<br>252-204-7012 – Safeguarding Covered Defense Information and Cyber Incident Reporting<br>252.211-7003 – Item unique identification and valuation |

**11.4. Address Data in Design Reviews.** Product and software data problems are much easier and less expensive to resolve if problems are identified early. These reviews, including the Preliminary Design Review (PDR), the Critical Design Review (CDR), and in process reviews broadly address design maturity, but they also provide the opportunity for the AF to review early deliverables and in process data for compliance with the contract (e.g., format, marking). Specific considerations during these reviews include:

11.4.1.  Ensure the PSM or the designated EDM participates in the review.

11.4.2. Ensure product and software data deliverables are reviewed at the review for compliance with the contract.

11.4.3.  Review CDRL and Supplier Data Requirements Lists (SDRLs) to ensure all product and software data under contract are being developed by the contractor and subcontractors.

**11.5. Determine Technical Data and Data Rights Needs.** To properly design, develop, produce, operate, maintain, sustain, and dispose of weapon systems cost-effectively, the AF should acquire IP and associated license rights to that IP. As each program is different and may have different acquisition and product support strategies, it is important for program offices to "do their homework" in order to identify required IP. Since deliverables without sufficient IP rights limit the usefulness of that IP to the AF, it is critical for the AF to address both IP

deliverables and IP rights to meet the needs of the warfighter. In this regard, an ACAT I program may not receive Milestone B approval until the Milestone Decision Authority determines in writing that appropriate actions have been taken to negotiate and enter into a contract or contract options for the technical data required to support the program.

11.5.1. IP deliverable needs. The AF needs recorded information (e.g., technical data, computer software, contract administration information) at an affordable price with sufficient IP rights. To determine what recorded information to acquire, the program office should initiate a Data Call to ensure stakeholders have the opportunity to identify what data they need based on the unique characteristics of the specific weapon system. The program office should then validate the need for that data by convening a Data Requirements Review Board. A starting point for most weapon systems is to acquire:

11.5.1.1. Technical data that describes the major system platform's system and software architecture (e.g., Contract Work Breakdown Structure, System/Subsystem Design Description, Software Architecture Description, Software Design Description).

11.5.1.2. Performance specifications that describe the end-state functionality of all hardware components and software items that comprise the major system platform (e.g., System/Subsystem Specification, Software Requirements Specification).

11.5.1.3. Major system interfaces that define the interfaces between the major system platform and those hardware components and software items, between those hardware components and software items, or between major system platforms (e.g., Interface Control Documents, Interface Requirements Specification, Interface Design Description).

11.5.1.4. Related IT System Database Structure and Design - database design documentation, physical database structure and data (e.g. Oracle RDBMS exports), Data Definition Language (DDL) / create scripts, mappings of database to functional and computer application fields / elements, database load (ETL) scripts / programs, database maintenance procedures, configuration management documentation, mappings of database implementations to functional requirements.

11.5.1.5. Verification/validation data that demonstrate the contractor developed and produced the major system platform consistent with MOSA requirements included into the contract (e.g., Test Plans, Test Procedures, Test Reports).

11.5.1.6. Design documentation (e.g., Design Review Information Package).

11.5.1.7. Product definition data (Product Drawings/Models and Associated Lists).

11.5.1.8. Technical Orders.

11.5.1.9. Computer software (source and executable code) and computer software documentation (e.g., Software Product Specification),

11.5.1.10. Contract administration information (e.g., Earned Value Management data, Integrated Program Management Report).

11.5.2. IP Rights. The IP rights DoD acquires to recorded information delivered or otherwise furnished to it under a DoD contract identifies the persons to whom the data may be released, for what purposes (e.g., in support of the program's product support strategy), and for what period. The IP rights the DoD acquires to that data generally depend upon the extent to which

the Government funded the development of the technology, whether the technology is commercial or noncommercial, and the scope of any specially negotiated licenses to which the parties agreed.

11.5.2.1.  The DoD acquires Unlimited Rights to certain types of data irrespective of who funded the development of that data, such as form, fit, and function data, and data necessary for operation, maintenance, installation, or training purposes. The DoD acquires Government Purpose Rights for noncommercial items developed with mixed (Government and private) funding. The DoD acquires Limited Rights in noncommercial technical data pertaining to items or components developed exclusively at private expense, and Restricted Rights in noncommercial computer software developed exclusively at private expense. The DoD acquires UR in noncommercial technical data and computer software developed exclusively at private expense. As the standard DFARS clauses do not grant DoD an IP license to contract administration information, the parties should negotiate a special license governing DoD's rights to use, release, or disclose that information.

11.5.2.2. The contract should clearly identify what IP license governs the use, release, and disclosure of each deliverable. As a best practice, a single special license should govern the entire deliverable, vice the document being portion-marked such that different licenses will apply to various portions of the deliverable. The contract should also identify the particular component or process to which the deliverable pertains.

**11.6. Address Data in Requests for Proposal (RFPs).** While it is important to properly address product and software data in program strategies and other documents, the RFP is where the AF communicates to offerors the specific data it intends to acquire. It is crucial data be addressed completely and consistently in all appropriate sections of the RFP (e.g., Section B, C, H, I, J, K, L, and M) to communicate internal consistency and to eliminate inadvertent omissions. **Figure 11.1** shows the relationships of section of the RFP to each other with regard to data, and **Table 11.3** highlights considerations for individual sections of the RFP.

**Figure 11.1.  How Key Sections of the RFP Relate To Each Other as They Address Data.**

RFP Section C                    RFP Section J

| SOW, SOO, PWS | In accordance with ... | **CDRL 002** | Described by .... | DID |
| 1.2.3. The Contractor shall design, develop, and deliver an aircraft in accordance with CDRL 002 described by DID DI-SESS-81000. | Per Task | **Drawings, Models and Lists** | | DI-SESS-81000 Drawings ----- Models ----- and Lists ----- ----- ----- |

The Statement of Work (SOW), Statement of Objectives (SOO), and Performance Work Statement (PWS) describe the work to be performed.

The Contract Data Requirements List (CDRL) contains data requirements and delivery information.

The Data Item Description (DID) identifies the purpose, description, and preparation instructions.

**Table 11.3.  Resources, Data and Data Rights Consideration RFP Section.**

| RFP Section | Product and Software Data & Data Rights Considerations |
|---|---|
| Section B—CLINs | Establish a separately-priced CLIN for the delivery of all recorded information described in Section J Exhibits (CDRLs) so the program office will be able to negotiate a reasonable price for that recorded information.<br>Establish a separately-priced CLIN for the delivery of the IP rights the contractor will deliver to all recorded information described in Section J Exhibits (CDRLs)—irrespective of whether the rights the contractor proposes to grant to the Government are based upon which entity funded the development of a particular item or component, or whether the Government will acquire such IP rights as a priced option or as part of the basic contract—so the program office will be able to negotiate a reasonable price for those IP rights. |
| Section C—SOOs & SOWs | The following product data considerations are taken when developing the SOW. All data requested by the Government in the CDRL is clearly supported by an SOW task describing requirements for:<br>Technical Data Package (Engineering Data)<br>Technical Orders<br>Required equipment with performance characteristics to be purchased<br>Software |

| RFP Section | Product and Software Data & Data Rights Considerations |
|---|---|
| | Engineering Data Guidance Conference<br>In-Process Review (IPR) of the Technical Data Package<br>Relationship of Contractor with Subcontractors/Vendors<br>Engineering Data Updates and Revisions<br>The CDRL defines data requirements, but does not contractually allow for the automatic acceptance of data. Instead, the CDRL allows sufficient time for the responsible organization/location to inspect and accept the data. |
| Section H—Special Contract Requirements | Include a clause that (1) clearly identifies what IP license governs the use, release, and disclosure of each deliverable, (2) baselines the type of license associated with that deliverable to a single level per deliverable, and (3) identifies the particular component or process to which the deliverable pertains. The clause should also state the IP licenses transfer to the Government upon delivery of the recorded information to which the license pertains. It should also specify what markings the contractor should affix to the deliverable, and require that a copy of the applicable IP license be physically attached to the deliverable. It should also include a copy of all commercial licenses that will govern the use, release, or disclosure of commercial technical data or computer software delivered to the Government. Finally, it should include an Order of Precedence provision that nullifies provisions in commercial licenses that violate Federal procurement law or that do not satisfy the program's needs. |
| Section I—Contract Clauses | Include all patent clauses required by the FAR and DFARS, and all technical data and computer software rights clauses required by the DFARS. |
| Section J—List of Documents, Exhibits, and Other Attachments | Section J identifies a list of documents, exhibits, and other attachments. Documents that should be contained in Section J include:<br>Exhibits (CDRLs): The CDRL is a list of authorized data requirements for a specific procurement. It is the required format for identifying data requirements in a solicitation, and deliverable data requirements in a contract. Each CDRL has a Data Item Description (DID) associated with it that is suitably tailored for that specific procurement.<br>SOW/SOO/PWS: The SOW/SOO/PWS should include tasking statements that specifically require the development/production and delivery of CDRL exhibits.<br>System Requirements Document (SRD)<br>Compliance/Reference List: Include the SEP as either a compliance or reference document depending on the maturity of the plan and the AS.<br>252.227-7017 Identification and Assertion of Use, Release or Disclosure Restrictions: Ensure that these restrictions do not conflict with the Section H clause that identifies the IP rights the Government will acquire to each item of recorded information delivered or otherwise furnished to the Government. |

| RFP Section | Product and Software Data & Data Rights Considerations |
|---|---|
| | Integrated Data Environment (IDE) Concept of Operations (CONOPS) |
| Section K—Representations & Certifications | 252.227-7017 Identification and Assertion of Use, Release, or Disclosure Restrictions |
| Section L—Instructions, Conditions and Notices to Offerors | As it relates to the acquisition of IP and IP rights, Section L includes: The rationale for requesting the offeror deliver the IP and IP rights described in the RFP (e.g., the statutory/regulatory basis for requiring offerors to deliver certain types of technical data with unlimited rights, what type of IP rights the CDD or AS indicates are needed to satisfy the total life-cycle needs of the program, the rationale for requiring offerors to negotiate with their commercial software vendors modifications to those vendors' standard commercial software licenses to meet the Government's minimum needs or to be consistent with Federal procurement law, the extent to which the weapon system's product support strategy dictates that the Government should acquire a certain type of IP rights).<br>A requirement that the offeror's Technical Volume explain how the IP and IP rights its Contracts Volume proposes to deliver to the Government will meet the Government's minimum needs under the appropriate subfactor(s), and how the offeror should propose fixed-prices or estimated costs for IP and IP rights in its Cost Volume.<br>A requirement that the offeror fill-in Block 18 of each DD Form 1423 so the Government will know the price the offeror proposes to deliver that recorded information to the Government for negotiation purposes.<br>A requirement that the offeror provide copies of all IP licenses associated with all commercial technical data or computer software the offeror intends to deliver as part of any CDRL.<br>DFARS 252.227-7028 Technical Data or Computer Software Previously Delivered to the Government<br>A requirement that the offeror include into Section J of its proposed Contract Volume a WBS and WBS Dictionary.<br>A requirement that the offeror describe how its proposed WBS supports the program's delivery schedule, the extent to which its MOSA defines all major system interfaces consistent with the program's SRD, and how its approach for conducting systems engineering will be consistent with the program's SEP.<br>For software acquisitions, a requirement that the offeror submit a Software Architecture Description that identifies where all noncommercial and commercial software applications will reside in the offeror's proposed architecture. |
| Section M—Evaluation Factors | As it relates to the acquisition of IP and IP rights, Section M includes: Evaluation criteria within the appropriate Technical subfactor that states the Government will evaluate the extent to which the offeror's proposed IP and IP rights satisfies the Government's minimum needs and does |

| RFP Section | Product and Software Data & Data Rights Considerations |
|---|---|
| | not inhibit the Government's ability to successfully execute the program throughout its life-cycle.
Evaluation criteria within the appropriate Technical subfactor that states the Government will evaluate the extent to which the offeror's proposed architecture will implement MOSA principles consistent with the program's SEP, the offeror's proposed WBS, and its proposed Software Architecture Description.
Evaluation criteria within the Cost/Price Factor that explains how the Government will evaluate the offeror's prices for IP and IP rights it proposed in Section B. |

**11.7. Data Rights Assertions.** If data is adequately addressed in the RFP, and the winning offeror is put on contract based in their winning proposal, the Government acquires needed data with sufficient data rights under the contract. However, if the offeror asserts rights to data which the Government expected to secure through the "data rights assertions" process, the Government reviews those assertions to determine whether the assertions are appropriate.

11.7.1.  In the RFP, the AF includes DFARS 252.227-7017 to identify data the offerors will deliver with less than unlimited rights.

11.7.2.  During source selection, the proposal evaluation team reviews all proposed assertions against Government requirements and DFARS.

11.7.3.  Any DFARS 252.227-7013 & -7014 data rights assertion agreements reached during source selection are included in the contract as a Section J attachment.

11.7.4.  After contract award, the AF only considers new assertions when based on new information or inadvertent omissions unless the inadvertent omissions would have materially affected the source selection decision.

**11.8. Integrated Data Environment (IDE).** An IDE is a data storage and information management system. Its purpose is to create an environment of connected knowledge workers, in which the preferred approach to performing work involves instantaneously accessing data (including work-in-process data) required to accomplish the necessary tasks and then outputting the results into an instantaneously accessible form. It is the infrastructure that permits implementation of Product Life Cycle Management as it integrates the people, processes, business systems, and information associated with the design, development, production, deployment, maintenance, sustainment, and disposal of a weapon system over its entire life-cycle. Under this construct, information sharing is rewarded and redundant data development, transmission or storage is frowned upon. As outlined in DFARS 227.7108 & 227.7207; *SAF/GCQ Solicitation/Contract Checklist for Integrated Data Environments (4 Feb 14)*, the following processes should be followed.

11.8.1.  During operation and support of a weapon system, delivery of recorded information and hosting that information on a government server is preferable and a good management practice in order to maintain competition throughout the acquisition life cycle and to permit organic sustainment.

11.8.2.  If, however, the program office wants the contractor to create and maintain an IDE on the contractor's servers, the program office should require the contractor to propose the CONOPS for that IDE.

11.8.2.1.  The IDE will consist of three parts:

11.8.2.1.1.  The web-based environment into which IP will be deposited by and accessed by authorized users.

11.8.2.1.2.  The IP that will reside within that environment.

11.8.2.1.3.  The IP rights the contractor will grant to the Government to the environment as well as the data that will reside within that environment.

11.8.2.2.  Section L of the RFP should require the offeror propose an IDE CONOPS as a Section J attachment to its Model Contract that includes the following information:

11.8.2.2.1.  Submission of a Software Product Specification, a Software Version Description, a Database Design Descriptions, and a Data Accession List CDRL.

11.8.2.2.2.  A description of the IDE's purpose.

11.8.2.2.3.  Definitions of applicable terms.

11.8.2.2.4.  What the minimum capabilities of the IDE will be. How the offeror will configure the IDE consistent with the relationship between the four CDRLs described above. How the costs the offeror will incur to create and maintain the IDE will be allocable to the contract. What types of recorded information will reside on the IDE (e.g., all draft/work-in-progress data generated in performance of the contract, all data listed on the Data Accession List, all data delivered under other CDRLs, all data utilized in performance of the contract that is not a CDRL). A statement that all data the contractor and its subcontractors deposit/upload into the IDE are "deliverables" when so deposited/uploaded into the IDE. A statement that as of the date of contract award the Contracting Officer has, in accordance with DFARS 252.227-7027 ordered all technical data and computer software listed on the DAL during contract performance. What procedures the contractor will develop and maintain to protect recorded information residing in the IDE from unauthorized release or disclosure and to control release of that information from that environment to authorized users. How the contractor will obtain use and non-disclosure agreements from all non-government employees to whom recorded information will be released or disclosed. During what periods authorized users will be able to access recorded information residing on the IDE and the conditions under which they will not be able to access that information. When will the contractor image the IDE and deliver that instantiation to the contracting officer. A statement that the contractor will indemnify the Government against liability resulting from or as a consequence of an unlawful release or disclosure of any recorded information from the IDE. How the recorded information will be received, inspected, and accepted by the program office. A statement regarding what training and help desk support the contractor will provide to authorized users of the IDE.

11.8.2.2.5.  Monetary remedies proportionate to the importance to the program office of that IDE to its need to monitor the contractor's performance and acquire an

instantiation of the IDE upon request; along with a list of circumstances under which the contractor will not be liable to the Government if unauthorized users are unable to access the recorded information residing within the IDE.

11.8.2.2.6.  Identification of what restrictive markings will be affixed to what recorded information residing within the IDE.

11.8.2.2.7.  Identification of what IP rights the contractor will grant to the Government to all recorded information that will reside within the IDE as well as to the four CDRLs described in **paragraph 11.8.2.1**

11.8.2.2.8.  Identification of all commercial computer software the contractor will use to create/maintain the IDE, along with a copy of all IP licenses to that software.

11.8.2.3.  Section M of the RFP should state the Government will evaluate the extent to which the offeror's proposed IDE will permit all Government personnel, including covered government support contractors, and the contractor to securely create, manipulate, deposit/upload, retrieve/download, and exchange all information residing within that IDE in order to collaborate amongst themselves during the entire contract performance period.

**11.9.  Independent Research and Development (IR&D).**  IR&D is initiated and conducted by defense contractors, independent of DoD control and without direct DoD funding. It includes basic and applied research, development, and systems and concept formulation studies. IR&D funded capability is attractive to PMs because it usually results in reduced acquisition costs, reduced risk, and reduced timelines. However, IR&D funded capability could result in higher life cycle costs if data rights are not addressed appropriately.

11.9.1.  Benefits of IR&D. IR&D is intended to strengthen the defense industrial base and the technology base of the U.S., enhance the industrial competitiveness of the U.S., and promote the development of technologies identified as critical. Often, IR&D helps a program reduce acquisition costs, reduce development risk, and enable faster time to deployment of military systems and capability.

11.9.2. Risks & Cautions with IR&D. The government may reimburse (indirectly fund) development costs of a system or capability through IR&D, but not get the data rights typically received when the government directly funds development. Without data rights, the government may have limited flexibility for upgrades, spare parts, or operations and support, resulting in higher life cycle costs.

**11.10.  Inspection and Acceptance of Data.**  Provisions within the contract identify inspection and acceptance requirements for data. This is usually done on the CDRL.

11.10.1.  Data received as part of a contract is sometimes accepted without adequately being inspected for contract compliance (e.g. completeness, quality, format, markings).

11.10.2.  Data in this case is not dependable for operations and support or other reasons for which it was acquired.

**11.11.  Life Cycle Management of Resources, Data and Data Rights.**  This section provides additional guidance and best practices for program offices to execute the requirements at AFI 63-101/20-101, paragraph 6.12.4.2. This AFI paragraph requires program offices to provide digital product design data to a DoD standardized product data management system (e.g. the JEDMICS

for common government storage, maintenance, access, and control. Program offices maintain updated digital product design data in the standardized system throughout O&S.

11.11.1. Use guidelines in AFI 63-101/20-101, this document,  MIL-STD-31000 *DoD Standard Practice Technical Data Packages*, AFMCI 63-402, MIL-HDBK-245, *Preparation of Statement of Work (SOW)*, MIL-HDBK-288 *Military Handbook Review and Acceptance of Engineering Drawing Packages*, and DoD 5010.12M*, Procedures for Acquisition and Management of Technical Data*, to incorporate requirements for engineering data into Requests for Proposal (RFP), Statement of Objectives (SOO), Statement of Work (SOW) and contracts.

11.11.2. Preparing, Approving, Maintaining and Updating Digital Product Design Data for Government Storage, Access, and Control. **Note:** For the purposes of this Pamphlet, the term "product design data" consists of the information routinely delivered as a part of the Technical Data Package. See MIL-STD-31000, Figure 1. It includes manually and computer generated engineering drawings, unincorporated change documentation, databases, models, and associated lists. Air Force activities engaged in the generation and maintenance of engineering drawings and associated documentation implement the guidance of applicable non-Government standards (see **Attachment 10**). Commercially available generic drawing requirements manuals, based primarily on these standards (also listed at **Attachment 10**), may be used for the preparation and revision of engineering drawings and associated documentation.

11.11.2.1. IAW AFI 63-101/20-101, all generated engineering drawings are compatible for retention within a DoD standardized product data management system such as JEDMICS government storage, maintenance, access, and control. If a prime contractor central repository is used instead of a government maintained and control facility, appropriate access for government personnel is ensured through specified inclusion in the contract.

11.11.2.2. ISO 10303, Standard *for Exchange of Product model data (STEP)*, AP239, *Product Life Cycle Support*, defines a neutral format allowing product data to be shared among heterogeneous systems. PMs for new aerospace system designs and major modifications acquire engineering data conforming to ISO 10303-239 and the MIL-STD/DID in which the blue-highlighted requirements are incorporated unless either the PEO or system PM approves a waiver. Use of ISO 10303-239 for legacy systems, based on a positive business case analysis, is encouraged.

11.11.2.3. Verification, Approval, and Authorization. Air Force design activities have an effective manual or electronic verification, approval, and authorization process or system. Authorized individuals enter their names in the appropriate locations to indicate that engineering drawings and engineering orders conform to all applicable requirements. Department of Defense Form 2617, *Engineering Release Record*, or equivalent local protocol, is used to document these actions. See **Attachment 9** of this document for recommended implementation practices.

11.11.2.4. Formatting.

11.11.2.4.1.  AF-unique engineering drawing layouts in a variety of formats (formerly AF Forms 1651 through 1656A) are available as .dxf files for direct use with current Computer Aided Design (CAD) systems generating engineering drawings.

11.11.2.4.2.  Larger drawing sizes may be generated as prescribed in ASME Y14.1, *Decimal Inch Drawing Sheet Size and Format*, using the current AF Form 1656 format criteria.

11.11.2.4.3.  When AF-unique engineering drawing layouts are used to prepare multi-sheet drawings, abbreviated title block formats of may be used for continuation sheets. For larger sizes used to prepare multi-sheet drawings, continuation sheets may be generated as prescribed in ASME Y14.1.

11.11.2.4.4.  AFMC standardized parts list format (formerly AF Form 1658), data list format (formerly AF Form 1659), and index list format (formerly AF Form 1660) may be generated in a CAD system provided the final format output meets current ASME requirements as applicable. They duplicate the AFMC-approved form or include the following exception notice in the lower right-hand corner of the form margin or border: "Exception to AFMC template for CAD generation approved by AFLCMC/XP (date of approval) (name of software and vendor)."

11.11.2.5.  Drawing Numbers. To enable the management, traceability, and accessibility of drawings in the standardized product data management system, Air Force generated or acquired drawings use assigned numbers provided by AFLCMC/XP. AFLCMC/XP may also provide deviations. See **Attachment 9** for additional practices on drawing numbers.

11.11.2.6.  Drawing Revision Practices. ASME Y14.35M, *Revision of Engineering Drawings and Associated Documents*, prescribes standard practices for revising engineering drawings and associated lists.

11.11.2.7.  Engineering Orders (EO). EOs document information affecting the content or status of an Air Force drawing or the products defined on contractor drawings. EOs may be approved only by the chief/lead engineer(s) authorized by the responsible Configuration Control Authority. EOs may be initiated by anyone.

11.11.2.7.1.  EO Formats (formerly AF Forms 3925, 3926, and 3927). When inclusion of non-text data is required, AFMC standardized EO formats may be generated in a CAD system provided the final form output meets current ASME requirements as applicable. They duplicate the AFMC-approved format or include the following exception notice in the lower right-hand corner of the form margin or border: "Exception to AFMC template for CAD generation approved by HQ AFLCMC/XP (date of approval) (name of software and vendor)."

11.11.2.7.2.  Change Notice Engineering Order (CNEO). Chief/lead engineers use CNEOs to inform drawing users a revision has been made. It describes and records changes incorporated during the revision action and precludes extensive revision descriptions in the drawing revision block, and provides documentation of all engineering and configuration management approvals. The EO identifier is annotated in the revision history block of the revised drawing.

11.11.2.7.3. EOs are permanently maintained with the affected drawing to provide a history of Air Force required drawing changes.

11.11.2.7.4. Advance Engineering Change Orders (AECO). AECO's authorize drawing changes before revising the affected drawing original. Released AECO's are considered an integral part of the drawing and represent changes that are incorporated only on Air Force drawings and other original drawings acquired by the Air Force through a design activity transfer, at the next drawing revision.

11.11.2.7.4.1. AECO Use. AECOs are used only when the schedule for revising, releasing, and distributing the affected drawing does not allow time to incorporate the change.

11.11.2.7.4.2. AECO Incorporation. AECOs are incorporated into the affected drawing at the earliest opportunity.

11.11.2.7.5. Advance Engineering Supplemental Orders (AESO). AESOs supplement drawings of another design activity, government or contractor, to document and control Air Force required departures from the established product baseline. AESOs supplement the product baseline drawings of other design activities for modification or follow-on production of materiel. However, AESOs are avoided to prevent configuration management, control, and data conflicts between the drawing original and Air Force "supplemented" copies. The AESO accompanies the affected drawing to correctly implement the supplemental requirements until incorporated through formal revision action by the Current Design Activity (CDA).

11.11.2.7.5.1. AESO Incorporation. The affected drawing CDA is the only activity authorized to incorporate the contents of an AESO on the drawing original. The affected drawing CDA is tasked to incorporate the AESO through contract action for contractor activities and other appropriate means for Government activities. Note: As an alternative, acquiring the drawings through design activity transfer action is considered when the CDA is reluctant, for whatever reason, to incorporate an AESO.

11.11.2.7.5.2. AESO Limitation. An AESO:

11.11.2.7.5.2.1. Does not constitute a revision to the drawing.

11.11.2.7.5.2.2. Does not establish new, or alter existing, item identification.

11.11.2.7.5.2.3. Does not alter drawing identification in any manner, including the drawing title.

11.11.2.7.5.2.4. Valid only for the drawing revision level against which it is prepared. Further revision of the drawing by the CDA, whether or not the subject AESO is incorporated, invalidates the AESO.

11.11.2.7.5.2.5. Permanently associated with the drawing until that drawing is revised.

11.11.2.7.5.3. AESO Impact. When generating an AESO against the drawing of another design activity, the preparing official determines the impact of proposed changes to related drawings. An AESO is prepared for affected drawings to

document required changes resulting from the initial proposed AESO.

11.11.2.7.5.4.  AESO Alternatives. As an alternative to generating an AESO, the use of an Altered Item Drawing or Modification Drawing as described in ASME Y14.24, Types and Applications of Engineering Drawings, may be considered. Both of these drawing types generate a new identification for the affected item necessitating revision of related documentation such as next higher assemblies, technical manuals, and cataloging, provisioning, and configuration management records.

11.11.2.7.6. Change History. All applicable outstanding approved EOs are incorporated when the drawing is revised. All incorporated AECOs are maintained with the drawing to provide drawing change history.

11.11.2.7.7. Deviations. EOs are used to authorize and document deviations to items or processes defined on previously released engineering drawings and associated lists. This information allows engineers to substitute materials and processes for one time deviation from dimensions, tolerances, finishes, processes, and so on, for specific applications.

11.11.2.8.  Design Activity. The original design activity is the owner of the drawing until design responsibility is transferred to another activity. The design activity whose name appears in the title block is the original design activity. The original drawing design activity identification is never changed. When design responsibility changes, a transfer of design activity responsibility is accomplished by adding the current design activity to the drawing in accordance with ASME Y14.100 paragraph 6.5.2.1 and ASME Y14.35.

11.11.2.8.1. Design Activity Transfer. Original engineering drawings transferred to an Air Force design activity are revised to show the current design activity per the guidance of ASME Y14.35M. Variations in placement of the CDA identification on the drawing may be required due to drawing formats and content. The ODA Commercial and Government Entity (CAGE) code and drawing number is retained without change or alteration and the current design activity legend added as prescribed by ASME Y14.100, Attachment D.

11.11.2.8.2. Design Activity Transfer Documentation. Transfer of design activity requires documentation of agreement between the losing and gaining design activities. This documentation is retained by both the gaining and losing design activities. Documentation of subsequent transfer to another design activity is also retained.

11.11.2.8.3. Design Activity Transfer Notification. Notify AFLCMC/XP upon completion of a design activity transfer action. Notification includes a list of the drawing numbers transferred (first and last numbers if an uninterrupted sequence), the sending and receiving activities, and date of transfer completion.

## Chapter 12

## LIFE CYCLE RISK MANAGEMENT

**12.1.  Overview of Life Cycle Risk Management.**

12.1.1. Introduction. Without prescribing a particular methodology, DoD Acquisition Pathway instructions require programs to assess and manage cost, schedule, and performance risks. AFI 63-101/20-101 identifies the minimum standardized attributes for any AF program's risk management effort. "Life Cycle Risk Management" (LCRM) is the AF term for the standardized risk management approach that should be applied to all programs regardless of the Adaptive Acquisition Framework pathway selected. This Chapter provides additional guidance on implementing LCRM across the AF integrated life cycle management and oversight enterprise. Note: LCRM differs from operational risk management addressed in AFI 90-802, Risk Management.

12.1.1.1.  LCRM is _not_ a new or stand-alone risk management process. LCRM leverages the existing, well accepted risk management methodologies already used by industry and DoD. These accepted methodologies are included in the DAG and are treated in expanded detail in the *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs*. In addition, they are taught as a basic part of DoD and AF Acquisition and Sustainment training and education.

12.1.1.2.  LCRM builds on these established risk management methodologies and provides the framework for standardizing the implementation of risk management across the AF integrated life cycle management enterprise.

12.1.1.3.  LCRM is not a separate, stand-alone risk management activity. When properly implemented, LCRM uses inputs from and provides outputs to most other program planning, analysis, management, and oversight activities.

12.1.2. LCRM Concept. At its core, effective program management and oversight is risk management: the proactive management of future uncertainties to ensure that program cost, schedule, and performance objectives are achieved in every phase of the life cycle. To be effective, LCRM is conducted throughout the life cycle at all levels, in a proactive rather than reactive mode by an integrated team.

12.1.2.1.  Risk management is performed continuously across the integrated life cycle management framework. LCRM risk information is preserved and "handed off" between life cycle phases. Risk management is conducted jointly with the prime contractor team. Consider including contractual language in the request for proposal for programs seeking to ensure joint risk management participation during program execution. For examples of contractual language, see *AFLCMC Process for Risk and Issue Management*.

12.1.2.2.  LCRM is the process used by decision makers at all levels of program management and oversight to identify, analyze, and then reduce, offset or accept risks. LCRM provides leaders and staff with a consistent and systematic methodology to identify, assess, and choose the preferred course of action for any given situation. To be effective, LCRM becomes a fully integrated element of planning, executing, and overseeing a program.

12.1.2.3. LCRM is proactive rather than reactive. When those with a stake in a program do not consistently and rigorously use risk management principles and practices. Topics like supply chain risk management, cybersecurity, Section 508 compliance, human system interface, anti-tampering, adversary threats and intelligence needs, and program protection, are factors that cannot be ignored and they are important factors of a system design. Overlooking these factors can turn what could have been manageable into potential risks that become unexpected current problems (i.e. issues), driving program management and leaders to react with a more limited range of options having a bigger adverse impacts on program cost, schedule, and performance.

12.1.2.4. The risk management process is owned by program management; however, financial management and engineering play leading roles. Risk management has often been conceived as an exclusively engineering and technical activity, functionally driven by the engineering community. LCRM is not an exclusively technical activity. It is an integrated approach to managing all of the programs cost, schedule, and performance risks. Within each program office, LCRM is be executed by cross-functional teams including cost analysts, contracting officers, acquisition intelligence analysts, sustainment planners, schedulers, sub-system managers, and other specialists in addition to engineering.

12.1.2.5. Risk Management Principles. Four principles govern all actions associated with risk management: accept no unnecessary risk; make risk decisions at the appropriate level; integrate risk management into operations; and apply the process cyclically and continuously.

12.1.3. LCRM Definitions.

12.1.3.1. Risk. A risk is a future event that may cause a negative outcome or an execution failure in a program within defined performance, schedule, and cost constraints. The likelihood and consequence may be estimated for a risk, in contrast to a concern where one or both terms are unknown and cannot be estimated. Risks are only identified if their likelihood and consequence are plausible and credible. For AF purposes, the likelihood, as reflected in the probability of occurrence for risks, is between 5-99 percent. The range for risk management likelihood reflects the lower limit bounds risks as greater than 5 percent certain (less than 5 percent is insignificant) and the upper limit bounds risks as less than 100 percent certain. A risk has all of the following three components: 1) it is a future event, 2) it has a likelihood, as assessed at the present time, of future event occurring, and 3) it has a negative consequence. Note: Programs manage issues and opportunities, but are not a part of risk management. If a risk comes to fruition, it is categorized as an issue. Risks can be defined/presented as: .05 < Likelihood < .99, Consequence > 0, Timeframe: future.

12.1.3.1.1. Risk Handling. Risk handling is the preferred and more encompassing term to recognize that there are potentially multiple options to manage risks. These options include accepting, monitoring, transferring, mitigating (or controlling), and avoiding risks. These options are defined in Section 12.2.5.1. *Note:* The LCRM process model expands the title of this step from "Risk Mitigation Planning" in the *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* to "Risk Handling Planning and Implementation" to recognize

that most of these options address handling risk in a manner other than mitigating (i.e. eliminating or reducing) it. This also emphasizes that in some cases it may be appropriate to "handle" a risk through acceptance or transferring the risk, for example, rather than mitigation actions that may prove more costly.

12.1.3.2. Concern. A concern is a potential future event for which the cross-functional LCRM team does not have sufficient information to quantify a likelihood or consequence. An example of a concern is "Congress may not fund the full program, and the amount of funding is unclear." A concern is periodically monitored and reevaluated for likelihood and/or consequence. Once likelihood and consequence can be quantified by the team, a CONCERN becomes a RISK. The "concern list" is a short and/or temporary list. Most potential future negative events can be evaluated and managed as risks: Likelihood = unknown, Consequence = unknown, Timeframe: future.

12.1.3.3. Issue. An issue is a negative event that has occurred (came to fruition), is occurring (happening in present time), or is certain to happen in the future (100 percent probability of occurring) and has a detrimental impact on at least one dimension of consequence (performance, schedule or cost). An example of an issue is "satellite availability drops below the required threshold value in 2 years." Issues can be defined as: Likelihood = 1.00, Consequence > 0, Timeframe: past, present or future.

12.1.3.3.1. If the negative event, while not a risk, has occurred or is occurring, the program is actively addressing the detrimental effects. If the negative event, while not a risk, is in the future and has 100 percent probability of occurrence, the program plans measures to address the effects for when it comes to fruition.

12.1.3.3.2. An issue is periodically monitored and re-evaluated for consequence. If the probability changes to below 100 percent, an issue is re-categorized as a risk. Note: An issue is not a risk and does not belong on the LCRM 5x5 matrix because the probability does not fall between 5-99 percent and the "If" risk statement portion cannot be developed.

12.1.3.4. All risks are visible up to the SAE/MDA level. Moderate and high risks tend to get the most attention; however, evaluate low risks to determine if they have a compounding effect greater than a single moderate or high risk impact. These compounded low risks require the same visibility as moderate and high risks. There are different perspectives for interpreting risks at different management levels. The consequence tables provide a uniform rating structure applicable to all management levels.

12.1.4. Roles and Responsibilities. LCRM is a key enabler of risk-based program management and decision-making. Roles and responsibilities at all levels are executed in order for LCRM to be effective. Under LCRM, standardized risk reporting about each program follows the hierarchy of PM, PEO, and MDA. How leadership uses this information is critical to the successful LCRM adoption and to the launching and sustainment of high confidence programs.

12.1.4.1. PMs. PMs are responsible for:

12.1.4.1.1. Establishing and monitoring the program's LCRM effort.

12.1.4.1.2.  Approving the content of the program's Risk Management Plan (RMP).

12.1.4.1.3.  Constituting cross-functional risk management IPTs.

12.1.4.2. Cross-Functional Risk Management IPTs. Cross-functional risk management IPTs are responsible for the day-to-day execution of LCRM within program offices.

12.1.4.2.1. Risk management touches on all aspects of program management to include cost, schedule, performance, technical, product data access, technology protection, cybersecurity, production, sustainment, logistics planning, and other appropriate areas. Effective LCRM efforts have a representation, as necessary, from all program specialties. However, it is recognized that membership is scaled to program size and life cycle phase.

12.1.4.2.2.  The following contractor and Government role equivalents are suggested for participation in the IPT: program management, engineering, logistics, financial management, scheduling, cost analysis, test, independent subject matter experts (i.e. software, avionics, airworthiness, systems engineering), and advisors, and risk manager. The management level of the actual participants is dependent on the level of risk.

12.1.4.2.3. The RMP documents the program's cross-functional risk management IPT membership and responsibilities.

12.1.4.2.4. The IPT ensures the program does not limit risk management to contractor activities, but also includes those risks inherent to the Government (e.g. Government Furnished Equipment (GFE), Government Furnished Materiel, Government Furnished Property (GFP), government testing, and external interfaces to other programs, etc.).

12.1.4.2.5. The IPT ensures that risk management efforts interface with cost analysis, schedule analysis, requirements analysis, systems engineering, and system safety efforts.

12.1.4.2.6. The IPT ensures historical risk information is documented and maintained for "lessons learned" and trend analysis purposes.

12.1.4.3.  Risk Training. For successful risk management, all functionals of the AF team receive, at a minimum, basic risk management process training. Key program personnel with program management or analysis responsibilities receive training on risk management tools and databases they use relative to their roles. The functionals are familiar with contractor and stakeholder risk management processes and tools. Many performance risks are identified and managed by contractors and stakeholders. Risk management training is available from a variety of Government sources, including but not limited to the DAU, AFIT, and AFLCMC.

12.1.5.  Key Elements of LCRM.

12.1.5.1. *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* is the basic guidance for executing risk management. This Chapter provides additions and clarifications to the basic guidance in the DoD guide. The DoD guide and this Chapter are used together.

12.1.5.2. Five-step LCRM Process. LCRM is executed throughout the life cycle in a continuous and iterative five-step process. These steps differ slightly from the steps identified in the DoD guide. Additional AF-specific guidance on each of these steps is included in Section 12.2 of this Chapter. The five steps are:

12.1.5.2.1. Risk Management Planning (not considered a separate step in the DoD guide).

12.1.5.2.2. Risk Identification.

12.1.5.2.3. Risk Analysis.

12.1.5.2.4. Risk Handling Planning and Implementation (to include documentation of interim risk acceptance).

12.1.5.2.5. Risk Tracking (to include the formal documentation of final/residual risk acceptance).

12.1.5.3. Risk Management Plan (RMP). The RMP describes the strategy by which the program coordinates and integrates its risk management efforts, and is continually matured throughout the program's life cycle. It does not need to be a stand-alone document. It can be incorporated into other appropriate planning document, and is linked to risk management activities described in other planning documents (e.g. source selection plan, Systems Engineering Plan, etc.).

12.1.5.4. Cross-functional Risk Management IPTs. As discussed previously, cross-functional risk management IPTs are critical to the successful execution of LCRM.

12.1.5.5. Standardization. To ensure consistent and rigorous LCRM execution and reporting, all programs are required per AFI 63-101/20-101 to use the standard LCRM 5x5 matrix, likelihood criteria, and consequence criteria to analyze program risks. All moderate and high risks are presented using the standard LCRM 5x5 matrix as a part of program, technical, and Milestone decision reviews. Realizing that every risk may have multiple consequences (performance, cost, and schedule) which should be analyzed, the matrix depicts the consequence with the most severe impact. Risk handling/mitigation plans are prepared for moderate and high risks. Formal decisions to proceed (e.g. Milestone Decisions, Acquisition Strategy Panels, etc.) constitute approval of a program's current risk analysis and handling/mitigation plans. Formal acceptance of moderate and high residual risks (after all handling/mitigation actions have been completed) is included in approval documentation (e.g. the Acquisition Decision Memorandum). The use of the matrix and these criteria is discussed in more detail later.

12.1.5.6. Products include qualified risks identified as high, moderate, or low based upon the LCRM 5x5 matrix output; risks quantified in terms of performance, schedule, and cost; and risk handling/mitigation plans (including waterfall charts). Additional products may be available if a risk analysis simulation is performed. These include a cumulative distribution function ("S-curve) representing confidence levels for schedule and cost. The outputs from a Schedule Risk Assessment (SRA) is included for trend analysis, used to better manage the schedule, and used for Integrated Baseline Reviews (IBRs) and other top-level reviews, where applicable. A Cost Risk Assessment (CRA) provides better risk

impact estimates in terms of cost based upon subject matter expert (SME) inputs. The outputs from a CRA is included in Program Office Estimates (POEs).

12.1.5.7. LCRM Database. PMs are responsible for tracking all risks and handling/mitigation activities in a database archiving risk management across each program's life cycle. This is especially important to support the seamless transition of risk management between life cycle phases, responsible organizations, and prime contractors. When a program transitions to the Operations and Maintenance (O&M) phase, the LCRM database can form the basis for the sustainment program's risk management efforts. The AF Enterprise-wide Risk Management System (an AF-tailored version of the COTS software "Active Risk Manager (ARM)") is the current standard AF tool to manage and track program risks across the life cycle.

12.1.6. LCRM Relationships to Other Program Management and Risk Management Activities.

12.1.6.1. Section 12.3 of this chapter describes in detail how LCRM uses inputs from and provides outputs to most other program planning, analysis, management, and oversight activities. LCRM differs from and connects to other existing program risk management efforts in the following ways.

12.1.6.1.1. System Safety/Mission Assurance. Mission assurance and system safety risks are assessed and managed using methodologies separate from LCRM. Manage system safety risks by applying MIL-STD-882, the *DoD Standard Practice for System Safety*. All high and serious system safety risks are translated and presented IAW AFI 63-101/20-101 at all program, technical, and Milestone decision reviews or to support other key decision points. The LCRM 5x5 displays integrated system safety, cost, schedule, and performance risks; this is important because the handling/mitigation of system safety risks can often increase cost, schedule, and performance risks, and vice versa.

12.1.6.1.2. AFI 90-802, *Risk Management*. The tenets of AF-wide operational risk management covered in AFI 90-802 are based on the same general principles as LCRM. However, the key elements of LCRM discussed in this chapter have been tailored specifically for life cycle management programs. When a system is fielded, some of the program's LCRM risk information is useful to the risk identification efforts of operators and maintainers. Similarly, operator and maintainer risk management activities can identify risks requiring integration into the program's LCRM efforts.

12.1.6.1.3. Risk-Based Source Selection. Risk-based source selection is accomplished IAW the FAR, DFARS, and AFFARS. LCRM risk information is used as inputs to source selection activities.

12.1.6.1.4. Technology Readiness Assessments (TRAs) and Manufacturing Readiness Assessments (MRAs). TRAs and MRAs are not, by themselves, risk management processes, nor do the results represent risks. For example, TRA and MRA results do not incorporate consequence of occurrence, and are only partially related to the probability of occurrence term. Instead, TRAs and MRAs are tools for identifying triggers that may become risks and providing inputs with regard to how

well these items are managed over time. Results from TRAs and MRAs are examined as inputs to the risk identification process as appropriate. However, because technology readiness level values and similar measurements for manufacturing and other categories are related only to the risk likelihood portion and not related to the consequence of occurrence, an item with a low Technology Readiness Level (TRL) or related value is not necessarily a risk.

12.1.6.1.5.  Programs developing systems/platforms/components interfacing with any Information Technology (IT) network, data links, and/or classified radio network passing data are to review AFI 17-101, *Risk Management Framework for Air Force IT Systems*, and comply, if applicable.

**12.2.  Five-Step Life Cycle Risk Management Process Model.**

12.2.1.  Introduction.

12.2.1.1.  Proper risk management of any activity, whether tied to AF acquisition or any other endeavor, uses basic and universally recognized steps to execute the process. These steps involve: planning, identifying risks, analyzing those risks to determine their importance, determining how to handle/mitigate those risks, implementing handling/mitigation actions and tracking to determine if the handling/mitigation actions are effective.

12.2.1.2.  These steps are conducted continuously throughout the acquisition life-cycle in an iterative manner. Identifying a risk and taking handling/mitigation actions will not end the process regarding that risk; teams need to continue to track handling/mitigation actions, determine if the root cause still remains (i.e. repeat risk identification), analyze the likelihood and consequence to determine remaining potential programmatic impacts, revise risk handling/mitigations plans if needed, implement those plans, and then return to tracking again. Until a risk is eliminated or sufficiently reduced to an acceptable level, this process is repeated.

12.2.1.3.  The AF LCRM process model reflects these continuous and iterative steps as illustrated in **Figure 12.1** As stated earlier, the *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* serves as the basic guidance for risk management and is used with this chapter. There are slight differences between the AF LCRM process model and the process model presented in the DoD guide. Much of the content of the DoD guide is identical to the AF LCRM process, though, and this chapter does not repeat that content. The remainder of this section addresses the five steps in the AF LCRM process model and those differences by focusing on additions, clarifications, and points of emphasis only. *Note:* As handling efforts are realized, the risk parameters change and the risk is re-characterized by revisiting Step 2. Once a risk is managed to an acceptable level, the risk is closed-out as determined by the Risk Manager/Program Office responsible party/PEO.

**Figure 12.1.  AF LCRM Process.**

**Standardized Process Steps (at the Macro Level)**
**All steps occur throughout the life cycle**



**Performance / Schedule / Cost**
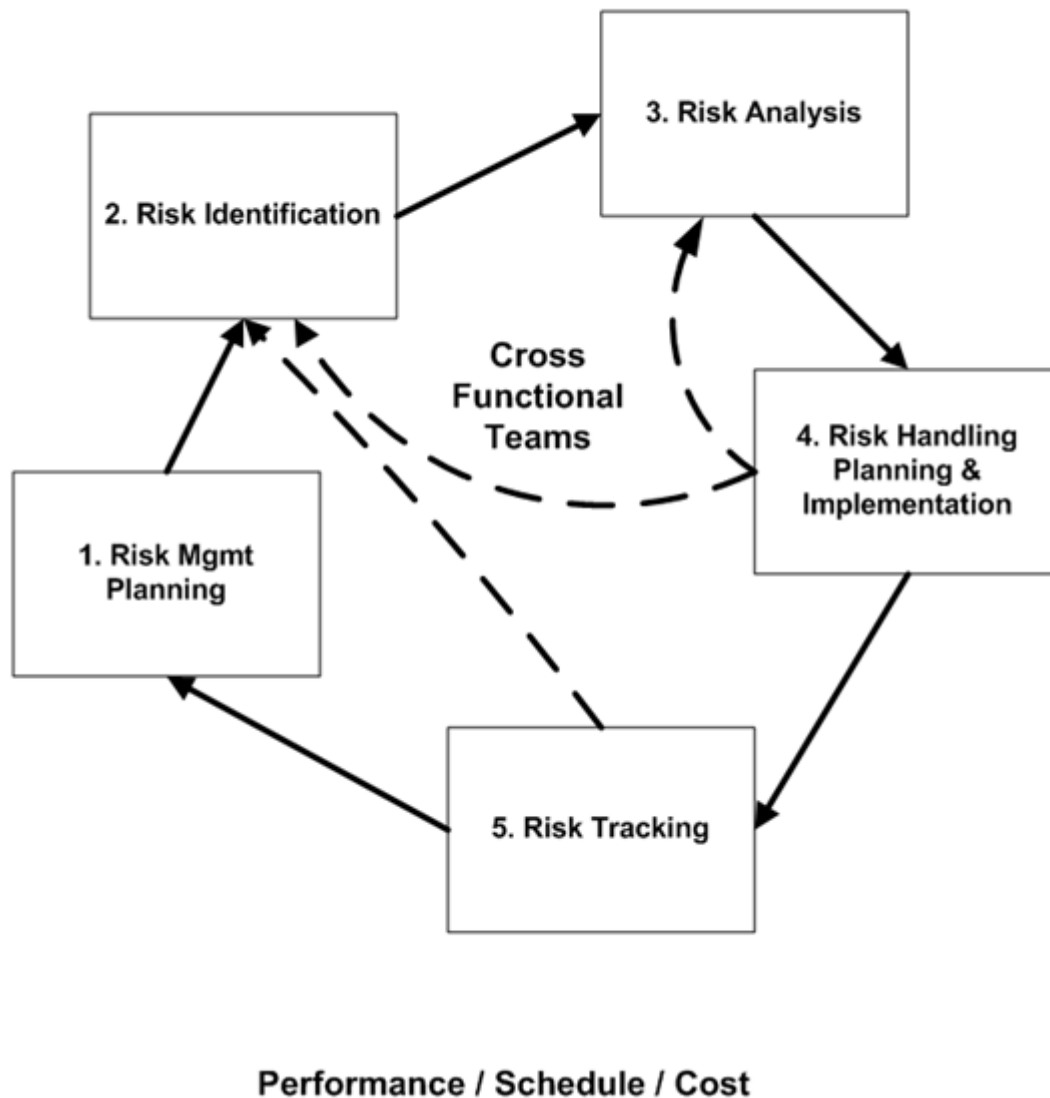
12.2.2.  Risk Management Planning—Step 1.

12.2.2.1.  Risk management planning is the foundation of the LCRM process and key to successful program execution. It links a program's risk management effort to life cycle planning by answering "who, what, where, when, and how" risk management is performed. The product of risk management planning is a Risk Management Plan.

12.2.2.2.  Risk Management Plan (RMP).

12.2.2.2.1. The PM prepares a RMP as summarized in the *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs*.

12.2.2.2.2. The RMP explains the strategy by which the program coordinates and integrates its LCRM effort. The RMP is a strategic document providing an overarching plan. Risk handling/mitigation plans are separately developed to address

individual risks and are tactical in nature. Risk handling/mitigation plans are typically contained in the AF standard risk tool and not contained in the RMP.

12.2.2.2.3. As previously stated, the RMP does not need to be a stand-alone document. It is recommended that RMP be incorporated into appropriate planning documents, and linked to risk management activities described in other planning documents (e.g. IMS, SEP, Acquisition Strategy) as necessary. PEOs may develop organizational RMPs addressing strategy common across the organization with Program unique strategy addressed within planning document.

12.2.2.2.4. RMP Content. *The Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* provides an example format summary for the RMP. The RMP also describes a database for PM and IPT to use in tracking risks, handling/mitigation actions, and decisions regarding risks.

12.2.2.2.4.1. The database is intended to provide a mechanism for archiving LCRM activities across each program's life cycle to support transition of risk management between life cycle phases, responsible organizations, and contractors.

12.2.2.2.4.2. It also provides a source for "lessons learned" that can be passed to subsequent programs.

12.2.2.2.5. To further assist with RMP development, consider the following:

12.2.2.2.5.1. Does it explain the purpose, scope, ground rules and assumptions, processes, success criteria, and constraints pertaining to the program LCRM process?

12.2.2.2.5.2. Does it describe how the LCRM process integrates and relates to other life cycle activities?

12.2.2.2.5.3. Does it include and discuss potential sources (design/engineering, manufacturing, support, technology, cost, budget, schedule, etc.) in sufficient detail that this information can be used to assist in risk identification?

12.2.2.2.5.4. Does it explain LCRM roles and responsibilities and the cross-functional IPT; describe customer and supplier interactions with respect to LCRM? In addition, who determines what is a risk, concern, or issue? Who are the responsible parties for risk handling and reporting progress?

12.2.2.2.5.5. Does it address how team members are trained to apply LCRM?

12.2.2.2.5.6. Does it describe frequency, methods, tools, and metrics?

12.2.2.2.5.7. Does it include a process for identification of risk acceptance criteria?

12.2.2.2.5.8. Does it describe how and when risk information is aggregated and communicated both internally to the program and throughout the execution chain?

12.2.2.2.5.9. Does it specify the format and data elements for tracking risks; document how the list will be maintained; how configuration control will be maintained; shareholders who need access to the data; and how often it will be

reviewed/updated?

12.2.2.2.5.10.  Does it address a strategy for developing a contingency plan (e.g., requirement de-scoping) if sufficient risk handling cannot be accomplished?

12.2.2.2.6.  RMP Updates. As a strategic document, the RMP is updated periodically and matured throughout each program's life cycle as it crosses phases at Milestones. Other events that may lead to RMP updates include:

12.2.2.2.6.1.  Changes in acquisition strategy, program re-baselining, or support strategy,

12.2.2.2.6.2.  Preparation for a milestone decision,

12.2.2.2.6.3.  Significant changes in success criteria, program architecture, or design,

12.2.2.2.6.4.  Results and findings from event-based technical reviews, and

12.2.2.2.6.5.  Program Objective Memorandum (POM) submissions.

12.2.3.  Risk Identification—Step 2.

12.2.3.1.  With the RMP in place, the next step in the LCRM process initiates execution of the plan: Risk Identification.

12.2.3.2.  Risk Identification is the action of examining a program or project to determine "What can go wrong?"

12.2.3.3.  Risk Identification is performed continuously by all program personnel.

12.2.3.4. Risk identification focuses on identifying the "root cause" (when possible) contributing to the uncertainty. An *If-Then* statement is developed for each risk to describe the risk, consequence, and impact where: "*If*" is the potential negative event or "root cause", and "Then" provides the results or consequences (possible outcomes of the negative event). (*Note:* DoD refers to the potential future event as a "root cause" to distinguish it from the consequence or impact. The AF typically refers to it as the "risk.")

12.2.3.4.1.  A good risk statement contains two elements: the potential event and the associated consequences. An example of a risk statement: "IF long lead components are not received in time to produce the flight controller by 5/17/13 for software integration testing, THEN program will lose access to testing and ground flight resources, leading to a delay in flight control system completion by four months and increasing cost by $156,000."

12.2.3.5.  Risk Identification Sequence. It is best performed by decomposing the program or project into the lowest level of activities, elements, or processes reasonable for that phase of the life cycle, and then asking "What can go wrong?" and "Why?" (to determine root cause when possible).

12.2.3.5.1. Decompose the program or project using the WBS, Integrated Master Schedule (IMS) or Integrated Master Plan (IMP), sub-processes, key requirements, or other means of identifying discrete efforts for the program or project such as DevSecOps or Agile implementation methods.

12.2.3.5.2.  Examine each discrete effort in terms of risk sources or areas,

12.2.3.5.3.  Determine what could potentially go wrong, and then

12.2.3.5.4.  When possible, use appropriate methods to identify a root cause(s), such as observation or digging deeper into the WBS/IMS/etc. until a root cause is determined.

12.2.3.6.  For each risk identified, clearly assign ownership and responsibility tied to the program or project structure (IPT) and linked to discrete efforts within the WBS/IMS/etc. Risks may affect more than one IPT, thus, IPTs communicate with one another to understand how they interact.

12.2.3.7.  Specific WBSs or activities in the IMS relating to risks are identified in the risk register and schedule.

12.2.3.8.  Sources of Risk. The *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* includes a list of typical risk sources. Additional sources of risk for consideration are:

12.2.3.8.1.  Changes in Government and contractor leadership and key personnel,

12.2.3.8.2.  Changes in assigned or planned resources,

12.2.3.8.3.  Transition activities between life cycle phases and/or organizations,

12.2.3.8.4.  Concurrency with other interrelated programs (dependent on either input or output).

12.2.3.8.5.  Cybersecurity considerations.

12.2.3.9.  Risk Identification Methods. One or more top-level and one or more lower-level risk identification approaches should be used in performing a comprehensive risk identification. Using only top or lower level approaches increase the chance that potential risks are not identified because the evaluation is often performed in a non-comprehensive and/or unstructured manner.

12.2.3.9.1.  Top-Level Risk Identification Approaches. Examples of top-level approaches include, but are not limited to using the WBS, key requirements, key processes, and risk categories to reveal risk triggers.

12.2.3.9.2.  Lower-Level Risk Identification Approaches. Examples of lower-level approaches include, but are not limited to: affinity, brainstorming, cause/effect diagrams, checklists, critical and near critical path, expert opinion, failure analysis, influence diagrams, lessons learned from analogous programs (contact the local ACE), Logistics Health Assessments (LHAs), metrics (e.g., PMRT), models (e.g., Systems Engineering Assessment Model (SEAM)), trigger questions, and triggers from risk scales.

12.2.3.9.3.  Risk Identification: Integration & Ilities (RI3). RI3, an Air Force Smart Operations for the 21st Century (AFSO-21) best practice, is an integrated method involving both top-level (key processes) and lower-level (trigger questions) approaches for identifying technology risks in pre-Milestone A and later activities. The methodology (including key processes and trigger questions) are incorporated in

the *Risk Identification: Integration & Ilities (RI3) Guidebook*, Dec 2008 available from the Acquisition Community Connection of the DAU. Note: The "Ilities" and "ility" in the guidebook refer to characteristics of a unit or a technical discipline typically associated with the support, operation, and maintenance of said unit. This can also include items not ending with "ility," such as integration, training, and human factors. Reference the RI3 Guidebook for additional information.

12.2.3.9.4.  Other Considerations.

12.2.3.9.4.1.  Additional attention is given to risks that occurring at relatively high WBS levels (e.g., WBS level 1 and 2) and those affecting various types of integration (e.g., hardware/hardware, hardware/software, software/software, component through system level, and systems-of-systems level) because the risk might be more complex than when initially evaluated, have interdependencies with other risks, and involve ownership sharing.

12.2.3.9.5.  Other assessment activities.

12.2.3.10.  Risk Identification Output. The product of risk identification is a list of risks and their corresponding root causes (when known). Where practical, risks are related to the specific tasks in the current IMS and applicable WBS element.

12.2.3.10.1.  All risks, root causes, and the resulting outcomes are documented and tracked in a database as described earlier.

12.2.4.  Risk Analysis—Step 3.

12.2.4.1. Risk Analysis assesses the degree of likelihood and impact of risks to the program or project.

12.2.4.2. Risk Analysis is the process of refining each risk in terms of its quantifiable likelihood and quantifiable consequences, always assuming the risk occurs. Analysis determines "What is the magnitude of the risk?" Each risk is evaluated independently. In some cases common attributes across risks may lead to a new risk with an equal if not higher likelihood and/or consequence rating (e.g., in the case of resource constraints).

12.2.4.2.1.  Likelihood is an estimation of probability that the risk will occur.

12.2.4.2.2. Consequence of occurrence is an evaluation of the worst credible potential impact to performance, schedule, and cost if the risk occurs based on the most likely scenario. The maximum value of these three dimensions is selected without performing any mathematical operations.

12.2.4.2.3. Plotting the likelihood and consequence assessments on the LCRM 5x5 matrix, see **Figure 12.2**, provides a relative priority of risks based on potential impact to a program or project.

12.2.4.3.  Risk Analysis is performed continuously as new risks are identified, but also are re-accomplished periodically to assess if the likelihood and/or consequence have changed for a previously identified risk (e.g., as risk handling/mitigation plan activities are implemented or other events occur).

12.2.4.4.  Risk Analysis Sequence. Analyze the risk, then follow the following three steps to plot the result of analysis for management reporting:

12.2.4.4.1. Assign a probability or likelihood of occurrence for the risk using **Table 12.1** As an example, the probability of occurrence can be based on operating hours using airworthiness and system safety techniques, or they could be based the probability of an event (e.g. unsuccessful takeoffs and landings.).

12.2.4.4.2. Assess the consequences for each risk in terms of cost, schedule and performance impact using the criteria in **Tables 12.2** through **12.4** *Note:* the consequence score for each of the three impacts (performance, schedule, and cost), and select the most severe (highest) consequence associated with a risk to place on the matrix for program reviews.

12.2.4.4.3. Plot the likelihood and consequence for each risk on the LCRM 5x5 matrix, see **Figure 12.2,** to depict its potential magnitude and relationship to other risks. If a likelihood or consequence cannot be reasonably assessed, then it is not reported as a risk on the LCRM 5x5 matrix. It may be separately reported as a "concern" and monitored for change and/or determination of likelihood and consequence. *Note:* Risks should not be confused with issues. A risk, whether or not previously identified, that has occurred or will occur with certainty is an issue (i.e. problem).

12.2.4.5. The likelihood and consequence scales given in **Tables 12.1** through **12.4** are required to be used by AF personnel (AFI 63-101/20-101). Methods of analyzing risk include, but are not limited to, the following:

12.2.4.5.1. Individual or group expert judgment.

12.2.4.5.2. Analysis of historical data.

12.2.4.5.3. Uncertainty analysis of cost, schedule, and performance projections. Uncertainty is the indefiniteness about the outcome of a situation. Uncertainty is assessed in estimate models for the purpose of estimating the risk (likelihood) a specific limitation is exceeded.

12.2.4.5.4. Probabilistic Risk Assessments associated with performance, schedule, and cost to the program. Always assume the risks come to fruition for simulations.

12.2.4.5.4.1. Performance Risk Assessment (PRA). A PRA is a process of using statistical techniques to quantify the performance impact of the modeled item. PRAs are used to evaluate a wide variety of potential complex risks, including but not limited to predictions of: dynamic stability of control systems, missile accuracy, satellite gap analysis vs. time, and timing closure on application specific integrated circuits (ASICs). Each PRA may have a different model structure and resulting output, depending upon the engineering discipline.

12.2.4.5.4.2. Schedule Risk Assessment (SRA). A SRA is a process of using statistical techniques to quantify the schedule impact of technical, programmatic, and other risks on specified project or program milestones and other key dates to a targeted confidence level. This analysis focuses on critical path, near-critical path, and medium and high risk activities, as well as less critical activities, since any activity may potentially affect the program's completion date.

12.2.4.5.4.3. Cost Risk Assessment (CRA). A CRA is a process of using

statistical techniques to capture the cost impacts of technical risks, schedule risks, estimating error (statistical error that exists in parametric estimating methodologies), and pure cost risk (such as inflation and consumer price variables).

12.2.4.5.5.  Fault Tree Analysis and Failure Modes and Effects Analysis.

12.2.4.5.6.  Comparison to similar systems or programs.

12.2.4.6.  LCRM 5x5 Risk Matrix. The LCRM 5x5 matrix, see **Figure 12.2,** is adopted from the *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* as the standard for displaying AF programmatic risks. Programs are not allowed to modify the matrix scale or color coding (e.g., no 5x8 or 4x6 matrix, no color changes to individual blocks of the 5x5 matrix).

12.2.4.6.1.  The LCRM likelihood criteria and consequence criteria are more specific than criteria in the DoD guide assisting program offices and decision makers with improved consistency in risk assessments and reporting.

12.2.4.6.1.1.  AFI 63-101/20-101 requires PMs to use the cost, performance, and schedule consequence dimensions, see **Tables 12.2**, **12.3**, and **12.4**, at a minimum. PMs may develop additional consequence criteria, if needed.

**Figure 12.2.  LCRM Risk Matrix.**



12.2.4.6.2.  A risk is considered "high" when the intersecting point of the likelihood and consequence of a risk on the matrix falls in a red (shown as black) square, "moderate" when falling in a yellow (shown as light grey) square, and "low" when falling into a green (shown as dark grey) square.

12.2.4.6.3.  The LCRM 5x5 matrix is in the ASP/Air Force Review Board (AFRB) mandatory templates maintained by SAF/AQ for SAE briefings. PMs use the levels outlined in **Table 12.1** as they analyze their program risk.

12.2.4.6.4. Mission assurance and system safety risks are managed using separate methodologies (for system safety risks apply MIL-STD-882, *DoD Standard Practice for System Safety*).

12.2.4.6.5. The likelihood criteria in **Table 12.1** is provided as a reference of how PMs should rate likelihood of a potential risks.

**Table 12.1.  Likelihood Criteria.**

| LEVEL | LIKELIHOOD | PROBABILITY OF OCCURRENCE |
|---|---|---|
| 5 | Near Certainty | >80% to ≤ 99 % |
| 4 | Highly Likely | > 60% to ≤ 80% |
| 3 | Likely | > 40% to ≤ 60% |
| 2 | Low Likelihood | > 20% to ≤ 60% |
| 1 | Not Likely | > 1% to ≤ 20% |

12.2.4.6.6. The consequence criteria for performance in **Table 12.2** outlines the levels a program manager can use to quantify system performance.

**Table 12.2.  Standard AF Consequence Criteria – Performance.**

| Level | Standard AF Consequence Criteria - Performance |
|---|---|
| 1 | Minimal consequence to technical performance or supportability but no overall impact to the program success. A successful outcome is not dependent on the occurrence of this risk; the technical performance goals or technical design margins will still be met. |
| 2 | Minor reduction in technical performance or supportability, can be tolerated with little impact on program success. Technical performance will be below the goal or technical design margins will be reduced, but within acceptable limits. |
| 3 | Moderate shortfall in technical performance or supportability with limited impact on program success. Technical performance will be below the goal, but approaching unacceptable limits; or, technical design margins are significantly reduced and jeopardize achieving the system performance threshold values. |
| 4 | Significant degradation in technical performance or major shortfall in supportability with a moderate impact on program success. Technical performance is unacceptably below the goal; or, no technical design margins available and system performance will be below threshold values. |
| 5 | Severe degradation in technical performance or supportability; will jeopardize program success; or will cause one of the triggers listed below (see **Note 1).** |

> **Note 1:** Any root cause that, when evaluated by the cross-functional team, has a likelihood of generating one of the following consequences is rated at Consequence Level 5 in Performance:
> Will not meet KPP Threshold
> Critical Technology Element (CTE) will not be at Technology Readiness Level (TRL) 4 at MS/ A
> CTE will not be at TRL 6 at MS/ B
> CTE will not be at TRL 7 at MS/ C
> CTE will not be at TRL 8 at the Full-rate Production Decision point
> Manufacturing Readiness Level (MRL)* will not be at 8 by MS C
> MRL* will not be at 9 by Full-rate Production Decision point
> System availability threshold will not be met
> * MRLs will be calculated in accordance with the *DoD Manufacturing Readiness Assessment Deskbook.*

12.2.4.6.7.  The consequence criteria for schedule in **Table 12.3** outlines the levels a program manager can use to rate program schedule.

**Table 12.3.  Standard AF Consequence Criteria – Schedule.**

| Level | Standard AF Consequence Criteria - Schedule |
|---|---|
| 1 | Negligible program or project schedule slip |
| 2 | Schedule slip, but:<br>Able to meet milestone dates (e.g. A, B, and C) and other key dates (e.g. CDR, FRP, FOC)<br>Does not significantly decrease program total float and<br>Does not impact the critical path to program or project completion date |
| 3 | Schedule slip requiring close monitoring of the schedule due to the following:<br>Impacting the ability, but still able to meet milestone dates (e.g. A, B, and C) and/or other key dates (e.g. CDR, FRP, FOC)<br>Significantly decreasing program total float<br>Impacting the critical path to program or project completion date |
| 4 | Schedule slip requiring schedule changes due to the following:*<br>Significantly impacting the ability to meet milestone dates (e.g. A, B, and C) and/or other key dates (e.g. CDR, FRP, FOC)<br>Significantly impacting the ability to meet the program or project completion date |
| 5 | Schedule slip requiring a major schedule re-baselining due to the following:*<br>Failing to meet milestone dates (e.g. A, B, and C) and/or other key dates (e.g. CDR, FRP, FOC)<br>Failing to meet the program or project completion date |

Exhibit awareness that exceeds Nunn-McCurdy threshold breach for schedule.
*Note:* Impact varies based on 1) The schedule slip relative to the remaining duration in the program or major milestones; amount of remaining time to work-around the impact; 2) The impact of the slip with respect to key resources.

12.2.4.6.8. The consequence criteria for cost in **Table 12.4** outlines the levels a program manager can use to quantify system cost.

**Table 12.4.  Standard AF Consequence Criteria – Cost.**

| Level | Standard AF Consequence Criteria – Cost (A-B Refers to Milestone designation) |
|---|---|
| 1 | For A-B Programs: <1% increase from MS A or last approved Development or Production cost estimate. For Post-B and Other Programs: <1% increase from MS A or last approved Development or Production cost estimate. |
| 2 | For A-B Programs: 1% to <3% increase from MS A or last approved Development or Production cost estimate. For Post-B and Other Programs: 1% to <3% increase from MS A or last approved Development or Production cost estimate. |
| 3 | For A-B Programs: 3% to <5% increase from MS A or last approved Development or Production cost estimate. For Post-B and Other Programs: 3% to <5% increase in Development or >1.5% increase to Program Acquisition Unit Cost (PAUC) or Average Unit Procurement Cost (APUC) from last approved baseline estimate or >3% increase to PAUC or APUC from original baseline. (1/10 of Nunn-McCurdy 'significant' breach). |
| 4 | For A-B Programs: 5% to <10% increase from MS A or last approved Development or Production cost estimate. For Post-B and Other Programs: 5% to <10% increase in Development or >3% increase to PAUC or APUC from last approved baseline estimate or >6% increase to PAUC or APUC from original baseline. (1/5 of Nunn-McCurdy 'significant' breach). |
| 5 | For A-B Programs: >10% increase from MS A or last approved Development or Production cost estimate. For Post-B and Other Programs: >10% increase in Development or >5% increase to PAUC or APUC from last approved baseline estimate or >10% increase to PAUC or APUC from original baseline. (1/3 of Nunn-McCurdy 'significant' breach). |

12.2.4.6.9. **Figure 12.3** shows the difference between MIL-STD-882 risk matrix to the OSD Risk Management Guide Matrix.

**Figure 12.3.  Translation of MIL-STD-882 Risk Matrix to the OSD Risk Management Guide Matrix.**
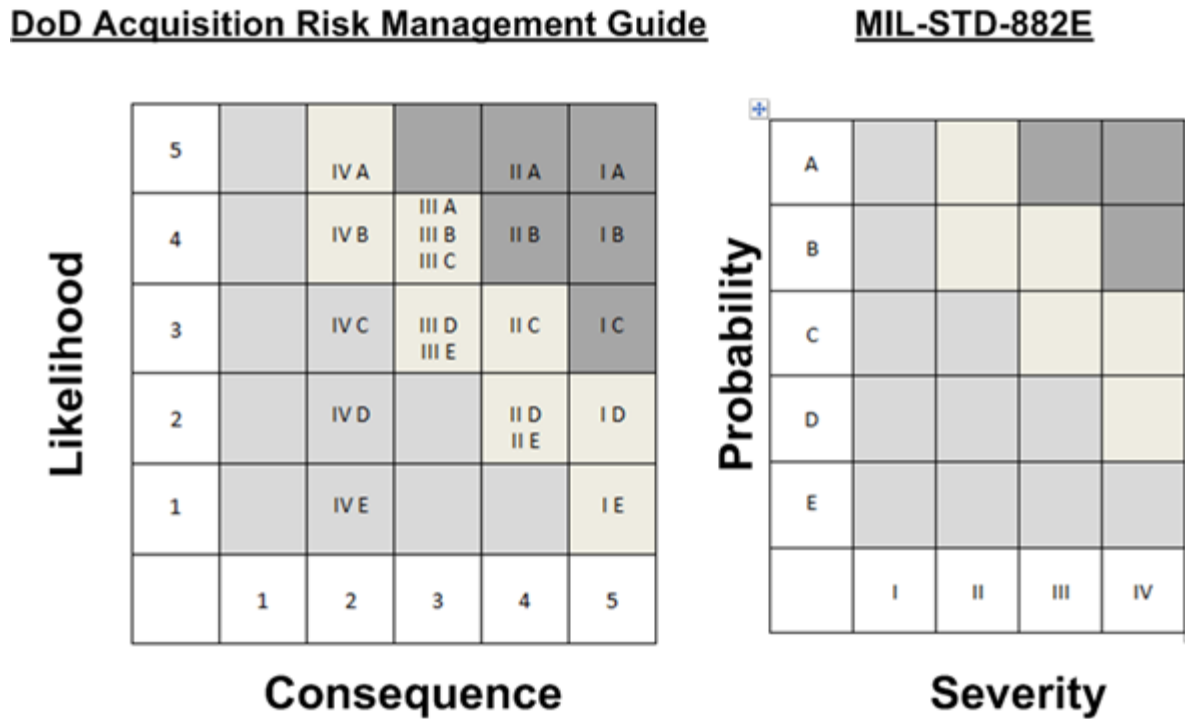


12.2.4.7. Risk Interdependencies. During Risk Identification and Risk Analysis, it is important for PMs and IPTs to address and communicate risk interdependencies and the ability of a given risk to affect other risks and potentially create new risks. Risks and handling activities may affect other risks within the same program or project, or affect other (external) programs (in the same AF portfolio, in another AF portfolio, or in a portfolio of another Service). Identifying, documenting, and communicating risks across these relationships is especially critical when associated with a Systems of Systems or a Family of Systems. Prime contractor involvement is key to this area of communication success.

12.2.4.8. Risk Analysis Output. The following are typical outputs expected from a risk analysis: risk ID, LCRM category, and root cause (when known), risk interdependency identification, risk level (from LCRM 5x5 matrix reflecting the likelihood and maximum of the three consequences for each risk), risk historical information, sub process results (e.g., PRA, SRA and CRA with desired percentile confidence level), aggregated Risk Report.

12.2.4.8.1. All moderate and high rated risks are presented on the matrix as a part of program, technical, and Milestone decisions. In addition, low risks that have a compounding effect equal to a single moderate or high risk are presented on the matrix.

12.2.4.8.2. Briefing charts follow the ASP/AFRB template provided by either the SAF/AQ Oversight Secretariat for ACAT I/IA or non-delegated ACAT II programs or the Center level oversight POC for ACAT II and III programs.

12.2.4.8.3. Analysis results are documented and tracked in a risk management database as described earlier.

12.2.5.  Risk Handling/Mitigation Planning and Implementation—Step 4.

12.2.5.1. Risk handling planning and implementation is the process of identifying, evaluating, and selecting options and then developing and implementing approaches to reduce risk to an acceptable level given program constraints and objectives. This includes the specifics on what is to be done, when it should be accomplished, who is responsible, associated available resources, etc. After risks are identified and analyzed, the next step is determining and documenting an appropriate action for each risk. *Note:* Risk handling is the preferred and more encompassing term to recognize potential multiple options to manage risks than simply mitigating the risk (mitigation or control option). Options for addressing risks include:

12.2.5.1.1.  Accept. Risk acceptance is a conscious decision to accept the associated level of a risk, without monitoring, transferring, mitigating, or avoiding the risk.

12.2.5.1.2.  Monitor. Take no immediate action, but watch for changes. Recognize what is monitored (i.e., Technical Performance Measures (TPMs) and production rates) and the threshold or trigger event initiating additional handling actions.

12.2.5.1.3.  Transfer. Shift the responsibility elsewhere. Risk transfer may reallocate risk from one part of the system or interface to another, thereby reducing the overall system risk, or redistributing risks between the Government and the prime contractor or within Government organizations, or among members of the contractor team, or from one IPT to another. In some cases, the transfer option is a form of risk sharing and not risk cancellation on the part of the Government. The transfer option can result in the reduction of likelihood and/or consequence of occurrence.

12.2.5.1.4.  Mitigate (Control). Apply resources aimed at reducing the risk to an acceptable level by reducing the likelihood and/or consequence of the risk.

12.2.5.1.5.  Avoid. Avoidance eliminates the sources of high and/or moderate risks and replaces them with a lower risk solution to reduce the likelihood and/or consequence of the risk. Risk avoidance involves a change in the concept, design, requirements, specifications, and/or practices by removing the potential root cause and/or reduce the risk to an acceptable level.

12.2.5.2. A risk handling strategy, composed of a risk handling option and an implementation approach, is developed and implemented for all moderate and high risks and selected low risks. All risk handling options (accept, monitor, transfer, mitigate, and avoid) are evaluated with regard to performance, schedule, cost and risk tradeoffs performed, and the "best" option selected for each risk. Given the option chosen, an implementation approach is then selected for each risk, again based upon evaluating performance, schedule, cost, and risk tradeoffs. It is also possible for a risk handling strategy to include a combination (or hybrid) of some or all risk handling options, and is not limited to a single option.

12.2.5.2.1.  Multiple risk handling strategies are developed on an as-needed basis and performed in parallel for the same risk, or be implemented contingent on intermediate progress associated with the primary risk handling strategy.

12.2.5.3.  Decisions to proceed (e.g., MDA, Acquisition Strategy Panels, etc.) constitute approval of the current risk assessments and handling plans for all moderate and high risks. Therefore, it is imperative for the MDA to be aware of all moderate and high risks, their respective handling/mitigation plans, and the current implementation status of each plan.

12.2.5.3.1.  For programs or projects with a high number of moderate risks in addition to high risks that cannot be briefed due to time constraints, the Decision Authority may elect to rely on staff independent of the program/project office for recommendations regarding approval of Risk Handling Plans for moderate risks. As previously stated, all moderate and high risks are presented to decision makers on the LCRM 5x5 matrix to ensure their awareness of these programmatic risks during program, technical, Milestone reviews.

12.2.5.4. Risk Handling/Mitigation Plan Content. The *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* provides the recommended content for risk handling/mitigation plans. In general, risk handling/mitigation plans describe actions to eliminate or reduce the identified risks, as well as risk measures, indicators, metrics, and trigger levels used to track the risks and the effectiveness of their handling actions. These plans also include the cost and schedule information required for implementation.

12.2.5.5. Risk Handling/Mitigation Planning Output. The outcome of this step is documentation of decisions and a risk handling/mitigation plan to accept, monitor, transfer, mitigate, and avoid all moderate or high rated risk impact (and selected low rated risks) to reduce the risk to an acceptable level. Acceptances and planning actions are documented in a database as described earlier.

12.2.5.6. Risk Handling Implementation. The final risk handling step is to allocate the resources needed to implement each developed and approved risk handling strategy via its risk handling/mitigation plan and implement the plan. It is essential that the risk handling/mitigation plan be resourced and implemented, or else risks may not be reduced to an acceptable level.

12.2.5.6.1.  When a risk handling plan is implemented, a successor risk handling activity should is not started until its preceding activity has been successfully completed.

12.2.5.6.2.  Working activities out of sequence may lead to missteps, possible rework, and decisions leading to an inefficient application of resources.

12.2.6.  Risk Tracking—Step 5.

12.2.6.1. Risk tracking is the process systematically evaluating and tracking the performance of risk handling actions against established metrics. Risk tracking is a proactive technique to observe the results of risk handling and provide feedback to the prior risk management process steps.

12.2.6.2.  Risk tracking provides information to draw conclusions about the effectiveness of the risk handling/mitigation plan and its actions.

12.2.6.3.  Risk tracking involves collecting, updating, organizing, and analyzing risk data and reporting risk trends. By monitoring risk handling/mitigation plan implementation at specific intervals, the resulting information can be fed back to update risk handling/mitigation plans as necessary, re-analyze existing risks (to determine if particular risks have decreased, remained the same, or increased over time), identify new facets of an existing risk (or new risks), and update risk planning considerations, such as risk categories, and ground rules and assumptions. Historical risk data is saved in the risk management database to permit evaluating how risks change over time.

12.2.6.3.1.  Metrics included in the risk handling/mitigation plan are evaluated for each risk at the same point in time. Ideally, this includes metrics for performance, schedule, cost, and risk tradeoffs to provide the program or task manager with a multi-dimensional view of how the risk has changed with time.

12.2.6.3.2.  Risk and metrics information collected can serve as a trigger to initiate an additional risk handling/mitigation plan if the original implemented risk handling/mitigation plan proves to be inadequate.

12.2.6.3.3. If reported trends collectively indicate a different strategy for risk management is appropriate, changes to the overall Risk Management Plan may be necessary.

12.2.6.4.  The frequency to evaluate tracking results and triggers is such that adequate time remains to react to adverse trends.

12.2.6.5.  Following risk handling implementation, decisions to accept, avoid, monitor, or transfer, rather than further mitigate, any moderate or high rated risk impacts are included in approval documentation (e.g., Acquisition Decision Memorandum).

12.2.6.5.1.  Acceptance of system safety risks should comply with DoDI 5000.02T dictating specific levels of approval regardless of the ACAT level.

12.2.6.5.2.  Review of processes applicable to joint weapon system development complies with the requirements of DoDI 5000.69, *DoD Joint Services Weapon and Laser System Safety Review Processes*.

12.2.6.6.  Updated information from risk tracking can significantly impact programmatic decisions and plans, and is communicated within the program/project team and to decision makers. This is accomplished via existing channels (e.g. reviews, decision points, etc.) without creating a separate risk reporting process for staff oversight. It is outlined in the Risk Management Plan, using the existing risk management reporting process.

12.2.6.7. Risk information is documented and tracked for each risk in a database including the information below. In addition, the same risk information is recorded each time a risk parameter changes to maintain historical data. Risk activities requiring additional resources, are considered for inclusion on the program's master schedule.

12.2.6.7.1. Risk ID (this field is system generated and only viewable to system developers)

12.2.6.7.2.  Risk Description

12.2.6.7.3.  Risk Origination Date

12.2.6.7.4.  Risk Owner

12.2.6.7.5.  WBS (if applicable)

12.2.6.7.6.  IMS Activity ID (if applicable)

12.2.6.7.7.  Risk Rating (Level: high, moderate, and low)

12.2.6.7.8.  Likelihood of the Risk Occurring (levels 1-5)

12.2.6.7.9.  Performance, Schedule, and Cost Consequences of the Risk Occurring (levels 1-5)

12.2.6.7.10.  Risk Handling Plan Option ID (if applicable)

12.2.6.7.11.  Burndown or waterfall chart (optional) depicting projected and actual risk burndown associated with risk handling activities over time.

## 12.3.  LCRM across the Life Cycle.

12.3.1.  Risk management is the proactive form of acquisition life cycle management. Risk management applies to all programs regardless of the Adoptive Acquisition Framework pathway selected. To remain proactive, risk management is performed continuously across the acquisition framework. It is a core responsibility of every team member performed on a daily basis. A program team with members that only assesses risks or update status of handling mitigation actions just prior to milestone reviews, only to meet periodic reporting requirements, will likely discover these risks have migrated into issues ; driving the program team into a reactive mode with a potential loss of control of performance, cost, or schedule or in all areas.

12.3.2.  As previously stated, the LCRM process is continuous and iterative. For simplicity, the Major Acquisition Capability process is used as an example of how LCRM can be applied. This continuous process feeds into all key aspects of acquisition management from the formal entry point into the acquisition process, the MDD beginning with the MSA phase, through the Operations & Support phase into final disposition. Conducted properly, risk management drives down risks and uncertainty as a team progresses through the acquisition framework to a point of handling mitigation and/or acceptance of risks.

12.3.3.  Viewing the "big picture," operational risks generate capability requirements often leading to materiel solutions to satisfy these requirements. During the MSA phase, cost, schedule and performance risks associated with each potential materiel solution is identified and assessed to determine the best strategy for the Technology Maturation & Risk Reduction (TM&RR) phase. The primary purpose of the TM&RR phase is to reduce technology risk (i.e. handle/mitigate the risks identified during the MSA) and to assess manufacturing and integration risks before proceeding into EMD. Mitigation actions for these manufacturing and integration risks are then initiated during EMD and completed (verified) in Low-Rate Initial Production (LRIP) and Initial Operational Test & Evaluation (IOT&E). Upon successful completion, a decision to proceed into Full-Rate Production can be made with considerably lower risk remaining for Production and Deployment as well as for Operations and Support. Even from the initial assessment of potential materiel solutions during the MSA

phase, it is crucial for the team to look as far forward as possible to identify risks across the life cycle out through sustainment and eventual disposal activities.

**12.4. Opportunity Management.** From the 2017 *DoD Risk, Issue, and Opportunity Management Guide*, "opportunity and potential future benefits to the program's cost, schedule and/or performance baseline usually achieved through proactive steps that include allocation of resources. Risk and opportunity management support Better Buying Power initiatives should-cost objectives." Opportunity management enables achieving program 'should cost.' Opportunity management, like issue management, is complementary to risk management. Program personnel should implement an opportunity identification and evaluation process to plan, identify, analyze manage and monitor initiatives that yield potential program cost reductions, schedule reductions, and performance improvements. Opportunities can also help offset cost or schedule impacts from realized risks. Identifying opportunities starts with an active search for potential enhancements within the program's technical mission and stakeholder objectives. As opportunities are found or identified, the program evaluates the likelihood and potential benefits as well as the risk involved. See *DoD Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* for additional information.

## Chapter 13

## ACQUISITION PROGRAM BASELINE (APB) PREPARATION AND GUIDANCE

**13.1.  Introduction.**  The purpose of this chapter is to provide guidance to program managers in developing their APB for all AF acquisition programs. To comply with 10 USC §2435 and DoDI 5000.02T, every program manager documents program goals prior to program initiation. The APB satisfies this requirement. A baseline is an agreed-upon description of the attributes of a product at a point, which serves as a basis for change. Configuration management facilitates the orderly development of a system through the establishment of the technical baseline, including the functional, allocated, and product baselines, and their assessment and approval at various technical reviews and audits. Upon approval, the technical baseline documentation is place under formal configuration control. Through configuration management, the program identifies, controls, and track changes to the technical baseline, ensuring changes occur only after thorough assessment of performance, cost, and scheduled impacts, as well as associated risks. The PM establishes government control of the functional baseline at the System Functional Review, and verifies it through Functional Configuration Audits leading up to the system-level functional configuration audits or the system verification review. The APB serves as the contract between the program manager and the MDA documenting the objective and threshold value for key performance, schedule and cost parameters as the program is expected to be developed, produced, and/or deployed. The APB also forms the basis for complying with some reporting requirements such as the Selected Acquisition Report (SAR), Defense Acquisition Executive Summary (DAES), and Monthly Acquisition Report (MAR).

**13.2. Goals.** Every acquisition program establishes program goals (via thresholds and objectives) for cost, schedule, and performance parameters describing the program over its life cycle. The difference between the threshold and objective represents the potential trade space – the area in which the PM works to achieve successful closeout of the parameter. Anything beyond the trade space is be approved by the MDA.

13.2.1. In accordance with the just released DoDI 5000.85, Major Acquisition Capability, the Service Chiefs concurred with the following:

13.2.1.1. With the need for a materiel solution as identified in the materiel development decision (MDD) review prior to entry into the materiel solution analysis (MSA) phase.

13.2.1.2. With the cost, schedule, technical feasibility, and performance trade-offs that have been made with regard to the program before Milestone A approval is granted pursuant to Section 2366a of Title 10, U.S.C.

13.2.1.3. That appropriate trade –offs among cost, schedule, technical feasibility, and performance objectives have been made to ensure that the program is affordable when considering the per unit cost and the total life-cycle cost before Milestone B approval is granted pursuant to Section 2366a of Title 10, U.S.C.

13.2.1.4. Before Milestone C approval is granted, that the requirements in the requirements document are necessary and realistic in relation to program cost and fielding targets, pursuant to Section 2448a of Title 10, U.S.C.

**13.3. Parameters - Thresholds and Objectives.** Program goals consist of the performance, schedule and cost parameters, each with an objective value and a threshold value. The default value for objectives in AF requirements documents is the threshold value (i.e., T = O).

13.3.1.  Thresholds. Threshold values represent the acceptable limits to the parameter values that in the user's judgment, and consistent with should cost/will cost objectives, still provide the needed capability. For performance, a threshold represents either a minimum or maximum acceptable value. For schedule and cost parameters, thresholds would normally represent maximum allowable values, which are normally 6 months beyond objective for schedule or 10% higher than objective for cost (per DoDI 5000.02T and DoDI 5000.85. The failure to attain program thresholds may degrade system performance, delay the program (possibly impacting related programs or systems), or make the program too costly. The failure to attain program thresholds, therefore, places the overall affordability of the program and/or the capability provided by the system into question.

13.3.2.  Objectives. The performance objective value represents an incremental, operationally meaningful, time-critical, and cost-effective improvement to the threshold value. The performance objective value is an operationally significant increment above the threshold, representing a desired operational goal associated with a performance attribute beyond which any gain in utility does not warrant additional expenditure. A performance objective value is developed only when absolutely necessary and is the same as the threshold when an operationally significant increment above the threshold is not significant or useful. The cost parameter's objective value is the MDA approved cost estimate for the program.

13.3.3.  Missing Values. The above guidelines notwithstanding, if no threshold is specified, the PM may propose an appropriate threshold value targeting affordability and control of cost growth, subject to MDA and user approval. In those situations where an objective value is required, the objective value is analytically justified in terms of operational risk and impacts to program cost and schedule. For each parameter, if no objective is specified, the threshold value also serves as the objective value. Also on occasions where "To Be Determined (TBD)" applies for both Objective and Threshold values. They typically apply to Schedule parameters when the parameter is contingent upon some other event or decision. These cases are very uncommon and the TBD values require MDA authorization.

13.3.4. Trade Space. Maximizing PM and contractor flexibility to make cost/schedule/ performance trade-offs is essential to achieving program objectives. Trade-offs—within the objective-to-threshold "trade space"—not require higher-level permission, but require coordination with the lead operating command. The lead operating command strictly limits the number of threshold and objective items in requirements documents and APBs. Performance threshold values represent true minimums, with requirements stated in terms of capabilities rather than as technical solutions and specifications. Cost threshold values represent true maximums. Cost objectives are used as a management tool.

13.3.5.  Subprograms/Increments. The capability requirement document specifies the KPPs per subprogram or increment. When a MDAP program uses subprogram(s), each subprogram has a set of parameters with objective and threshold values specific to the subprogram.

**13.4.  APB Content/Structure.** Every major capability acquisition program needs to prepare an APB prior to program initiation – typically Milestone B. The baseline includes sufficient parameters to describe the cost estimate (referred to as the "Baseline Estimate" in 10 USC 2433),

schedule, performance, supportability and any other significant factor of a major defense acquisition program, major automated information system, or designated major subprogram. The PM derives the APB from the users' performance requirements, schedule requirements, and best estimate of total program cost, which are referenced in the ADM.

13.4.1.  APB Content. Acquisition Program Baseline parameter values represent the program as it is expected to be developed, produced and/or deployed, and funded. The baseline only contains those parameters that, if thresholds are not met, will require the MDA to re-evaluate the program and consider alternative program concepts or design approaches. The number of performance parameters are limited to provide maximum trade space.

13.4.2.  APB Types.

13.4.2.1. MDAP APBs. In the case of MDAP programs, there are two baselines per program – the Original Baseline and the Current Baseline. Each subprogram includes these two baselines.

13.4.2.1.1. The Original Baseline is established at program initiation, typically Milestone B. Program initiation can also be when a post- MS B ACAT II or III program increases in scope (cost and funding) sufficient to cause it to be declared an ACAT I. The Original Baseline can be changed only following a critical Nunn-McCurdy Unit Cost Breach certification, resulting in a revised Original Baseline.

13.4.2.1.1.1. The statutory and regulatory requirements for each milestone, including MS B, are contained in the Tables in DoDI 5000.02T. Additional non-mandatory guidance on best practices, lessons learned, and expectations is available in the *Defense Acquisition Guidebook*.

13.4.2.1.1.2. Requirements for MS B include completion of Preliminary Design Review (PDR), Independent Cost Estimate, recommended Service Cost Position (or Component Cost Estimate as referenced in DoDI 5000.02T), an approved requirements document, and technology that has been demonstrated in a relevant environment. Findings from the PDR are considered when developing the Original Baseline.

13.4.2.1.2. The Current Baseline is initially established at program initiation and matches the Original Baseline at that time. Circumstances authorizing changes are limited and revision to the current baseline is not automatically authorized if there is a change to cost, schedule or performance parameters. DoDI 5000.02T lays out the limited circumstances as a basis to authorize a revision to the Current Baseline. They may be considered if changes are the result of:

13.4.2.1.2.1. A major program restructure that is fully funded and approved by the MDA; or,

13.4.2.1.2.2. Program deviations (breaches), if the breach is primarily the result of external causes beyond the control of the program manager. A good example of this is a breach resulting from content being added to the program (i.e. additional capability or units).

13.4.2.1.2.3. A Milestone or full rate production decision. Typically, this involves an update to implement the MS C decision.

13.4.2.1.2.4.  Multiple revisions to the Current APB are not authorized and at no time will a revision to the Current APB be authorized if it is proposed merely to avoid a reportable breach.

13.4.2.2.  All Other Programs. There is only the single baseline for all other programs (ACAT IAM, ACAT IC, ACAT II, and ACAT III programs. *Note:* The ACAT IAM and MAIS categories are only used for current IAM and MAIS automation programs until they are transitioned into another ACAT category, however, guidance for these programs will continue to be included until all programs transition.). This equates to the Current Baseline referenced for MDAP programs, but the "Current Baseline" nomenclature is not used.

13.4.2.3.  Technology Projects. Technology Projects are defined in DoDI 5000.02T. The MDA makes the determination whether a Technology Project requires a baseline, and if so, what parameters are included. The APB module in PMRT may be used for a Technology Project baseline. The MDA considers cost, schedule and scope (in lieu of performance because there are no KPPs) goals for such an effort in establishing a project baseline.

13.4.2.4.  The PM retains all approved baselines for historical purposes.

13.4.3.  Parameters.

13.4.3.1.  Performance.

13.4.3.1.1.  The sponsor of a capability requirements document provides a threshold and an objective value for each KPP describing an aspect of a system or capability to be developed or acquired. The total number of performance parameters are the sufficient number needed to characterize the major drivers of operational performance, supportability, and interoperability (10 U.S.C. §2435). KPPs are those performance parameters whose thresholds, if not met, would require an evaluation by the MDA to consider alternative acquisition approaches or possible program termination. These KPPs are verifiable by means of developmental and operational testing.

13.4.3.1.1.1.  An AF Form 1067, is used as the basis for the APB performance section for improvement modifications using investment appropriations. As described in AFI 63-101/20-101, the AF Form 1067 is used to initiate a modification proposal to fielded systems and equipment. It captures a description of the modification requirement and the technical aspects of the materiel solution that satisfies the requirement. Refer to AFI 63-101/20-101 for additional guidance.

13.4.3.1.2.  All validated KPPs are inserted verbatim into the performance section of the APB. For performance parameters, "threshold" is the minimum or maximum acceptable value that, in the user's judgment, is necessary to satisfy the need. If performance threshold values are not achieved, program performance may be seriously degraded, and the utility of the system may become questionable.

13.4.3.1.3.  The PM may propose additional parameters (usually derived parameters) to be tracked using the APB, subject to approval by the MDA. Additionally, the

MDA may add additional performance parameters to track other than the validated KPPs in order to ensure adequate oversight. Additional parameters are not KPPs.

13.4.3.1.4. The number and specifics of performance parameters may change over time. Early in a program, the APB reflects broadly defined, operational-level measures of effectiveness or measures of effectiveness or measures of performance to describe needed capabilities. As a program matures, system-level requirements become better defined. This maturity is reflected in updated requirements documents and Milestone APBs.

13.4.3.1.5. For Evolutionary Acquisitions, the capability requirements document should break out the KPPs by increment.

13.4.3.1.5.1. Document which increment(s) satisfy KPP(s). This is required in order to build the cost estimate and the test requirements for each block/increment.

13.4.3.1.5.2. Specify the minimum performance parameters, including those that define the core capability and target which increment provides the core capability.

13.4.3.1.5.3. For MAIS increments and Decision Points for Defense Business Systems Authority to Proceed (ATP), increments, the KPPs included in the performance section of the APB will be associated with the increment being baselined.

13.4.3.2. Schedule.

13.4.3.2.1. Schedule parameters minimally include dates for program initiation, major program decision points, and key events. If schedule threshold values are not achieved, the program timing may no longer meet the user's needs and the utility of the system may become questionable. Ensure schedule parameters are clearly within the scope of authority and responsibility of the PM. Events outside PM control are avoided as schedule milestones or defined in a way consistent with PM authority and responsibility.

13.4.3.2.2. The program summaries in the capability requirements document describe the overall program strategy for reaching full capability and the timing of the delivery of each increment. In general, the schedule parameters usually include the following key events:

13.4.3.2.2.1. Program initiation (MS B).

13.4.3.2.2.2. Design Reviews (SRR, PDR, CDR, etc.).

13.4.3.2.2.3. Major Milestones (MS C, FRP, First Article Delivery, etc.).

13.4.3.2.2.4. Key test milestones (DT&E Start and/or Complete, IOT&E Start and/or Complete). It may be duplicative to include both test start and complete especially if the completion of a test is a pre-requisite for a follow-on key event. In these cases, including just the key event may be sufficient. An example is DT&E Completion may not be needed if MS C is included because completion of DT&E is a pre-requisite for a MS C. Any slip in DT&E likely impacts the MS C date. In this case, just listing DT&E Start is sufficient.

13.4.3.2.2.5. IOC equivalent (i.e., Required Assets Available (RAA)). For MDAPs, OSD tracks IOC as part of a defense acquisition cycle time span metric for overall acquisition program reporting to the Congress. The PM considers using equivalent milestones, containing things within the scope of their authority and responsibility. As an example, Required Assets Available (RAA) can be used as an equivalent to IOC (and is acceptable for the OSD metric). This is defined as what the PM should deliver to support IOC (i.e. 18 aircraft plus trainer, tech pubs and initial spares). If IOC is required, there is a full description of the exit criteria for this milestone included as a footnote in the Schedule section of the APB. It is written so it can be understood and implemented by persons not associated with program initiation. This is also documented in the Program Management Agreement for ACAT I and II programs. Note: The operator or customer retains the authority to declare IOC and FOC. IOC and FOC include things outside the authority and responsibility of the PM such as training and readiness of the operators.

13.4.3.2.2.6. FOC is not a required milestone for APBs. It is also a milestone outside the scope of a PM's authority and responsibility. If required, follow the guidelines laid out for inclusion of IOC.

13.4.3.2.2.7. In all cases the PM may propose, for MDA approval, other specific, critical, system events, as necessary.

13.4.3.2.3. MDAP programs. The following are mandatory milestones and significant schedule events: Milestone A (if applicable), Milestone B, Milestone C, Full Rate Production, Preliminary Design Review, Critical Design Review, major testing events, and IOC (or IOC equivalent). It is highly advisable to not use a milestone for an event the PM does not retain both authority and responsibility.

13.4.3.2.4. MAIS programs. The following are mandatory milestones and decision points for MAIS programs:

13.4.3.2.4.1. Materiel Development Decision (MDD).

13.4.3.2.4.2. MS A, B, and C. At their discretion the MDA may tailor out MS A, MS B or MS C, with an appropriate, and concise footnote explaining the tailoring.

13.4.3.2.4.3. Full Deployment Decision

13.4.3.2.4.4. Full Deployment (FD). FD is the fielding of an increment in accordance with the terms of the Full Deployment Decision (FDD). Consequently, FD is not defined until the FDD, and the dates for FD are "TBD" until defined in the FDD ADM.

13.4.3.2.5. ACAT II and III Programs: ACAT II and III weapon system programs should consider milestones that meet the intent of the DoDI 5000.85 and reference AFI 63-101/20-101 when identifying decision points and milestones.

13.4.3.2.6. Objective Dates: The objective value corresponds to the approved program schedule, executable within the resources identified in the Cost section (Objective value) and approved by the MDA.

13.4.3.2.7. Threshold Dates: The APB default threshold value is the Objective date plus 6 months for Acquisition Category (ACAT) I programs. ACAT II and III programs use the 6 month span. The span for any program can be increased or decreased based on the risk associated with the individual milestone. The PM may propose, with justification, an appropriate threshold date different from the default date to optimize program trade space or commensurate with program risk, subject to MDA and user approval.

13.4.3.2.8. TBD in lieu of specific Dates for objective and/or threshold values may be appropriate in limited circumstances.

13.4.3.2.8.1. If the dates cannot be determined due to circumstances beyond control of the PM – for instance GFE/I or dependency on another system for which availability cannot be determined.

13.4.3.2.8.2. For MAIS programs, the FD milestone dates are "TBD" until after the FDD milestone is met. Criteria to meet FD are established in the ADM documenting FDD.

13.4.3.3. Cost. The APB incorporates the MDA-approved cost estimate, as documented in the ADM, in the Objective Cost values. It will not include costs that are not part of the program approved by the MDA. A Program Element (PE) does not define an acquisition program; program cost may include funding from more than one PE (i.e., multiple PEs make up funding for the program), or a portion of a PE (i.e. one PE may support multiple programs). Additionally, the PE may contain funding extending beyond the completion date of the program. This typically is for support in the O&S phase of the system. As the program progresses, the PM typically updates the APB based on ADM direction at Milestone decision(s). If the budget is not sufficient to support the cost requirements, the PM proposes a plan to the MDA on how funding shortfalls can be resolved. The MDA may recommend requirements tradeoffs or approve the plan as is.

13.4.3.3.1. Cost Estimate: The cost of the program reflects realistic estimates of the total program, including a thorough assessment of cost uncertainty and risk. The PM is responsible for developing a reasonable cost estimate for their program. To successfully estimate the costs, PMs and their staffs work closely with the center Financial Management Cost Staff and the Air Force Cost Analysis Agency (AFCAA). In many cases, the cost estimate is one of the pacing items in preparation for a milestone decision, on average taking 7 months for a MDAP Independent Cost Estimate (ICE) by Office of the Secretary of Defense Cost Assessment and Program Evaluation (OSD (CAPE)) or AFCAA. (See AFPD 65-5, Cost and Economics, and AFI, 65-508, Cost Analysis Guidance and Procedures, for additional direction and guidance.)

13.4.3.3.1.1. For MAIS programs, the Deputy Assistant Secretary (DAS) of the Air Force for Cost and Economics (SAF/FMC) approves and recommends a Service Cost Position (SCP) for consideration by the Service Acquisition Executive (SAE). The SAE typically accepts the recommended SCP, but may designate an alternative position as the official AF SCP. The SCP represents the AF's official cost estimate. Typically, the recommended SCP is developed through the Air Force Cost Assessment and Program Evaluation process. This

process is a product of the combined efforts of all stakeholder cost organizations designed to be collaborative and include a broad range of functional input. Recommended SCPs are established for all Milestone (A, B, C and FRP or FDD review) decisions for ACAT IB, IC, ID, IAM, and special interest programs. Recommended SCPs are established or updated whenever a program APB is established or updated. SAF/FMC should provide OSD (CAPE) a memorandum documenting the recommended SCP.

13.4.3.3.1.2. For MDAPs, 10 U.S.C. § 2334 prohibits the MDA from approving entry into a milestone phase unless an ICE has been conducted or approved by Director of Cost Assessment and Program Evaluation (DCAPE). The ICE is conducted/approved by DCAPE prior to the following decisions: (1) milestone approval pursuant to 10 U.S.C. §2366a and §2366b certifications (i.e., MS A and MS B decision points), (2) Low Rate Initial Production (LRIP) or FRP decision entry (i.e., MS C) and (3) certifications and reports under 10 U.S.C. §2433a (i.e., Nunn-McCurdy breaches). In most cases, AFCAA is delegated the responsibility to conduct the Independent Cost Estimate for ACAT IB/IC programs. If this is the case, programs will follow procedures outlined in **paragraph 13.4.3.3.1.1**

13.4.3.3.1.3. For ACAT II and III programs, the MDA makes the determination as to what type of estimate or level of review of the POE is to be done. Typically, the Product Center FMC will conduct a review of an ACAT III program POE. For an ACAT II program, they may do their own independent estimate.

13.4.3.3.2. MDAP Cost Baselines. There are two cost baselines breaches associated with all MDAP APBs (they are described in 10 U.S.C. §2435, Baseline Description). They correlate to the Original Baseline and the Current Baseline, and both estimates are assessed against the Nunn-McCurdy Unit Cost Breaches criteria.

13.4.3.3.2.1. Original Baseline Estimate is the cost baseline established with the initial APB (Original Baseline) at program inception, typically Milestone B. It documents the program cost as it was originally approved. There are no APB breaches against the Original Baseline Estimate. This cost baseline only changes following a Nunn-McCurdy Critical Breach certification (10 U.S.C. §2435); it is then referred to as a Revised Original Baseline Estimate.

13.4.3.3.2.2. Current Baseline Estimate is the cost estimate component of the Current Baseline. The Original Baseline Estimate initially matches the Current Baseline Estimate until a Current APB update is proposed and approved. A Current Baseline update results in an updated Current Baseline Estimate. APB and Nunn-McCurdy breaches are against the Current Baseline Estimate.

13.4.3.3.3. Non-MDAP Baselines. Unlike MDAP programs, there is only one baseline for ACAT IA (MAIS), ACAT II, and ACAT III programs. It is analogous to the Current Baseline. Differences between the different ACATs in this paragraph may include:

13.4.3.3.3.1. Unit Costs (PAUC and APUC) do not normally apply to AIS, and IT programs.

13.4.3.3.3.2. Working Capital Funds may be a breachable element for AIS, and

IT programs.

13.4.3.3.3.3. Total Development Cost and Total Life Cycle Cost (breachable elements of the Original Estimate for MAIS programs) are not breachable APB totals.

13.4.3.3.3.4.  As otherwise modified/tailored by the MDA.

13.4.3.3.4. Cost Baseline Preparation. The Acquisition Program Baseline should contain cost parameters (objectives and thresholds) for major elements of program life-cycle costs. The cost parameters are prepared in both base-year and then-year dollars.

13.4.3.3.4.1. Total Acquisition Cost Elements: Total Acquisition Cost elements represent the total program costs to develop and acquire the program as defined in the program scope as documented in the ADM. This encompasses the entire acquisition phase, program acquisition costs are comprised of cumulative-to-date, current fiscal year, Future Years Defense Program (FYDP), and beyond FYDP costs. For MAIS programs, the sum equates to "Total Development Cost" included in the MAIS original estimate and comprises the following elements: Research, Development, Test, and Evaluation costs; Procurement costs; Military construction costs; Acquisition-related Operations and Maintenance costs (O&M costs procuring acquisition items, or supporting the production, test and/or deployment phase, if any); and Working Capital Funds typically applied to AIS programs.

13.4.3.3.4.2. Total Operations and Support: Operations and Support costs are those costs that occur during the O&S phase of a system, and comprise the costs to operate, maintain, sustain, dispose of, and improve all delivered units. These costs can be in any appropriation/ any source. O&S costs can oftentimes occur in the same year as R&D and Investment costs.

13.4.3.3.4.3. Total Life Cycle Cost (derived by totaling Total Acquisition and Total Operations and Support costs). This sum does not have an APB Threshold value and is not breachable. For MAIS programs, the sum equates to "Total Development Cost" which is included in the MAIS Original Estimate and under MAIS Significant/Critical Change requirements.

13.4.3.3.4.4. Total RDT&E quantity (fully configured development units). Fully configured is defined to mean it satisfies the requirements capability document. It does not have to be production representative. Objective and Threshold values do not apply to this element. This item does not usually apply to AIS or IT systems.

13.4.3.3.4.5.  Total system procurement quantity (production units). Objective and Threshold values do not apply to this element. This item does not usually apply to AIS or IT systems.

13.4.3.3.4.6. Average Procurement Unit Cost (APUC): APUC is derived and defined as total procurement cost divided by total procurement quantity and usually does not apply to AIS or IT systems.

13.4.3.3.4.7.  Program Acquisition Unit Cost (PAUC): PAUC is derived and

defined as the total of all acquisition-related appropriations divided by the total quantity of fully configured end items. This item does not usually apply to AIS or IT systems.

13.4.3.3.4.8. Any other cost objectives established by the Milestone Decision Authority.

13.4.3.3.4.9. Objective values are based on the cost estimate approved by the MDA and documented in the ADM. Objective values are shown in both base-year and then-year dollars. Then year dollars are provided for each cost element for information purposes only.

13.4.3.3.4.10. The default threshold value for cost elements is 10% over the objective value. The span can be increased or decreased based on the risk associated with the individual milestone. The PM may propose with justification an appropriate threshold value different from the default value to optimize program trade space or commensurate with program risk, subject to MDA and user approval. Threshold values are done in base year dollars. Base year selected typically reflects the year of program initiation. A base year may change to reflect the year of the Milestone C decision or the year of the estimate supporting a Critical Nunn-McCurdy Unit Cost Breach certification. A base year change is approved by the MDA.

13.4.4. System Modifications. Modifications can occur throughout the life of a system, both in and prior to the O&S phase. The O&S phase begins after the initial production or fielding decision and is based on an MDA-approved Life-Cycle Sustainment Plan. During the O&S phase, changes planned to be made to completed/delivered units are treated as O&S Cost. The O&S phase may include any appropriation, including investment appropriations (RDT&E and Procurement). The approved cost estimate for O&S used in the initial APB includes a factor for mods over the life of the system. Typically, changes made to maintain the existing capability are funded via the O&M appropriation while changes made to improve or upgrade the system are funded with investment appropriations. The discussion below addresses the issue of how to categorize what sometimes amounts to a significant amount of investment appropriation that is planned and programmed for improvement/upgrade mods that occur before and after units have been delivered by the contractor and accepted and placed in service by the Government. Mods in the O&S phase using investment appropriation(s) are a separate acquisition program (usually ACAT III).

13.4.4.1. Development. Modification development is treated as Research, Development, Test, and Evaluation Acquisition Cost until the APB is retired. After that point, the RDT&E done in support of a change is treated as O&S Cost.

13.4.4.2. Procurement.

13.4.4.2.1. If the modification is to a unit not yet delivered (it is cut in on the production line), then the modification is counted as Procurement Cost.

13.4.4.2.2. If the improvement/upgrade modification is to be to a unit already delivered and accepted, then the mod is counted as O&S Cost. Note: The discussion above on Development and Procurement costs does not apply to planned increments or upgrades for which there is sufficient scope and definition to call it a subprogram

(MDAP). This would include requirements, schedule, an approved cost estimate, acquisition strategy and the Milestone B documentation and an MDA decision (Milestone B) to initiate it.

13.4.5. Footnotes: Footnotes are used in the Performance, Schedule, and Cost sections for explanation and documentation. They are kept brief; elaborate or lengthy paragraphs distract from the note. They are not used to document acquisition strategy, program achievements, future planned actions, assumptions or should-cost vice will-cost differences.

13.4.5.1. Examples of footnotes used for documentation include: the date of the source of requirements (usually CDD or CPD, current version and date), the criteria the PM should meet for IOC, additional info needed to characterize a performance parameter, clarification of the scope of the program or relationship to or reliance on other program(s), and the number of FMS units. It is recommended a footnote cite the basis for the Funds First Obligated date for MAIS programs. It is also a good practice for ACAT III AIS programs to document their FFO date (in their APB or elsewhere) in case they ever "grow" into a MAIS program.

13.4.5.2. Footnote examples for explanation include the quantity and planned delivery date of different variants for different customers. It is a good practice for MAIS programs to identify the source and date of the cost estimate and the associated cost confidence level.

13.4.6.  MDAP Issues.

13.4.6.1. Subprograms. The Fiscal Year 2009 National Defense Authorization Act added a new section to 10 U.S.C. §2430a permitting the Secretary of Defense (delegated to the Under Secretary of Defense for Acquisition, Technology and Logistics) to designate subprograms within a MDAP.

13.4.6.1.1. The USD(AT&L) Memo dated 23 Jun 2009, *Designation of Subprograms for Major Defense Acquisition Programs*, specifies there are two primary instances when establishing subprograms within an MDAP may be advisable: 1) when an MDAP requires the delivery of two or more categories of end items that differ significantly in form and function, and 2) when there are major components of a program that are dissimilar and therefore cannot be combined in a rational way to produce a unit cost that is representative of the program. If either of these two conditions is met, subprograms may be established for baseline development and reporting purposes.

13.4.6.1.2. In 2016, 10 U.S.C. Section 2430a was updated to provide the designation of subprograms if an MDAP to purchase satellites requires the delivery of satellites in two or more increments or blocks.

13.4.6.1.3. The law stipulates that when one subprogram is designated within an MDAP, all remaining elements (increments or components) of the program are appropriately organized into one or more other subprograms.

13.4.6.1.4. The decision whether to establish subprograms for an MDAP requires careful analysis and are made on a case-by-case basis. Structuring an MDAP with subprograms reflect the way the program is being managed and represent the most

efficient and informative way to convey information about a program to senior defense acquisition officials as well as to Congress. One factor to consider is a critical Nunn-McCurdy breach to any subprogram requires a certification encompassing all subprograms. If a specific subprogram has a critical unit cost breach, the Nunn-McCurdy certification is at the overall program level.

13.4.6.1.5. The law requires for the Congressional defense committees to be notified in writing of any proposed subprogram designation no less than 30 days before the date such designation takes effect.

13.4.6.1.5.1. The approval of an APB reflecting subprogram designation is considered the date subprogram designation takes effect, therefore, notification to Congress by the DAE occurs no less than 30 days before a subprogram APB is approved. The SAE notifies the Director Acquisition Approaches and Management of all proposed APBs reflecting new or revised subprogram designation at least 60 days before the proposed APB is submitted to the MDA for approval.

13.4.6.1.5.2. If a subprogram breakout is required by law, the 30-day Congressional defense subcommittee notification is not required.

13.4.6.1.6. SAR, Defense Acquisition Executive Summary (DAES), and the Unit Cost Report (UCR) all require reporting at the subprogram level.

13.4.7. Special Interest Programs. Per the DAG Chapter 10, a program or a technology project that results in a program has special interest if it has one or more of the following factors: technological complexity; Congressional interest; a large commitment of resources; the program is critical to achievement of a capability or set of capabilities; the program is part of a system of systems; or the program is a joint program. Generally, the level of funding, desired oversight and/or reporting should determine the MDA and whether or not the program is designated a "Special Interest" program. Programs already meeting the dollar thresholds for an MDAP, Major System, or MAIS program cannot also be designated Special Interest programs. For an ACAT I Special Interest Program, if the DAE desires oversight of a program falling below MDAP dollar thresholds and deems that statutory reporting associated with MDAPs is not needed, the program may be designated a Special Interest Program. If the DAE retains MDA, the program is an ACAT ID Special Interest program. If the DAE delegates MDA to the Component Head or CAE, then the program is an ACAT IC Special Interest program. The SAE may also designate Special Interest programs that are ACAT II or below. For such Special Interest programs, the reporting requirements are tailored to meet the specific oversight needs.

**13.5. APB Preparation and Approval Process.** In general, the PM prepares the APB at program initiation and revises the APB at subsequent milestone reviews, program major restructurings or unrecoverable program deviations. The PM, PEO, and the SAE, as appropriate, concur in the proposed APB and sign the cover sheet signifying approval. The proposed APB is submitted to the MDA for approval. The MDAs approval date becomes the date of the current APB.

13.5.1. Format and Preparation.

13.5.1.1.  The PM, in coordination with the user/sponsor, prepares the APB for program initiation. The MDA is the approval authority for the APB. Templates/samples depicting format, content, and hints for APB preparation can be found at **Attachment 13**.

13.5.1.2.  ACAT I programs and ACAT I Special Interest programs prepare and submit their APBs via the DAMIR system at **https://ebiz.acq.osd.mil/damir**.

13.5.1.2.1.  Classified APB Information. Use of DAMIR also applies for collateral SECRET ACAT I program APBs. As of December 2010 Selected Acquisition Report (SAR) season, the SECRET parameters and values (typically Performance) are entered into SIPR DAMIR. Programs with SECRET parameters are required to create their Unclassified and Classified APB simultaneously utilizing the NIPR and SIPR versions of DAMIR.

13.5.1.2.2.  For each section in the Unclassified DAMIR APB containing classified information, a checkbox is provided for the program to mark [Classified Data Exists Checkbox]. By checking this information, the program office is indicating to DAMIR that a classified APB needs to be created. The program office enters all unclassified information into the Schedule and Performance sections of the NIPR DAMIR system and then enters into the SIPR DAMIR site. Within the SIPR DAMIR system, the program office is able to add/delete/edit all classified APB information. Unclassified information is available for viewing purposes only. The full APB report to include classified and unclassified information is available for review and printing within the SIPR DAMIR Purview Program view.

13.5.1.3.  ACAT II and III Programs: The APB module in Legacy SMART was deactivated and a modified version is available in the APB application in DAMIR. DAMIR use of new ACAT II-III APB module is optional, but highly encouraged. The scope, parameters and definitions are the same as used with ACAT I programs. As with ACAT I APBs, the MDA has authority to add or subtract from the template content.

13.5.2.  Program Funding. A key criterion for APB approval is for the program to be fully-funded to the Objective Cost values. Full-funding means the dollars and manpower needed for all current and future efforts to carry out the acquisition strategy are in the President's Budget Program (cumulative to date, FYDP, and beyond FYDP). The Program Objective Memorandum or Budget Estimate Submission (BES) lock positions are not sufficient to support the full-funding criteria. If a program is not fully-funded, the issue is raised early to the appropriate PEO or SAE staffs. One approach to address this problem with ACAT I programs is to obtain a full funding commitment letter signed by SAF/FM and SAF/AQ for submittal with the APB approval request to the MDA for their consideration.

13.5.3.  APB Coordination/Approval.

13.5.3.1.  ACAT I and IA. The PM and PEO sign the cover signature page before forwarding for SAE approval. Coordination includes Lead User/Operating Command and affected agencies/departments with requirements/funding in the program (i.e., joint programs). Internal coordination processes are defined at the PEO/Center level but may include FM, legal, ACE, and others on the Center or PEO staff.

13.5.3.1.1.  The SAE signs the cover signature page either as the MDA for ACAT IB, IC or IAC programs, or as coordinating as SAE before forwarding it on to the DAE as

MDA for ACAT ID or IAM programs. Coordination for SAE signature includes SAF/AQX and the Capability Directorate. Coordination may include legal (SAF/GCQ), FM, and others on the headquarters staff as the case dictates. The PEM is the focal point for coordination within the headquarters. In the case of an ACAT ID or ACAT IAM program, the PEM is the AF focal point after it is forwarded to OSD for coordination and then signed by the DAE.

13.5.3.1.2.  ACAT I and IAM program managers review the proposed APB with the PEM and SAF/AQX prior to signature by the PEO and committing it to SAF/AQ coordination/signature (ideally, discussions on program structuring should occur in conjunction with development/review of Acquisition Strategy). If necessary, and with the participation of the Program Office, the OSD SME may also be brought into "trusted agent" discussions to further vet the APB. A SAF/GCQ representative may also be called in if there appears to be any legal issues. This helps to ensure issues peculiar to the program or more complex than can be addressed in a comment page are identified and resolved prior to the start of formal coordination.

13.5.3.2.  ACAT II: The PM and PEO sign the cover signature page before forwarding for SAE approval. Coordination includes Lead User/Operating Command and affected agencies/departments with requirements/funding in the program (i.e., Joint programs).

13.5.3.2.1.  Internal coordination processes are defined at the PEO/Center level but may include FM, legal, ACE, and others on the Center or PEO staff. The SAE signs the cover signature page as the MDA. If the SAE signs the APB cover page, then coordination for SAE includes SAF/AQX. Coordination may include legal, FM and others on the headquarters staff as the case dictates. The PEM is the focal point for coordination within the headquarters.

13.5.3.2.2.  Where the SAE delegated MDA authority to the PEO, there is no need for the PEO to forward the APB to the SAE. Delegated ACAT II program coordination processes are defined at the PEO/Center level but may include FM, legal, ACE, and others on the Center or PEO staff.

13.5.3.3.  ACAT III, Technology Projects, and other Activities. The PM and MDA (or similar decision authority if not ACAT) signs the cover signature page. Coordination includes Lead User/Operating Command and affected agencies/departments with requirements/funding in the program. Internal coordination processes are defined at the PEO/Center level but may include FM, legal, ACE, and others on the Center or PEO staff.

13.5.3.4.  Signature Summary. See **Table 13.1** to identify required signatures for APBs prepared for programs at each ACAT level.

**Table 13.1.  APB Signature Authorities.**

| Signature | Acquisition Category | | | | |
|---|---|---|---|---|---|
| | ID | IB/IC | Non-Delegated ACAT II | Delegated (to PEO) ACAT II | Delegated (to PEO) ACAT III |
| PM | X | X | X | X | X |

| PEO | X | X | X | X | X |
|-----|---|---|---|---|---|
| SAE | X | X | X | | |
| DAE | X | | | | |

**13.6. Obligation Restrictions.**

13.6.1. ACAT I Programs:

13.6.1.1. Program Initiation. Per 10 USC §2435, the DoD may not obligate funds for Major Defense Acquisition Programs after entry into EMD without an MDA-approved baseline unless the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) specifically approves the obligation. DoDI 5000.02T extends this policy to ACAT IA programs. Obligation authority in these types of cases is specified via an ADM by the DAE. *Note:* If a program "grows" from ACAT II to ACAT I, it should comply with ACAT I requirements. This includes either a MDA approved baseline or specific obligation authority from the OUSD(A&S) to continue obligation of program funds. Failure to do this can result in an Anti-Deficiency Act violation.

13.6.1.2. Nunn-McCurdy Provision Compliance.

13.6.1.2.1. Nunn-McCurdy. The prohibition on obligations until the submission of the SAR for significant breaches, and the certification for critical breaches that affect all major contracts of the program including, if appropriate, all subprogram(s).

13.6.1.2.1.1. Following a critical Nunn-McCurdy breach resulting in the recession of the most recent Milestone approval, a new Milestone approval is required before taking any contract action to enter a new contract, exercise an option under an existing contract, or otherwise extend the scope of an existing contract under the program.

13.6.1.2.1.2. An exception is given to the extent determined necessary by the Milestone Decision Authority, on a non-delegable basis, to ensure that the program can be restructured as intended by the Secretary without unnecessarily wasting resources.

13.6.2. ACAT II and III Programs. There are no provisions in law or OSD policy that prohibits obligations without an MDA approved APB.

**13.7. APB Updates.**

13.7.1. ACAT I Programs (MDAP). DoDI 5000.02T specifies the Current APB is updated at Milestone Decisions and at full rate production. For Milestone Decisions, the Development APB follows MS B, the Production APB update follows MS C. Other opportunities to change the current APB are limited – only due to: 1) the result of a major program restructure that is fully funded and approved by the MDA, or 2) the result of program deviation(s), if the breach is primarily the result of external causes beyond the control of the PM (these are also referred to as programmatic breaches). This should be addressed by the PM in their communication to the MDA regarding causes and proposed future actions within 30 days of the notifying the MDA of a breach. A change is not automatically authorized due to changes to cost, schedule and/or performance. An APB update is subject to approval by the MDA. The changes discussed here affect the Current APB only.

13.7.1.1. Following a critical Nunn-McCurdy Unit Cost Breach, both the Current and Original Baselines are revised resulting in a "revised" Original APB and a new Current APB reflecting the Nunn-McCurdy certification approved by the MDA. At that time, as at program inception, both the Original and Current Baselines will match.

13.7.1.2. Following a significant Nunn-McCurdy Unit Cost Breach, only the Current APB may be revised, subject to approval by the MDA.

13.7.2.  ACAT IA Programs. For ACAT IA programs, the APB is approved at Milestone B, and updated as needed at Milestone C and the Full Deployment Decision. The APB is also updated following a Critical Change. Per 10 USC Chapter 144A, the Original Estimate (baseline) is established and submitted to Congress. By policy the Original Estimate is the Objective schedule and cost data and the Threshold KPPs copied from the Milestone B APB, but by law the Original Estimate may only be revised through the Critical Change process.

13.7.3.  ACAT II Programs. The APB is updated based on the rule-set for ACAT I (MDAP) Current APBs. If the MDA is the SAE, the process established for ACAT I programs. If the program MDA was delegated from the SAE to the PEO, the update follows the process established by the PEO.

13.7.4.  ACAT III Programs. The APB is updated based on the rule-set for ACAT I (MDAP) Current APBs. Individual ACAT III MDAs may establish their own internal update process.

13.7.5.  Technology Projects. If a Technology Project baseline is required by the MDA, an update is required based on criteria established by the MDA.

**13.8.  Program Deviations.**

13.8.1.  Terms.

13.8.1.1. Breach. An APB deviation/breach occurs when the PM has reason to believe that the Current Estimate for the program indicates that a performance, schedule, or cost Threshold value will not be achieved.

13.8.1.2. Current Estimate. The Current Estimate is the latest estimate of program acquisition cost and quantity, schedule milestone dates, performance characteristic values, and critical technical parameters of the approved program (i.e., the approved program as reflected in the currently approved APB, ADM, or in any other document containing a more current decision of the MDA or other approval authority).

13.8.1.2.1. Cost. The Current Estimate for cost parameters is defined as the President's Budget program plus or minus fact-of-life/known changes. The President's Budget program is defined to be the total of: Cumulative-to-date, FYDP and beyond FYDP costs through completion of the scope in the APB. The beyond FYDP costs are based on a cost estimate. The most common fact-of-life changes include Below Threshold Reprogramming (BTR) and Above Threshold Reprograming (ATR). Another fact-of-life change may be an unrecoverable cost increase (most often caused by a contract overrun) recognized by the MDA (or the SAE in cases of a Nunn-McCurdy breach determination) – this too is supported by a cost estimate and a commitment to fund the overrun. POM positions associated with a change in scope in the program alone are not considered fact-of-life changes and are not sufficient to support a cost breach determination. However, the POM may

constitute support for a breach determination if associated with funding a recognized overrun. The Current Estimate for Cost is in base-year dollars (to be compared to the Cost Threshold value in BY $).

13.8.1.2.2.  Schedule. The Current Estimate for schedule parameters is defined as the PM's best judgment/projection of schedule milestone dates that will be attained relative to the APB parameters. A schedule breach occurs when the PM projects it, not when the threshold date actually arrives.

13.8.1.2.3.  Performance: The Current Estimate for performance parameters is defined as the program's manager's best judgment/projection of performance characteristics values that will be attained relative to the APB parameters.

13.8.2.  Program Deviations (Breaches):

13.8.2.1.  Breach Categories. APB breaches can be categorized as one of two types: Programmatic or Fact-of-Life.

13.8.2.1.1.  Programmatic breach. Factors outside the PM's management control (external factors) can cause a program deviation. These breaches, referred to as "programmatic breaches" may be the result of guidance from above the program office level. Several factors can cause these breaches such as doctrinal revisions, program restructuring, requirements changes, or budget-related quantity and dollar changes. Even "good-news" events such as funding increases to support a quantity increase can cause the Current Estimate to fall outside the threshold and cause an APB breach.

13.8.2.1.2.  Fact-of-Life breach. A fact-of-life (FOL) breach is an internal cost-growth, management or technical problem leading to a breach of the program's performance, schedule, and/or cost parameters.

13.8.2.2.  APB Breaches.

13.8.2.2.1.  APB Cost Breaches. An APB cost breach occurs when the Current Estimate exceeds the APB Threshold value(s). If cost threshold values are exceeded, the program may be too costly, and the affordability of the system may become questionable. Base year dollars are used to calculate cost growth (effects of inflation are removed and give true value of changes over time) which forms the basis to calculate a breach. APB breachable elements include:

13.8.2.2.1.1.  RDT&E;

13.8.2.2.1.2.  Procurement;

13.8.2.2.1.3.  Military construction costs;

13.8.2.2.1.4.  Acquisition O&M;

13.8.2.2.1.5.  Working Capital Fund (if applicable);

13.8.2.2.1.6.  O&S;

13.8.2.2.1.7.  APUC (if applicable);

13.8.2.2.1.8.  PAUC (if applicable);

13.8.2.2.1.9.  Any other parameter directed by the MDA.

13.8.2.2.2.  APB Schedule Breaches. An APB breach occurs when the PM projects a Milestone Threshold date will not be met. The breach occurs when the PM projects a Current Estimate exceeds the Milestone Threshold date; it is not when the Threshold date is actually exceeded.

13.8.2.2.3. APB Performance Breaches. An APB breach occurs when the PM projects performance values which do not meet the threshold values.

13.8.2.3.  Other Breaches:

13.8.2.3.1. Nunn-McCurdy Cost Breaches. A MDAP program can incur a Nunn-McCurdy Unit Cost Breach (defined in Title 10, § 2433) when the APUC and/or PAUC exceeds their Original Baseline Estimate by 30% (Significant) or 50% (Critical; or their Current Baseline Estimate by 15% (Significant) or 25% (Critical).

13.8.2.3.2. Selected Acquisition Report (SAR) Schedule Breach. For MDAP programs, a SAR Schedule Breach occurs when the Quarterly DAES Current Estimate is more than 6 months beyond the Current Estimate date reported in the last SAR report to Congress.

13.8.3.  APB Deviation (Breach) Notification.

13.8.3.1. ACAT I and IA. As soon as an unrecoverable deviation/breach to the APB occurs, the PM immediately notifies the MDA that a deviation occurred or will occur based on available information in accordance with DoDI 5000.02T. If notifying the MDA of an impending deviation, this notification is immediately reported via submission of a Program Deviation Report (PDR). If occurrence of the deviation is reported in the Quarterly DAES report – values are a breach – it will always be followed up with a Program Deviation Report within 30 days of the effective date of the DAES. In almost all cases, this is not the first time the MDA is made aware of the program issue(s) and risk(s). The PM keeps the PEO informed of concerns and risks as well as actions to mitigate them though formal periodic acquisition reporting and/or other communication(s).

13.8.3.2. Program Deviation Report (PDR). The PM is required to notify the MDA of the reason for the program deviation and the actions need to be taken to bring the program back within the baseline parameters. The PDR, at a minimum, contains the name of the program, the date of determination, a description of the breach (to include identification of what the breach is), a short description of the cause, and recommendation on whether to update the APB. It may include a description of the way ahead. The PDR is one page in length. For MDAP Nunn-McCurdy breaches, a unit cost report should be attached. The unit cost report may be generated from DAMIR.

13.8.3.3. The MDA has authority beyond that of a PM to address potential breaches and may require additional information such as an independent cost estimate to assess current status and potential actions prior to a breach determination by the PM. They will use this information in forming a solid basis to support a breach determination.

13.8.3.3.1.  Process Following a Breach Notification - ACAT I (MDAP):

13.8.3.3.1.1.  Within 90 days of the occurrence of the program deviation, the

program will (1) be back within APB parameters, (2) a proposed APB update (changing only those parameters that breached) is submitted for approval, or (3) an Overarching Integrated Product Team (OIPT) or equivalent Component-level program review is held to review the program and the PMs proposed baseline revisions and make recommendations to the MDA regarding the parameters that were breaches. The MDA decides, based on criteria in 10 USC §2433 and §2435 (MDAP-only), and DoDI 5000.02T, whether it is appropriate to approve a revision to the APB.

13.8.3.3.1.2.  If one of the three actions listed in the previous paragraph has not occurred within 90 days of the program deviation, the OUSD(A&S) for ACAT ID programs and ACAT IB programs, or the SAE, for ACAT IB, and IC programs, requires a formal program review to determine program status.

13.8.3.3.1.3.  While APB breach reporting is regulatory, the breach is identified in the SAR for MDAP and thus reported to Congress. The SAR Report is statutory.

13.8.3.4.  ACAT II and III. As soon as an unrecoverable deviation/breach to the APB occurs, the PM immediately notifies the MDA that a deviation occurred or will occur based on available information. This is done via a Program Deviation Report (PDR).

13.8.3.4.1.  ACAT II programs, provides a PDR up to the SAE. If the SAE delegated MDA responsibility to the PEO, the program provides a PDR up to the PEO.

13.8.3.4.2. ACAT III programs, the program notifies up through the designated MDA via a PDR.

13.8.3.5.  Technology Projects. For Technology Projects with a project baseline, the PM immediately notifies the decision authority that a deviation has occurred.

## Chapter 14

## PROGRAM TAILORING

**14.1. Program Tailoring.** The purpose of program tailoring is to streamline the acquisition program to the maximum extent possible, consistent with risk, to provide new systems to operational commanders as fast as possible. Tailoring is authorized by AFI63-101/20-101 and higher level guidance. DoDI 5000.85 states "PMs will "tailor-in" the regulatory information that will be used to describe their program at the MDD or program inception. In this context, "tailor-in" means that the PM will identify and recommend for MDA approval, the regulatory information that will be employed to document program plans and how that information will be formatted and provided for review by the decision authority." All MDAs promote maximum flexibility in tailoring programs under their oversight and document all information tailoring decisions. It is important to note that the authority to tailor lies with the MDA, but the responsibility to present a sound, reasoned, and achievable approach lies with the PM.

14.1.1. Tailoring Recommendation. PMs are assertive in the development of tailoring recommendations, as long as they have good justification, and can balance the risks in line with the user's priorities. The PM proposes a tailored execution, management, program information, documentation, and oversight structure for the program in the Acquisition Strategy (AS). The PM proposal considers program size, complexity, system service-life, total force structure, and associated risk.

14.1.2. Tailoring Review. MDA tailoring determinations are reexamined at each program decision point against the current program conditions and execution strategy.

14.1.3. Tailoring Documentation and Approval. Tailoring recommendations, justification, and approval are captured in the appropriate documentation including the Acquisition Strategy (AS). The MDA approves in writing in an ADM a tailored execution, management, program information, documentation, and oversight structure. Upon approval, all deviations from the program's documented tailoring plan require MDA approval.

14.1.4. Tailoring versus Waiving. Tailoring is the ability to integrate, consolidate, incorporate, and streamline documentation to meet the intent of the requirement in the most efficient and effective manner possible. Waiving a requirement (e.g.; statute, policy, document, etc.) is different than tailoring, waiving a document is stating that the document does not apply and the intent will not be fulfilled.

14.1.4.1.  Tailoring. The manner in which certain core areas are addressed in a particular program. Tailoring provides the ability to integrate, consolidate, incorporate, and streamline strategies, oversight, reviews, decision levels, documentation and information. The purpose is to streamline the acquisition program to the maximum extent possible, consistent with risk, in order to most efficiently and effectively deliver a capability. Tailoring is allowed within the scope of the applicable statute or regulation. Tailoring is documented, including the supporting rationale and citation to the applicable statute or regulation. Tailoring authority is at the MDA level.

14.1.4.2.  Waiver. A waiver is an expressed or written statement to relinquish or provide exceptions to specific statutory or regulatory requirement. A waiver is employed when complying with directive publication adversely affects the mission or national security

due to a unique situation. Waiver processes for documentation are incorporated into the functional document and may require approvals above that of the MDA tailoring authority. Waiver authorities remain with the publication owner.

**14.2. Program Determination.** ACAT III has no funding floor and encompasses all acquisition programs not included within ACAT I, IA or II. Mods in the O&S phase using investment appropriation(s) are a separate acquisition program. Refer to AFI 63-101/20-101 for the specifics of the content of the Acquisition Master List (AML).

**14.3. Milestones.** MDAs make the determination where to enter the acquisition process based upon the technical maturity of the product being acquired. The program is still responsible to ensure the work required for the previous phases is completed. This includes the technical planning and certifications. The determination of entry into the acquisition system is made during MDD and documented in an ADM.

**14.4. Delegation of Authority.** A major component of tailoring is ensuring the program is delegated to the appropriate level of authority. This should be done consistent with DoDD 5000.01, DoDI 5000.85, DoDI 5000.74, DoDI 5000.75, HAF MD 1-10, AFPD 63-1/20-1, and AFI 63-101/20-101. ACAT III programs are automatically delegated to the PEO through AFPD 63-1/20-1; the PEO/MDA delegation is documented in the initial ADM and reported through PMRT and the AML. During program execution, the MDA retains overall responsibility for the program, but the MDA has authority to delegate within his organization the actual execution of work. This means that, unless explicitly stated in policy, when the MDA is the signatory of a document/ requirement, the MDA has authority to delegate the execution and approval of the work while retaining overall responsibility.

**14.5. Regulatory vs. Statutory.** A simple way to remember this in context of program tailoring is that regulatory information has the ability to be tailored, whereas statutory information may not be tailored except in rare cases and only with the approval of Congress or by the SECDEF using Rapid Acquisition Authority. The tables in DoDI 5000.02T (or the MDID) differentiate between regulatory and statutory information requirements and are carefully reviewed for applicability. Regulatory information can be tailored according to the guidelines set forth in controlling documentation. For example, refer to AFI 99-103 for applicability of the TEMP to ACAT III programs.

**14.6. Program Information.** Tailor to: (1) combine program information and documents with similar information and approval authorities; (2) establish a common reference for basic system and program information; and (3) eliminate non-applicable information. MDAs and PMs will be aware of statutory and regulatory requirements that cannot be tailored out of a program's milestone information requirements. Failure to comply with these requirements precludes the successful completion of applicable milestone reviews. PMs are aware that there is no program information required beyond what is contained in statute, directives, and instructions, and additional information required by the MDA. Non-directive guidance is not a requirement.

**14.7. Integrated Documentation.** The concept which allowed for streamlining the number of program documents by consolidating the AS, Acquisition Plan, TEMP, Systems Engineering Plan (SEP), Life Cycle Sustainment Plan (LCSP), and other program documentation into a single document is still a viable tailoring alternative. The MDA retains the ability to tailor and make the final determination of what information is contained in each document. For AF programs delegated to the SAE and below, the MDA can approve a tailored AS combining the AS,

Acquisition Plan, LCSP, TEMP, SEP, PPP, and other documentation requirements if it is appropriate for the program and properly documented. MDAs may still keep all program information in one document with attachments/annexes or a virtual information reservoir to ensure an integrated life cycle approach, but the formats comply with established templates (OSD templates) to ensure standardization of information being provided. The PM identifies the documents being integrated and document this as part of the tailoring strategy.

14.7.1.  It is consistent with policy to fully leverage the authority provided in policy, to tailor the regulatory information program information to fit the particular conditions of the program. Case studies have shown that programs can achieve a 40-60% reduction in documentation by incorporating required information into a consolidated document instead of stand-alone documents that duplicate general program information.

14.7.2. Instead of waiving the document, the PM presents the "thought process" in the acquisition strategy to show the document was considered and addressed, but due to the unique nature of the program, certain aspects or content of the document do not apply to the program. For example, if the program is an ACAT III program the PM may choose to incorporate its test planning into the acquisition strategy versus a TEMP, this does not mean that the PM is waiving the requirement, but they are fulfilling the intent of the requirement by addressing it and consolidating the information into another document. Another example is the program may choose to utilize an organizational SEP and document program unique SEP requirements in the Acquisition Strategy or in an annex to the SEP.

14.7.3. The PM references the following documents: DoDI 5000.02T; the applicable Adaptive Acquisition Framework DoDI; AFI 63-101/20-101; this document; the *Defense Acquisition Guidebook*; and functional guidance to determine the best way to document requirements and  reduce program documentation.

**14.8. MDD.** The formal entry review into the acquisition life cycle is the first opportunity for program tailoring. At this point, the program is targeted towards a specific authority and level. The PM (responsible acquisition organization in coordination with responsible Lead Command) proposes and documents the expectations for the next milestone review and the entry point into the acquisition life cycle based upon technical maturity, cost maturity, and other supporting considerations. All programmatic information including next milestone review, documentation required for next milestone, and other program expectations are documented in an ADM. If the program is recommending entry into the acquisition process at a later MS (e.g., MS B or C) it ensures all intent of the requirements of the preceding MSs is fulfilled. This means that if the program enters at MS B, it fulfilled the intent of the requirements of MS A.  *Note:* For some pathways the decision to pursue a materiel solution may not be referred to as an MDD, however, the same thought process should be applied at the earliest opportunity and in coordination with the requirements and end user communities.

**14.9. Milestone Decisions.** PMs present the tailoring/streamlining approach in the acquisition strategy of the program and get approval at MDD or another MS decision. Programs can enter at almost any milestone if they can present a case that shows that they have completed the work for the prior MS decisions and phases. If the capability being acquired is mature, they can streamline the acquisition process by entering the acquisition framework at a MS that is more appropriate to the work being conducted for the program. If the program is COTS, it may be more appropriate

to enter at MS B or C dependent upon risk. This is documented in the ADM to ensure program expectations are communicated and documented.

## Chapter 15

## ACQUISITION PROGRAM BEST PRACTICES

**15.1. Entry into the Acquisition System.** Capabilities that were acquired outside the normal acquisition process have multiple ways to support entry into the acquisition process. Capabilities without adequate requirement documentation may be determined to be out of scope, duplicative, or not needed and may not be funded. Entry into the acquisition phase can be handled multiple ways:

15.1.1. Portfolio Assignment. To identify appropriate PEO portfolio utilize the Portfolio Assignment process documented in AFI 63-101/20-101.

15.1.2. Requirement Documentation. Documents requirements according to section above and related guidance and enter into acquisition phase through the JCIDS process, DBS process, or Cyberspace Infrastructure Planning System (CIPS) process.

15.1.3. Integration with an existing program. Work with an existing program to include as a modification.

**15.2. Requirements.** Program requirements, as with all requirements are clear, concise, unambiguous, simple statements that are testable and provide traceability. The program should employ a rigorous configuration control process controlling the composition of the program baselines. Requirements can be developed and approved within multiple approval chains in the Adaptive Acquisition Framework. Regardless of the size of the effort, requirements are documented in writing.

15.2.1. As the initial effort transitions into an approved program, the program eventually documents the original requirement in multiple databases and program reviews. Dependent upon the type of framework selected in the Adoptive Acquisition Framework, requirements either follow the JCIDS process, Defense Business System process, or modification process. Different ways requirements can be approved before the required program is approved are discussed below.

15.2.2. JCIDS. CJCSI 3170 details the requirements for systems to follow the JCIDS process. It should be noted that CJCSI 3170 does not require that systems under $15 million in post MS B cost follow the JCIDS process, but still requires for the sponsor to manage the requirements, approve the JCIDS documentation, and comply with acquisition requirements. To ensure programs have flexibility, ICDs and IS-ICDs are used to document capability requirements and associated capability gaps where the intended solution approach involves research, development, and acquisition of applications system software, and the projected software development costs exceed $15M. It is not intended to be used for software embedded as a subset of a capability solution developed under other validated documents. All hardware associated with an IS ICD is COTS/GOTS/NDI and hardware development is restricted to what is necessary for system integration, system enhancements, and hardware refresh due to obsolescence. Follow-on IS-CDDs, CDDs and CPDs are not required for IS using an IS-ICD. An IS-ICD can be used for all Automated Information Systems exceeding $15M in development costs and are not designated an MDAP. Reference AFI 10-601 for more detail.

15.2.3.  Defense Business Systems. Follow the rules set in place by the Investment Review Board (IRB)/Defense Business Council (DBC) and AFI 17-110, *Information Technology Portfolio Management and Capital Planning and Investment Control*. Receiving IRB approval of the problem statement is equivalent to receiving JROC approval of a requirements document. DBC certification allows a program to expend funds. Receiving IRB approval and DBC certification still requires the capability to be acquired using the above guidance with the MDA making acquisition execution decisions.

15.2.4.  Services. Defense acquisition of services is addressed n AFI 63-138, *Acquisition of Services,* and DoDI 5000.74, *Defense Acquisition of Services.* Services are the performance of any work from private sector entities for DoD, including National Security Systems (NSS). Quoting paragraph 1.2.c. in DoDI 5000.74, "the evolving nature of industry-provided services capabilities, should be considered when acquiring services. These capabilities include, but not limited to, automation, improve or re-engineered processes (both internal and external to the DoD), and the utilization of tools and techniques to improve the services management." If a program selects services as its program framework, it is required to follow processes as specified in DoDI 5000.02T, DoDI 5000.02, DoDI 5000.74, and AFI 63-138,.

15.2.5.  Modifications. A modification is normally documented using the Air Force modification process. Modification are submitted with an AF Form 1067, but be aware that AF Form 1067 will fall under the guidance in  AFI 10-601 and in accordance with AFI 63-101/20-101.

**15.3. Acquisition  Strategy.** The  Acquisition  Strategy  for  a  program  accounts  for  all considerations contained within the AS template. This does not mean that the PM develops a plan or strategy to comply with each consideration, but shows that each consideration was evaluated and appropriate justification for compliance, non-compliance, or applicability was presented. In addition, the PM documents the plan for integration of activities, processes, and documentation. It is essential for the PM to document and to ensure that expectations are managed and agreements are formalized and documented. The PM looks for ways to consolidate documents to ease review requirements and maintain configuration control.

**15.4. Defense Business System (DBS) Determination and Requirements.** If an IT system falls under the definition of a DBS, it follows the additional requirements for DBS found in DoDI 5000.75 and AFMAN 63-144. DBS is an information system, other than a national security system, operated by, for, or on behalf of the Department of Defense, including financial systems, mixed systems, financial data feeder systems, and information technology and cybersecurity infrastructure, used to support business activities, such as acquisition, financial management, logistics, strategic planning and budgeting, installations and environment, and human resource management. DBS programs are required to follow DoDI 5000.75 acquisition process which includes acquisition as well as functional owner responsibilities.

**15.5. Documentation.** The PM presents a plan to integrate documentation and determine applicability of regulatory documentation to the program. For example, if the program is a software program it is more than likely that a corrosion prevention plan is not applicable to the program. For items similar to this the justification is presented in the Acquisition Strategy and approval gained during the coordination of the strategy.

**15.6. Urgent Capability Acquisition.** Urgent Operational Need (UON) acquisition programs are specifically designated by the MDA for specialized procedures. These programs respond to

urgent needs as documented by validated urgent operational needs (UON), Joint UONs (JUON), Joint Emergent Operational Needs (JEON), and Chief of Staff top-down direction. Upon validation and Air Force assignment (for Joint urgent needs) AQX will email out request for Course of Action (COA) from the Solution Sponsor/Lead MAJCOM). The email will identify the PEO and CD along with other critical known SMEs/POCs that would be beneficial to participating in building the COA. UON programs do not operate outside of normal acquisition procedures, but rather delegate certain authorities and fully leverage regulatory tailoring to satisfy near-term urgent warfighting needs. Rapid acquisition is accomplished through the use of cross-functional teams, tightly scoped requirements, higher risk thresholds, concurrent activities, delegated authorities, and a standardized process. PMs should consider the following best practices for the type of system they are acquiring. This is not mandatory guidance but lists considerations, best practices and direction while managing a program. Key tenets of UON programs include:

15.6.1.  Delegations of authority for ACAT II/III UON programs: The MDA is automatically delegated to the relevant PEO. The MDA may be further delegated by the PEO were qualified personnel exist.

15.6.2.  Limited formal MDA reviews: UON teams need to focus the bulk of their energy towards solving the warfighter problem. Therefore, formal reviews should be kept to a minimum. The UON process only prescribes two mandatory MDA reviews: an MDD to enter the process and the Capability Transition Decision (CTD) to exit or maintain the process and determine further disposition of the solution (further development, sustainment, or demilitarization and disposal).

15.6.3. Deferred documentation. UON programs should defer most regulatory documentation and detailed planning until at least the CTD. Major deferrals should be documented in an ADM.

15.6.4. Expedited staffing. When reviewing UON program documentation, functional organizations and commands should treat UON programs as higher priority than non-UON programs. UON programs by definition are essential to the fulfillment of an urgent need and should receive immediate attention. It is expected organizations should use streamlined staffing mechanisms to support the short timelines associated UON programs.

15.6.5. Rapid delivery – UON. UON programs provide rapid solutions to validated warfighter urgent needs. By their very nature, urgent needs are operational gaps associated with loss of life or an inability to complete critical missions. Urgent needs are documented as validated urgent operational needs (UON), Joint UONs (JUON/JEON), and Chief of Staff top-down direction. Schedule is paramount when executing a UON program, and both cost and performance should be traded off respectively. UON program teams should be able to think creatively and develop simple, quick responses. Every day lost to non-value added bureaucratic tasks or over-design is a day lost to the warfighter. Ideally, UON programs should field an initial capability within 180 days of urgent need validation. This aggressive schedule requirement is intended to encourage simple solutions. The discussion below highlights key UON enablers.

15.6.6. Oversight. MDA for ACAT II and III UON programs is automatically delegated to the PEO to allow local, rapid decision-making. In addition, the process only specifies two formal MDA reviews: a MDD and a Capability Transition Decision (CTD). The MDD is the

entrance ramp to UON acquisition and the CTD is the exit ramp to determine the UON solution's future state. Depending on the situation, these reviews may be virtual, though the MDA still needs to document the decisions made in an ADM. The UON process is designed to push authority to the lowest levels and ensure the PM has appropriate freedom of action to execute an MDA-approved COA.

15.6.7. Scope. UON programs, though not limited in policy to a specific ACAT threshold, are not intended for large-scale or complex solutions. To field rapidly, PMs should aggressively question requirements and deflect pressures to deliver more capability than is absolutely needed to mitigate the identified gap. Following initial fielding, there should be time to examine further increments of capability. *Note:* The implementing command or Chief of Staff should endorse a course of action that extends beyond 180 days from urgent need validation to initial fielding. Long (greater than 180 days) schedules should be the rare exception.

15.6.8. Testing. UON programs should craft very limited and well-integrated test strategies focused on defining the capabilities and limitations of the solution. The testing should provide knowledge to the lead command, warfighter, and PM, to determine whether the solution is a militarily useful capability. Under normal circumstances, the test organization would submit a final test report prior to a programmatic decision to field a capability. UON programs are tightly constrained by schedule and should likely use interim raw data to assess a capability's readiness for fielding. If the testing does not uncover critical issues that would preclude fielding, the lead command and PM should execute the fielding plan prior to receipt of final test reports.

15.6.9. Cross-Functional Teams. Successful rapid capability programs exhibit close-knit cross-functional teams composed of senior analyst and subject matter experts who have earned a high degree of trust. The UON team should include key stakeholders and any functional organizations needed to speed along certifications and/or waivers. The lead command and PM are responsible to fully leverage cross-functional teams and ensure seamless communication between the members.

15.6.10. COAs. UON COAs are streamlined acquisition strategies which include the cross-functional teams's approach for development, fielding, and initial sustainment. The cross-functional team will coordinate an integrated strategy that considers those threshold activities required to quickly provide a capability to the warfighter. Critical path activities will be worked in parallel to mitigate the risk of schedule delays. In support of a MDD, the COA should normally be presented to the MDA in briefing format and appended to the ADM as formal documentation. It is important to note the MDD should occur within 45 days of urgent need validation, and the COA may not be complete at that point. The MDA should document the intent for incomplete documentation and analyses, and defer non-value added activities until at least after initial fielding. The primary intent of the MDD is to provide reasonable assurance to the MDA that the team understands the requirements and has developed an appropriately aggressive COA to meet the warfighter need.

15.6.11. Risk. The MDA should have a higher risk tolerance for UON programs and be willing to leverage all regulatory/statutory authorities to field a rapid solution. The MDA needs to coordinate with the lead and warfighting commands, and build a strategy that manages risk within tight constraints.

15.6.12.  Additional information about UONs is in DoDI 5000.81 and A5R Guidebook, Vol 2 (**https://www.my.af.mil/gcss-af/USAF/ep/globalTab.do?channelPageId=s6925EC1352150FB5E044080020E329A9**).

**15.7.  Budget.**  All programs have associated costs. PMs will consider these costs as they prepare their costing information as they prepare their budget submission.

15.7.1.  DoD Directive 7045.14, *Program Planning Budget & Execution (PPBE) Process*, establishes the policy, procedures, and assigned responsibilities for the PPBE process.

15.7.2.  For IT programs, all resource information for IT programs is reported in Information Technology Investment Portfolio Suite (ITIPS). This resource information serves two purposes: (1) determines the life-cycle cost of a program and (2) is reported to DoD CIO for inclusion in the department's IT Budget submission to the President's Budget (PB). The IT Budget is not in itself a separate budget; it is more of a report. The IT Budget submission reflects what dollars within the overall AF budget is dedicated to IT spending. SAF/CN provides specific AF guidance with its Budget Estimate Submission (BES) and PB Submission Guidance.

**15.8.  Modular Open System Approach (MOSA).** As required by 10 U.S.C. § 2446a, an ACAT I program that receives Milestone A or Milestone B approval after January 1, 2019 will be designed and developed, to the maximum extent practicable, with MOSA to enable incremental development and enhance competition, innovation, and interoperability.

15.8.1.  Key MOSA concepts.

15.8.1.1.  MOSA is an integrated business and technical strategy employing a modular design that:

15.8.1.1.1.  Uses major system interfaces between major system components or between major system platforms.

15.8.1.1.2.  Is subjected to verification to ensure major system interfaces comply with (if available and suitable) widely supported and consensus-based standards.

15.8.1.1.3.  Uses a system architecture that allows severable major system components at the appropriate level to be incrementally added, removed, or replaced throughout the life-cycle of a major system platform to afford opportunities for enhanced competition and innovation while yielding:

15.8.1.1.3.1.  Significant cost savings or avoidance.

15.8.1.1.3.2.  Schedule reduction.

15.8.1.1.3.3.  Opportunities for technical upgrades.

15.8.1.1.3.4.  Increased interoperability, including system of systems interoperability and mission integration.

15.8.1.1.3.5.  Other benefits during the sustainment phase of a major weapon system.

15.8.1.1.4.  Complies with the technical data IP rights set forth in 10 U.S.C. § 2320.

15.8.1.2. A major system platform is the highest-level structure of an ACAT I system that is not physically mounted or installed onto a higher-level structure and on which a major system component can be physically mounted or installed.

15.8.1.3. A major system component is a high-level subsystem or assembly, including hardware, software, or an integrated assembly of both, that can be mounted or installed on a major system platform through well-defined major system interfaces, and includes a subsystem or assembly that is likely to have additional capability requirements, is likely to change because of evolving technology or threat, is needed for interoperability, facilitates incremental deployment of capabilities, or is expected to be replaced by another major system component.

15.8.2. Tri-service memorandum entitled "Modular Open Systems Approaches for our Weapon Systems is a Warfighting Imperative" states that, since sharing information from machine to machine requires common standards, MOSA supporting standards should be included in all requirements, programming and development activities for future weapon system modifications and new start development programs to the maximum extent possible. Air Force Space Command memorandum entitled "UCI Planning and Implementation Guidance (TS//SCI//SAP), AFSPC/CC Memo, 7 April 2017 (U//FOUO), Space Battle Management, Command and Control (BMC2) Operational Prototype Program Endorsement," states that current and future space systems should implement the Universal Command and Control Interface (UCI) standard. SAF/AQ & AFMC/CC memorandum, "Use of Open Mission Systems/Universal Command and Control Interface" directs Open Mission Systems (OMS)/UCI inclusion in all programs expending 3600 funds and are either pre-Milestone A or are between Milestones A and B to the maximum extent practicable, as long as Open Mission Systems/Universal Command and Control Interface implementation does not cause an increase in 3600 funding of more than 15% over the Future Years Defense Program. That memorandum also directs Open Mission Systems/Universal Command and Control Interface inclusion in Rapid Prototyping efforts under Section 804 and Weapon System Component Prototyping efforts under Section 806. It also states that all milestone reviews, especially the Acquisition Strategy Panel, include documentation to show how Open Mission Systems/Universal Command and Control Interface will be used in the program. SAF/AQ memorandum, "Standardized Interface for USAF Air-to-Ground Weapons: Universal Armament Interface (UAI)" directs all acquisitions of air-to-ground weapons, aircraft employing these weapons, carriage systems, and associated missions planning systems implement UAI.  It also states that all milestone reviews, especially the Acquisition Strategy Panel, include documentation to show how UAI will be implemented in the program.  The UAI standard, supporting documents, and training will be coordinated through the UAI Program Office at **AFLCMC.WWX.UAIProgramOffice@us.af.mil**.   Finally, SAF/AQ memorandum, "Contracting for Verifiable Modular Open Systems Approaches for USAF Systems", states that all PEOs will utilize the following contracting structure where feasible:

15.8.2.1. Tie performance-based payments on development contracts to delivery of technical data with sufficient rights in that data to ensure sufficient modularity and openness to compete future system upgrades.

15.8.2.2.  Include in production contracts and award fee/incentive fee structure where the award/incentive is tied to verified contractor compliance with applicable MOSA standards.

15.8.2.3.  Include in production contracts a Contractor Logistics Support/sustainment option after initial system delivery. The period of performance of that option should overlap with the remaining production period so that the USAF can verify that the system architecture or interfaces meet MOSA enabling standards through a defined test, compliance approval process, or the demonstrated ability to compete the future follow-on sustainment.

15.8.2.4.  If the program office is unable to successfully verify compliance with applicable MOSA standards, any award/incentive fee would be forfeited and the contractor would be subject to future acceptance withholds, progress payment withholds, and revocation of acceptance.

15.8.3.  Specific guidance for implementing MOSA in CDDs, AS, and RFPs is provided in section 11.5 and **Tables 11.1** and **11.3**

15.8.4.  **Paragraphs 11.5.2.1**-**11.5.2.2** list the technical data program offices should acquire to implement MOSA. In order to achieve the benefits of MOSA for follow-on production or sustainment contracts, the program office should acquire Government Purpose Rights to the technical data described in **paragraphs 11.5.2.1** and at minimum Limited Rights to the technical data also described in **paragraph 11.5.2.1**

**15.9.  Integrated Testing.**  The PM implements an integrated testing program to ensure that test data and artifacts are used to satisfy multiple requirements. The program DT&E, OT&E, IA, Interoperability, and other required testing is integrated to share test events, reuse the data, and manage test conditions to ensure the applicability of test data fulfills different requirements. Some best practices to follow when developing test plans for IT solutions include:

15.9.1.  Component Build. The Component Build follows the DoDI 5000.02T activities. During Component Build (done one component at a time), the software components are built to provide the materiel solution. Organize, combine, validate, and regression test the software components to form the complete system. Organize and combine test materials to form a complete test package for component integration testing. Test the combined components and continue efforts to validate regression test conditions carried forward from earlier phases. Testing conducted during component build continues to test system performance, security, and interoperability capabilities. Test planning for certification continues for these three areas.

15.9.2.  System Build and Test. During the System Build and Test, verify that all components are integrated to function properly and the system has been integrated with the supporting infrastructure. Stub-test the system interfaces before entering the system integration test. Leverage the test materials used during Component Build Testing and any additional data needed to test system integration functions that would otherwise go untested, to the maximum extent possible. This test package consists primarily of transactions to test the functionality of the system, thus making comprehensive test results available for review and analysis by functional test personnel. Additionally, this same information is used to establish simulated operational conditions needed to test other functions (e.g., various types of

recovery), interoperability testing, and other capabilities that are dependent on activity being generated by the system. Through test automation, complete systems tests can be conducted and validated in a darkroom environment, thus making possible regression and compatibility testing at a level and within time constraints otherwise not attainable (e.g., technical compliance network order (TCNO) validation by using applications, application compatibility with infrastructure changes, regression testing of sustainment activity). In addition to the System Build and Test specified above, also accomplish initial interoperability testing. Prior to this time, stub testing was used to validate the system interfaces, however, testing at this point consists of the actual end-to-end interoperability test when feasible.

15.9.3. Performance Evaluation Test. The Performance Evaluation Test evaluates factors like response time and capacity. Stress the system by executing a real or simulated load and compare performance as the load varies. It is important to create tests that are repeatable under a variety of possible field configurations.

15.9.4. System Operability Test. Conduct the System Operability Test in a laboratory or a location isolated from the base network that is functionally equivalent and appropriately scaled to the target operational environment. If the operational test is conducted in an operational information environment or with live data, then the AF-DAA will have to provide an Interim Authorization to Test and Authority to Connect (ATC). If the IS has an appointed DAA or Lead DAA then the AF-DAA or authorized authorities based on MAC level provide the ATC in conjunction with the Interim Authority To Test (IATT). Certify security, interoperability, performance, and functionality. The testing conducted is as near as possible to actual operating conditions. Testing begins by validating the test environment (hardware and software), loading and installing the release, and performing other activities needed to ready the environment for testing. Conduct the systems test using essentially the same test materials as used for system integration testing. This is an automated test, with automated validation, and is intended primarily to support a realistic assessment of the system from a functional perspective. In addition, train functional personnel and provide hands-on time to test any functional conditions that remain outstanding and to build the confidence needed to support functional certification. Conduct integrated tests to support security, performance, and interoperability certification. Throughout the phase, identify and document defects, and return the system to the applicable phase for resolution. After correction, validate and regression test as part of their acceptance.

15.9.5. Operational Test & Evaluation (OT&E). OT&E determines system operational effectiveness and operational suitability, and the operational impacts of fielding or employing a system across the full spectrum of military operations. OT&E also looks at doctrine, operational concepts, system performance, procedures, tactics, training, organization, personnel, logistics support elements, intelligence support elements, and materiel issues. Conduct OT&E in a realistic operational environment under actual operating conditions with representative users supporting the test. This testing determines if operational requirements are satisfied, and assesses system impacts to peacetime and combat operations. OT&E identifies and helps resolve deficiencies as early as possible, identifies the need for enhancements, and looks at changes in system configuration altering system performance. The PM strives to structure early testing as much as possible to allow reuse of data and results for the next iteration of testing.

15.9.6. Memorandum of Agreement (MOA). An MOA is used when one government organization is supporting a second government organization. PMs should not make the mistake of believing that the supporting organization will voluntarily provide outstanding service. PMs should outline the specific performance requirements your program needs. Organizations like the Defense Systems Information Agency (DISA) have a catalog of services with typical price for the services they provide, but these catalogs can be tailored to meet your operational requirements. If your program uses the DoD infrastructure, the infrastructure is operated and maintained by DISA, and your program should develop an MOA to outline performance requirements. **Attachment 15** provides recommended steps PM should consider when working on a MOA with another government organization.

**15.10. Modifications.** Because weapon systems often are supported longer than the original design life initially considered, there are modifications, i.e., temporary and permanent, that PMs can submit within limits. Modification with a project cost of under $100 million can be certified and approved at the MAJCOM level. Modification of $100 million or more can be certified and approved at the HAF level. PMs will ensure that the modification effort does not commence until approval is obtained via a written decision memo. AF/A5R Requirements Development Guidebook, Volume 4 outlines the modification proposals using the AF Form 1067.

**15.11. Standardized Processes.** Programs explore grouping similar programs under standardized processes. This concept is explored for processes such as configuration management, systems engineering, risk management, etc. Small programs can benefit from standardized processes at the portfolio level and reduce documentation and process requirements.

15.11.1. Systems Engineering. PMs explore standardizing Systems Engineering processes within the organization by approaching the systems engineering technical and technical management processes in a consistent manner. Program supplements to the standard plans only address aspects unique to the program, such as integrated product team structure and membership and which stakeholders control the various configuration baselines (allocated, functional, or product.). The management "processes" and organizational suite of tools and methods are standard. Standardizing like systems allows for cost and time savings by utilizing standard tools and reducing documentation.

15.11.2. Configuration Management. The process by which a program maintains configuration control of its configuration items should be standardized. Two like systems will not have vastly differing ways of identifying configuration items, maintaining configuration control, conducting configuration reviews (e.g. CCBs), configuration databases, etc. Differences may arise due to the support strategy and the level of the baseline that the program controls (allocated, functional, etc. but this is implementation level activities not related to the standardized process.

15.11.3. Nuclear. Support and guidance for nuclear programs are found in the following Air Force Policy documents: AFI 91-101, *Air Force Nuclear Weapons Safety Program,* and AFI 63-125, *Nuclear Certification Program*.

**15.12. Information Technology Topics.** IT programs, as with all programs, are tailored to the maximum extent possible consistent with risk. This includes integrating processes and documentation to the maximum extent possible. Items of note specific to IT include: if the IT program is using the Major Capabilities Acquisition pathway, then it is an ACAT program; an IT program can be an ACAT program and a Defense Business System and; if the program is a

commodity buy, tech refresh, or sustainment activity it is managed according to the applicable laws, regulations, and policy concerning the specific activity. Guidance in this section is not mandatory guidance but lists considerations, best practices and direction while managing a program and is primarily geared toward IT programs that do not meet the ACAT I thresholds as specified in DoDI 5000.85. PMs will consider the type of system they are acquiring when applying best practices.  Guidance that applies to all IT programs can be found in DoDI 5000.82, *Acquisition of Information Technology.*

15.12.1. IT Sustainment. IT sustainment begins when the initial increment reaches the Full Deployment Decision. Programs in sustainment follow procedures outlined during development for the management of the program operations and support. This means that during development of the increment, the program office has to define their configuration management process, the deficiency reporting process, the patch process, the process to comply with security vulnerabilities, process to maintain the IA certifications, etc. Programs posture for the right mix of money to ensure they have the appropriate color of money to maintain capability versus investment funding to add capability. Defense Business Systems in sustainment need to conform to the DBC certification process. In addition, when the program modifies the system to add additional capability and utilizes investment funding they have to follow the procedures AFI 63-101/20-101 to ensure that modifications that add capability are managed in accordance with policy.

15.12.2. Clinger-Cohen Compliance (CCA). CCA compliance and reporting applies to the acquisition, management, operation, and closure of all AF IT investments, as well as to all programs that acquire IT. This includes NSS, Space and non-space weapon systems and IT systems acquisition programs, defense business systems, infrastructure, and intelligence systems. CCA compliance should be an ongoing concern throughout the life cycle of an IT investment or program acquiring IT. Depending on its type, a program should prepare and submit a CCA Compliance Table to confirm its compliance. The report or table should be submitted with documentation that supports the program's compliance with the 11 CCA compliance elements.  Additional information and assistance can be found in the Clinger-Cohen Act Implementation Guide and on the CCA Compliance SharePoint site at **https://cs2.eis.af.mil/sites/10774/default.aspx**.

15.12.3.  Unless otherwise stated below, all CCA submissions should be to the AF CIO CCA POC for review and confirmation. The guidelines for CCA reporting and approval are summarized in AFMAN 17-1402, *Clinger-Cohen Act (CCA) Compliance*.

15.12.4. CCA Compliance Table. The table is the CCA Compliance Table located in the Milestone          Document          Identification          (MDID)          tool [**https://www.dau.edu/mdid/pages/Default.aspx**] (The table contains a list of the 11 CCA compliance elements and a column for listing the source documents that demonstrate the program's compliance with CCA. Preparation instructions for the CCA Compliance Table are contained in AFMAN 17-1402.

15.12.4.1.  ACAT III defense business or financial systems business systems prepare and submit a CCA Compliance Table, with supporting documents, to confirm compliance with the AF CIO before all Authority to Proceed reviews, major contract awards, or NDAA certification and re-certification reviews.

15.12.5. Sustainment Programs providing no new capabilities are only required to be registered in ITIPS. If a sustainment program undergoes a modification to provide a new capability, it will submit a CCA Compliance Table for approval.

15.12.6. CCA Compliance Best Practices. Best Practices are listed below:

15.12.6.1. CCA reporting utilizes many documents prepared earlier in the program life cycle as proof of compliance. For example, these items include those listed in Table 9, such as the ICD, CDD, AoA, EA, ISP, Cybersecurity Strategy, APB, Acquisition Strategy, etc. If one of those documents are not available to prove compliance with a CCA element, a PM may utilize other documentation, actions, and or events fulfilling the intent of compliance with the CCA element. The item is a primary source document that is coordinated, approved, and official. For Defense Business Systems, AFMAN 17-1402 Attachment 2 provides an alternative table showing DBS program documentation that can be provided to support a CCA compliance submission.

15.12.6.2. The CCA compliance process can be accomplished concurrently with the coordination of other documents. For example, the PM may conduct the CCA compliance process if the ISP is in coordination at the AF level. Begin working with SAF/CN early to ensure that reporting expectations are communicated throughout the process.

15.12.6.3. It is recommended that the PM take into consideration the time required to obtain CCA confirmation of compliance when developing the project schedule, preparing program documentation, and approaching program milestones to ensure that obtaining CCA confirmation from the AF CIO's office does not negatively impact program schedules. PMs are encouraged to submit drafts of the CCA Compliance Table and supporting documentation to SAF/CN at least four months before the milestone review is scheduled to allow sufficient time for multiple review and revisions. Submissions may be made by e-mail or DoD SAFE to the SAF/CN.

15.12.6.4. Extra attention is given to scheduling preparation of documents directly supporting CCA compliance, such as the Cybersecurity Strategy and Information Support Plan (ISP). These two documents often take much longer to prepare than the four months allocated for a CCA compliance review, so an appropriate amount of time should be set aside ahead of time to ensure their completion before submission. Although the Cybersecurity Strategy may be submitted for review at the same time as the CCA Compliance Table, the ISP is submitted earlier as the ISP review process takes longer than the Cybersecurity Strategy or CCA compliance review process. Also, a program will be registered in ITIPS before the CCA Compliance Table is submitted for review. If a document is not available to prove compliance with a CCA element of the package, a PM may utilize other documentation, actions, and or events that fulfill the intent of compliance with the CCA element. The item is a primary source document that is coordinated, approved, and official.

15.12.7. Cybersecurity Implementation. Cybersecurity plays an important role is system engineering. It is an integral activity cohesive with acquisition, systems engineering reviews, DT/OT, and milestone entrance/exit criteria. Cybersecurity activities are integrated throughout the life cycle of the program. Cybersecurity expertise is represented on appropriate IPTs including the Integrated Test Team. Cybersecurity is implemented through the Risk Management Framework (RMF) documented in DoDI 8510.01.

15.12.7.1. Cybersecurity is a complex topic. PMs and their staff should remember that because of rapid changes in technology, it is difficult to have a comprehensive policy that addresses new threats in software and supply chain risk management. Vulnerabilities surface in systems on a daily basis. The current DoDI 8510.01 is based on the National Institute of Standards and Technology (NIST) Special Publication 800-53, *Security and Privacy Controls for Federal Information Systems and Organizations*. This publication is currently being revised because of the evolving threats that are faced with today's technology. Software assurance is an area where security controls are extremely weak. Software is the source of 80% of new vulnerabilities. Programs cannot trust that they are buying secure products. Software should undergo binary analysis; statistical analysis; dynamic analysis; fuzz testing; and origination software testing if want to have high confidence system products and components are safe. The Joint Federated Assurance Center has been very active in providing information on hardware assurance and software assurance, so consider using this resource. The Joint Federated Assurance Center has a list of on-going hardware initiatives and studies of software assurance tools that have been tested. Secure Development Operations (SecDevOps) is an agile software development practice that is recommended to build security into your software. Legacy weapon systems were tasked to comply with RMF with no solutions or funds provided to meet these requirements. The current strategy to building compliance in all weapon systems is to comply through a process of crawl, walk, and run. The easiest systems to address are new systems that are in the design stage. Operational systems that were designed with MOSA in mind are systems that can be modified with upgrades that comply with these design requirements. Legacy systems that cannot comply should develop overlays that document the mitigation steps a system will take to ensure resiliency of their system.

15.12.7.2. Supply chain risk management (SCRM) has always been part of the life cycle support plan. Legacy systems are most vulnerable to counterfeit parts. Even when working with known integrators, verification of the quality and performance of 50 years of parts is a serious challenge. Trusted Systems Networks is a concept that is gaining favor with system engineers to design and develop validated components as they design and test their system. Here are five recommendations that programs should consider as they begin the acquisition life cycle.

15.12.7.2.1. Review and agree on consistent standards that will be applied on the system, its components, and its communication interfaces.

15.12.7.2.2. Build supply chain security into contracting requirements.

15.12.7.2.3. Include supply chain security requirements into the program with regular audits of vendors and contractors.

15.12.7.2.4. Build a database of suppliers that meet or exceed the standards needed in your system and its components. Be mindful that new, validated components that satisfy your requirements may be introduced, but have a different catalog item number. Manufacturers of older parts may not production of key components. Only by reading technical articles of manufacturers that produce potential components can you be knowledgeable on this information.

15.12.7.2.5. In your contracts, stress the importance of corporate due diligence. Companies doing business with DoD are now required to comply with NIST 800-171, *Protecting Controlled Unclassified Information in Nonfederal Systems and Organizations* with a compliance date of 2022. There are still a number of unanswered implementation and verification questions, but banks and health organizations have had a process using certified independent test and verification companies. Banks are tested for compliance every six months. In the meantime, it is up to PMs to mandate compliance from their integrators.

15.12.8. Information Support Plan (ISP). An ISP is a technical document required for all Information Technology and National Security Systems (IT/NSS) exchanging information of any type to other systems (e.g. not a standalone system or application); this includes Commercial off-the-shelf (COTS) and Government off-the-shelf (GOTS) systems. The ISP provides a means to identify and resolve implementation issues related to an acquisition program's IT and NSS information infrastructure support and information interface requirements. It identifies IT and information (including intelligence) needs, dependencies, and interfaces for programs in all acquisition and non-acquisition categories, focusing on net-readiness, interoperability, information supportability, and information sufficiency concerns. The ISP documents the program's interoperability, data exchange, and support requirements, and it addresses the interoperability and supportability shortfalls for the program of record and proposes shortfall mitigation plans (as applicable). The ISP is the authoritative program technical document used by AF and Joint Staff levels to determine a program's eligibility for Interoperability and Supportability (I&S) Certification.

15.12.8.1. I&S Certification. I&S Certification is required for all IT and NSS, regardless of ACAT, with a goal of validating interoperability of all fielded systems. I&S assessment and certification of Net-Ready KPP compliance is granted after satisfactory Service-level and Joint review and approval. Establishing and maintaining Interoperability and Supportability in a DoD system is a continuous process managed throughout the life cycle of the system. The ISP is the vehicle facilitating this effort.

15.12.8.2. Fielded Systems/Legacy System Modifications. Fielded Systems exchanging information of any type with other systems (e.g. not a stand-alone system or application) that did not develop an ISP or a Command, Control, Communications, and Computers Intelligence Support Plan (C4ISP) during the acquisition phase are required to develop a system level ISP if they undergo a major modification or change. A major modification occurs when any of the following criteria are met: initiating a changed/new capability to exchange information or data when the modification exceeds 10% of ACAT II minimum thresholds, $14 Million RDT&E or $66 million Procurement in FY 2000 dollars or when the modification results in a change to the JCIDS documents or when the Net-Ready (Interoperability) KPP is changed or a new one developed. This includes any changes to the internal or external data exchange interfaces.

15.12.8.3. Architectural Views. Architecture data is portrayed in various architectural views within the Information Support Plan. The architectural views within an ISP are driven by the JCIDS requirement for an NR-KPP as described in CJCSI 6212.01. The data is used to complete the program analysis and to develop operational test quality data. The list of required architectural viewpoints is outlined in **Table 15.1** Analysis of the qualitative and quantitative sufficiency of C4ISP support (e.g., hardware, software,

processes, etc.) is accomplished in terms of the operational/functional capabilities being enabled. The ISP architecture views required for use in the Analysis section of the ISP are reflected in Figure 11.1 of the Interoperability Process Guide on page 40  (**https://nit-jitc.nit.disa.mil/isg/downloads/IPG_Version_2.pdf**).

**Table 15.1.  Required Architecture Data by Document.**

| Viewpoint | Description |
|---|---|
| *REQUIRED* **Architecture Viewpoints for Joint Interoperability Certification** | |
| | |
| AV-1 | "Executive Summary" of the architecture. It will describe the Purpose, Scope, Perspective, etc. of the effort. It is not precisely tied to the architecture's data elements, as are the other views. |
| AV-2 | Data Dictionary. Purpose is to expand on the brief description of data elements used throughout the architecture. |
| OV-1 | A graphical depiction of what the architecture is about and an idea of the performers and operations involved. |
| OV-2 | Describes the Operational Performers within the scope of the architecture, and their need to communicate. |
| OV-3 | Resource exchange between the Operational Performers. |
| OV-5b | Describes the Operational Activities within the scope of the architecture, the Operational Resources those Activities require, and what Operational Resources are created by the Activities. |
| OV-6c | Provides a time-ordered examination of the Resource Flows as a result of a particular scenario. |
| SV-1 | Addresses the composition and interaction of System Performers. The SV-1 links together the operational and systems architecture models. |
| SV-2 | Describes the precise specification of physical connections between systems. In network-centric environments, this will also describe the networks utilized by the systems. |
| SV-5a | Maps system functions (activities) to operational activities. |
| SV-6 | Definition of the Resource exchanges between the System Performers. The SV-6 specifies the characteristics of the System Resource Flows with emphasis on resources crossing the system boundary. |
| SV-7 | Set of system performance parameters (measures). |

| StdV-1 | **Standards Profile - list of implemented technical standards, rules, and guidelines.**<br><br>*Note: If implemented standards appear in the StdV-2 and not the StdV-1 (e.g., as some have done for emerging standards that are currently implemented), then this information is also required.* |
|---|---|
| *CONDITIONAL* **Architecture Viewpoints for Joint Interoperability Certification**<br><br>**Note:  PMO/Sponsor needs to coordinate with their JITC AO**<br><br>**when determining requirements for service viewpoints** | |
| DIV-2 | **Logical Data Model. Documentation of the data requirements and structural business process (activity) rules.** *CONDITION: REQUIRED when critical Operational Resources are not clearly defined in the StdV-1, or when a standard Resource is used in a non-standard way.* |
| DIV-3 | **Physical Data Model. Physical implementation format of the Logical Data Model entities, e.g., message formats, file structures, physical schema.**<br><br>*CONDITION: REQUIRED when critical System Resources are not clearly defined in the StdV-1, or when a standard Resource is used in a non-standard way.* |
| SvcV-1 | **Services Context Description – identifies services and their interconnections.**<br><br>*CONDITION: REQUIRED when a system produces or consumes services or information stored in a shared space.* |
| SvcV-2 | **Specifies resource flows exchanged between services, and may list protocol stacks.**<br><br>*CONDITION: REQUIRED when a system produces or consumes services or information stored in a shared space.* |
| SvcV-4 | **Depicts allocation of service functions and data flows between service functions (activities).** *CONDITION: REQUIRED when a system produces or consumes services or information stored in a shared space.* |
| SvcV-5 | **Maps services (activities) to operational activities.**<br><br>*CONDITION: REQUIRED when a system produces or consumes services or information stored in a shared space.* |
| SvcV-6 | **Maps service data exchanges with associated measures and metrics.**<br><br>*CONDITION: REQUIRED when a system produces or consumes services or information stored in a shared space.* |
| SvcV-7 | **Complete set of performance parameters (measures) of the services.**<br><br>*CONDITION: REQUIRED when a system produces or consumes services or information stored in a shared space.* |

15.12.8.4. The ISP will be developed within the GIG Technical Guidance Federation (GTG-F) using the Enhanced Information Support Plan (EISP) Enterprise Service Version template. The GTG-F is an integrated ISP development, staffing, analysis, approval and archiving environment used by DoD and Joint commands. The CAC-enabled GTG-F homepage is located at **https://gtg.csd.disa.mil/**. The GTG-F supports unclassified ISPs. Contact SAF/CNZA Interoperability SMEs for guidance on development of classified ISPs.

15.12.8.5. ISPs are approved after formal assessment through the GTG-F review process. The formal review process are repeated for each major decision point in the acquisition lifecycle. Additional reviews may be required when programs have unique reporting requirements based on interoperability concerns raised by assessor organizations to the Air Force Interoperability Certification Manager. Specific guidance and instructions for ISP development, staffing and approval are provided in the Air Force Interoperability and Supportability SharePoint Site (**https://cs2.eis.af.mil/sites/13157/default.aspx**).

15.12.8.6. An ISP waiver may be granted on a case-by-case basis for Air Force unique programs with Commercial Off-the-Shelf solutions that have minimal or manual data exchange requirements and for programs with system data that is not exchanged via the DoD Information Network. To request a waiver, the PM should complete the waiver package (**https://nit-jitc.nit.disa.mil/projects/isgsite/testwaiver.aspx**) and submit to the Air Force Interoperability Certification Manager.

15.12.9. Records Management. If an IT investment has data used in the business of the Air Force, the data is generally considered to be records. Records created and received in the Air Force are Federal records, which are required by law to have a legally approved disposition schedule, that is, a plan approved by the National Archives and Records Administration (NARA) on what will be done with the records when the records no longer have business value. Data in an Air Force IT investment is managed and disposed in accordance with its National Archives-approved records disposition, which can be found in the Air Force Records Disposition Schedule (RDS) in the Air Force Records Information Management System (AFRIMS) and the National Archives General Records Schedules (GRS). Standalone IT investments not connected to the network, classified systems, and National Security Systems are not automatically exempt from the scheduling requirement. IT infrastructure and pure IT initiatives are exempt. To show an IT investment is compliant with records management, properly schedule the data in the IT investment with a National Archives-approved records disposition and address the questions in Title 36 Code of Federal Regulation Part 1236, Electronic Records Management. If the IT investment is registered in the Information Technology Investment Portfolio Suite (ITIPS), address the questions in the Records Management tab for the IT investment. For an IT investment with records data and which will not be registered in Information Technology Investment Portfolio Suite, address the questions on AF Form 1341, Electronic Record Inventory; guidance for preparing the form is located on the Air Force Records Management Community of Practice website. In both cases, Records Professionals will validate the responses. After consulting with a records professional, if an applicable disposition cannot be located (one or more "Table and Rule" from the Air Force Records Disposition Schedule or a "General Record Schedule Item" from the National Archives General Records Schedules), propose a records retention schedule by completing and coordinating an Air Force Form 525, Records Disposition Recommendation,

in accordance with Chapter 3 of Air Force Instruction 33-322, Records Management and Information Governance Program.  Integrate records management considerations throughout the life cycle of the IT investment and not as an afterthought.

15.12.9.1. Milestone A. Before the Technology Maturation and Risk Reduction Phase, submit basic information (survey of the data and system characteristics) about the IT investment either (1) during the Registration of the IT investment in Information Technology Investment Portfolio Suite (ITIPS) and during Open status in ITIPS in the Records Management tab or (2) on the Air Force Form 1341 if the IT investment is not being registered in ITIPS.  Begin to identify the types of data (records) to be captured in the IT investment and to evaluate the estimated time of business usefulness of the data to the Air Force, for example, 6 months, 3 years, 7 years, 30 years, 75 years, permanent (to accessioned to the National Archives), etc., and to determine how to dispose the data at the end of the retention period.

15.12.9.2. Milestone B. Before the Engineering and Manufacturing Development Phase, finalize the responses to the records management questions in either ITIPS or the Air Force Form 1341.  Confirms the types of data (records) collected.  If an applicable Table and Rule or General Records Schedule Item cannot be found with the assistance of a records professional, complete and coordinate the Air Force Form 525 to propose a retention time.

15.12.9.3. Milestone C. Before the Production and Deployment Phase, submit either the records management responses in ITIPS or the Air Force Form 1341 to Air Force records professionals.  If needed, submit the Air Force Form 525 to the Air Force Records Office via the Air Force Records Management hierarchy (Base Records Manager, Command Records Manager or Agency Records Manager). Record managers should factor one year before the operational date of the IT investment to ensure time for the National Archives to approve the proposed records disposition schedule for the data in the IT investment. If the IT investment has personally identifiable information (PII) and requires a Privacy Act System of Records Notice (SORN) and/or a Privacy Impact Assessment (PIA - Department of Defense Form 2930), the records retention cited in those privacy documents ("Retention and disposal" section of the SORN, question l in Section 1 of the PIA) should be consistent with the records retention cited in ITIPS, the Air Force Form 1341 or, Air Force Form 525. Reference Air Force Instruction 33-332, *Air Force Privacy and Civil Liberties Program.*

15.12.9.4. Operations and Support Phase. The Air Force Records Office has approved the records management responses for the IT investment in ITIPS or the Air Force Form 1341 prior to the operational date of the IT investment.  The National Archives has approved the proposed records retention submitted initially on the Air Force Form 525.

15.12.9.5. Sustainment.  Manage the data in the IT investment in accordance with Air Force Instruction 33-322 and dispose the data in accordance with its National Archives-approved records disposition schedule.  Update the responses to the records management questions in ITIPS to maintain currency.  Complete and coordinate an updated Air Force Form 525 if there is a change to the approved records retention time due to business needs.

15.12.9.6. Disposal/Decommission. While the hardware and software of the IT investment may readily be disposed, the same is not necessarily true for the data within the IT investment. The data is disposed in accordance with its National Archives-approved disposition. Activities that occur include:

15.12.9.6.1. If the data from the decommissioned IT investment is being transferred in whole to a succeeding IT investment, describe the succeeding IT investment when archiving the IT investment in ITIPS.  If the IT investment is not registered in ITIPS, provides an addendum to the approved Air Force Form 1341 with information on what is the succeeding IT investment to the Air Force Records Office.

15.12.9.6.2. If the data from the decommissioned IT investment is not being transferred in whole to a succeeding IT investment, the data is kept on a storage media (for example, portable hard drive, disk, cloud) until the data completes the time of the National Archives-approved records disposition.  If the data has a temporary disposition (that is, a retention ending after a period of time), the Air Force is responsible for ensuring the  accessibility of the data due to evolving computing and storage technologies (for example, storing the data in a flat file).  If the data has a permanent retention, transfer the data to the National Archives and Records Administration (NARA) in accordance with the National Archives-approved records disposition. Just because the IT investment is being decommissioned does not alleviate the Air Force from its responsibility to provide data due to Freedom of Information Act (FOIA) requests, litigation holds, and electronic discovery (for example. Legal e-Discovery).

15.12.9.6.3. Data in a decommissioned IT investment that is not preserved and disposed in accordance with the National Archives-approved records disposition are considered to be lost records.  Complete the lost records report per paragraph 6.1.6.2 of Air Force Instruction 33-322, which is required by Title 44 United States Code Section 3106 and Title 36 Code of Federal Regulation Part 1230, Unlawful or Accidental Removal, Defacing, Alteration, or Destruction of Records, The Air Force Records Office will provide the report on the unauthorized disposition of Federal records to the National Archives and Records Administration.

15.12.9.6.4.  Archive System in ITIPS.

15.12.10. Privacy. The PM ensures cybersecurity controls are implemented to protect personally identifiable information (PII). The PM also ensures a Privacy Impact Assessments (PIA) was approved on IT Systems that maintain, use, store, and/or disseminate PII and a System of Records Notices (SORN) is published in the federal register when information in retrieved by an individual's name, SSN, or a unique identifier for a system to be in compliance with the E-Government and Privacy Act.

15.12.10.1. SSN Usage. The PM submits a Memorandum of Justification signed by the first Senior Executive Staff (SES) or General Officer (GO) address to DoD Privacy Office for approval prior to any collection of SSN in accordance with AFI 33-332, *The Air Force Privacy and Civil Liberties Program.*

15.12.10.2.  General Public. The PM ensures all forms uploaded into the IT system have an approved OMB Control Number when collecting personal information on ten or more

in the general public within a 12 month period. The OMB Control Number is required to be annotated in the PIA. Refer to DoD 8910.1-M, *Department of Defense Procedures for Management of Information Requirements*, for definition of general public and guidance of OMB Control Number.

15.12.10.3.  Privacy Impact Assessments (PIA).

15.12.10.3.1.  PM submits PIA to their privacy officer for review and signature.

15.12.10.3.2.  PM's privacy officer forwards PIA to the AF Privacy Officer at **usaf.pentagon.saf-cn.mbx.af-privacy@mail.mil** to obtain AF IA and CIO signature.

15.12.10.3.3.  AF Privacy Officer forwards approved PIA to PM, privacy officer and a copy to DoD CIO on IT systems collecting information on the General Public.

15.12.10.3.4.  AF Privacy Officer updates PIA information in ITIPS.

15.12.10.3.5.  AF Privacy Officer posts approved PIA on the AF Privacy public website **http://www.privacy.af.mil/**.

15.12.10.3.6.  PM reviews PIA(s) 90 days prior to the expiration date of the systems' Authority to Operate (ATO); sends updated PIA(s) to **usaf.pentagon.saf-cn.mbx.af-privacy@mail.mil**.

15.12.10.3.7.  PM notifies the AF Privacy Officer via **usaf.pentagon.saf-cn.mbx.af-privacy@mail.mil** when the system is being decommissioned to removed PIA from the AF Privacy public website.

15.12.10.4.  System of Records Notices (SORN).

15.12.10.4.1.  PM researches the Defense Privacy Notice websites for an existing SORN supporting the IT system prior to adding a new SORN.

15.12.10.4.2.  PM forwards SORN to their privacy officer for review.

15.12.10.4.3.  MAJCOM privacy officer forwards SORN to the AF Privacy Officer via **usaf.pentagon.saf-cn.mbx.af-privacy@mail.mil**.

15.12.10.4.4.  AF Privacy Officer forwards SORN to the DoD Privacy Office for review and submission to the Federal Register office for publishing.

15.12.10.4.5.  DoD Privacy Office notifies the AF Privacy Officer when the SORN has been published to the Federal Register.

15.12.10.4.6.  AF Privacy Officer notifies the MAJCOM Privacy Officer when the SORN has been published.

15.12.10.4.7.  AF Privacy Officer updates ITIPS.

15.12.10.4.8.  PM reviews SORN(s) 90 days prior to expiration of the systems ATO.

15.12.10.5.  Activities at Milestone A (or approximately 25% Solution) include:

15.12.10.5.1.  Identifying types of PII data being collected identified.

15.12.10.5.2.  Drafting PIA/SORN.

15.12.10.6.  Activities at Milestone B (or approximately 85% Solution) include:

15.12.10.6.1.  PIA/SORN submitted for approval (SSN Justification Memo submitted if required).

15.12.10.6.2.  Privacy question in ITIPS answered as applicable.

15.12.10.7.  Activities at Milestone C (or approximately 95% Solution).

15.12.10.7.1.  PIA/SORN approved.

15.12.10.7.2.  Privacy question in ITIPS completed.

15.12.10.8.  At Full Rate Production/Deployment (100% Solution) the program is privacy compliant.

15.12.10.9. Disposal/Decommission. Data that is PII and is retrieved from the decommissioned IT system by name or personal identifier requires an amendment or deletion to its Privacy Act System of Records Notice per paragraph C6.5 of DoD 5400.11-R, *Department of Defense Privacy Program*. The PM works with the privacy officer on the SORN.

15.12.10.10.  Archive System in ITIPS.

15.12.11.  Centers of Excellence/Resources.

15.12.11.1.  Software Engineering Institute COTS Integration. In support of IT programs, the PM should consider the use of the Software Engineering Institute (SEI) developed Evolutionary Process for Integrating COTS-Based Systems (EPIC). EPIC has been used successfully in both the AF and the commercial world and currently represents a best practice for COTS or GOTS based programs. EPIC is a structured, disciplined process that is highly tailorable depending on the project. It sets forth descriptions of the various phases of activities, specific exit criteria, phase activities, and supporting activities. It still requires judgment to affect tailoring, but the combination of phase descriptions, exit criteria, phase and supporting activities enables a PM to arrive at a reasonable conclusion as to which activities need to be accomplished in depth and which activities can be streamlined. Additional information can be found at: **https://resources.sei.cmu.edu/library/asset-view.cfm?assetid=6093**.

15.12.11.2. Air Force Network Integration Center (AFNIC) is the AF's Certification Authority within the Air Force Certification and Accreditation Program (AFCAP). AFNIC also provides a one-stop-shop for AF-level IA policy. The newest addition, AF Certification and Accreditation Program (AFCAP) Primer, provides a good overview of the AFCAP which is beneficial to anyone attempting to learn the C&A process from the bottom up.

**15.13.  Space Systems.**  PMs should consider the following best practices for the type of system they are acquiring. This is not mandatory guidance but lists considerations, best practices and direction while managing a program.

15.13.1. Independent Program Assessment (IPA). The primary purpose of the IPA is to provide independent, objective advice to the MDA about the readiness of the program to proceed into the next phase of acquisition. The IPA was created as "the type of high-level review and analysis that the DoD Space MDA would do personally if time were available." An IPA consists of a review of the program's plans for entering the next acquisition phase

(and the rest of the life cycle), assessing the risks associated with those plans, and providing recommendations for improving those plans. The IPA Lead completes the assessment by delivering the IPA briefing to the MDA. Following this, the MDA should make decisions at or after the Defense Acquisition Board (DAB) or other assessment review meetings, and documents decisions in the ADM for the program.

15.13.1.1. IPA Scope. IPAs focus on an integrated view of the entire program, i.e., not only on the technical aspects of the program(s), but include all of the programmatic (i.e. cost, schedule, etc.) considerations crucial to measuring program success and improving program execution. IPAs can be expanded in scope to review, not only the individual program, but also provide an additional integrated review of a DoD capability it supports. This technique can be instrumental in highlighting the lack of synchronization on several multi-Service ACAT I programs and provide synthesized, corrective-action recommendations to assure an improved delivery of capability to the warfighter.

15.13.1.2. IPA Scheduling and Funding.

15.13.1.2.1. Conducted over a course of three to four weeks

15.13.1.2.2. Begins about two months prior to each milestone

15.13.1.2.3. Fully funded by the SPO, yet is wholly independent of their influence

15.13.1.3. IPA Team and Support.

15.13.1.3.1. The Milestone and IPA process begins when the PM requests, through acquisition channels, a milestone date from the MDA. The MDA establishes the milestone date and appoints an IPA Lead.

15.13.1.3.2. The IPA Lead may be a government employee, who does not have a conflict of interest associated with the program. The IPA Lead is normally a retired flag officer or civilian equivalent, who has been a PM of a space-related program.

15.13.1.3.3. The IPA Lead selects the IPA team members. To avoid conflict of interest and to maintain independence, the IPA Lead and IPA team members cannot be drawn from the staff of the PM. Best practice over the last five years has been the use of retired military members or civilian executives from defense contractors with broad program execution experience, as core members of the IPA team. Typically, six or seven of the 20 team members are from this group. The remaining team members are government and Federally Funded Research and Development Centers (FFRDC) subject matter experts.

15.13.1.4. IPA Criteria consist of well-defined assessment criteria and optional questions for the PM to use in preparing for the IPA and for the use of the IPA team in making their assessments, findings, and recommendations. Future assessment should be structured around the Acquisition Strategy outlines. In addition, the MDA may choose to add special emphasis criteria before the review, to target areas of particular concern or interest. Based upon lessons learned from many past IPAs, Aerospace Corporation has prepared an IPA and Milestone Evaluation Guide (Aerospace Report TOR-2011(8591)-6, available to government employees by request through the Director, SMC ACE).

15.13.1.5. IPA Key Values.

15.13.1.5.1.  Independence with no political influence

15.13.1.5.2. Consistent criteria for every review (including requirements, architecture, acquisition strategy, schedule, risk, technology maturity, systems engineering, cost, resource management, program protection, test and evaluation, data management, sustainment, and others as directed by the MDA)

15.13.1.5.3.  Integration across all aspects of the program or capability

15.13.1.5.4.  Identification of risk

15.13.1.5.5.  Corrective recommendations to accompany every negative finding

15.13.1.5.6.  IPA Lead/team coaching/mentoring of the PM and staff

15.13.1.5.7.  Consistency of IPA team members from one IPA to the next on the same program

15.13.1.6.  Program Office Support to IPA

15.13.1.6.1. PM provides documentation addressing legal and regulatory requirements

15.13.1.6.2. PM provides locally generated plans and documents which support the program's activities for the next acquisition phase and future phases

15.13.1.6.3. PM provides briefings on subjects, grouped into assessment areas. Briefings should be interactive with IPA members

15.13.1.6.4. Assessment areas are consistent with content of the AS and address the following areas; Acquisition Approach (including Top-Level Strategy), Source Documentation (including past direction and Congressional input), Capability Need (including AoA, Preferred Alternative, Enabling Concept, and Technical Requirements Document), Top-Level Integrated Schedule (including IMS), Interdependency and Interoperability (including Architectures), Risk and Risk Management, Technology Maturation, System Engineering Approach (including SEP and PESHE), Industrial Capability and Manufacturing Readiness, Business Strategy, Resource Management (including program office staffing, Cost drivers, POE/SCP, FYDP, and EVM), Program Protection Planning (including CPI, PPP, and IA Strategy), Test and Evaluation (Developmental and Operational), Data Management Strategy, Life Cycle Sustainment Plan, Clinger-Cohen Act, Other, and Recommendations.

15.13.1.6.5. Assessment areas and the scope, content, and agenda of the IPA can be tailored to the needs of the IPA Lead and team

15.13.1.7. Final Recommendation. The IPA Lead is responsible for the final recommendations to the MDA and also provides recommendations to the PM.

15.13.1.7.1. The IPA Lead takes input from all IPA team members and summarizes the key risks, findings, and recommendations in the briefing. For each finding, the team provides a backup slide which describes the finding, observations and relevant facts, recommendation(s), and an OPR if possible.

15.13.1.7.2. The IPA Lead gives frequent opportunities during the three to four weeks of face-to-face meetings, for the PM to provide additional facts and documentation and for the PM to challenge the IPA findings and recommendations.

15.13.1.7.3. The IPA briefing is not intended as a stand-alone briefing; it is developed as a companion briefing to accompany the Program milestone briefing. The Program Office is encouraged to prepare and present a response to the IPA for presentation at the milestone meeting.

**15.14. Small business.** PMs should not overlook using small businesses to support their program requirements. Small businesses have on-going programs that can be beneficial to your program. Small businesses often specialize in specific areas that support your program. They can be creative in their approach that may seem risky to a larger company. They want to establish a close client relationship to invest in their future growth and add their past performance resume.

## Chapter 16

## PROGRAM STRUCTURE

**16.1.  Increments.**  The decision on how to structure a program's increments must rely on robust and frequent interchanges with the full range of stakeholders including the oversight authority. The following section offers some thoughts for consideration as the team, including the users and testers, discusses the desired length, content and scope of each increment.

16.1.1. Increment Length. When building an evolutionary acquisition strategy, project leaders decide how long to make each increment. Long increments have a few benefits, including less frequent milestones, and less frequent CDD updates. However, long increments are also harder to scope, cost and test. They have a higher risk of Nunn-McCurdy breach, make it harder to add new requirements, face an increased technology maturity risk and require more time to achieve IOC. In addition, long increments do not get products to the customer in a reasonable timeframe to meet outcome expectations.

16.1.1.1.  Short increments basically provide the inverse. They are easier to scope, cost and test, and are less likely to experience a Nunn-McCurdy breach. With a series of short increments, it is easier to integrate mature technologies and new capabilities into subsequent increments. Shorter increments also mean capabilities are fielded more frequently. The drawback of course is more frequent milestones and CDD updates. However, short increments will likely be ACAT II or III with less oversight, more streamlining, and more delegations.

16.1.1.2.  As a general rule, increments should be as short as possible, because the objective of evolutionary acquisition is to provide improved capabilities on a short timeline. However, each increment should be sufficiently long to deliver a meaningful capability boost over the previous increment.

16.1.2.  Increment Considerations. The Fiscal Year 2009 National Defense Authorization Act added a new section to Title 10 (section 2430a) that permits the Secretary of Defense (delegated to the Under Secretary of Defense for A&S) to designate subprograms within a MDAP. That is, when an MDAP requires the delivery of two or more categories of end items that differ significantly in form and function, subprograms may be established for baseline development and reporting purposes. The law stipulates that when one subprogram is designated within an MDAP, all remaining elements (increments or components) of the program should also be appropriately organized into one or more other subprograms. Project leaders should consider the following factors when structuring a program into increments:

16.1.2.1.  The ability to manage the effort, including manpower resources (e.g. cost estimators). Based upon many factors such as industrial capacity, complexity, manning of both Government and contractor personnel and needed skill sets; consider dividing the requirements into a manageable increment structure.

16.1.2.2.  Ability to deliver capabilities faster. Each increment has its own delivery date; consciously breaking up delivery into discernible time-phased segments.

16.1.2.3. Fleet or system downtime. Consider how to more efficiently introduce a new capability while allowing maximum operational capability. Consider an incremental approach that minimizes s/w or h/w retrofit that will impact system or fleet availability.

16.1.2.4. Definable unique capability. Each increment should provide a unique, definable, producible, sustainable, and testable capability. These capabilities should be documented in a new or updated CDD, CPD, or AF Form 1067 to include objectives, thresholds and a set of KPPs, as required. Since a program increment provides a military useful capability and satisfies particular operational requirements, with no guarantee that future increments should be funded, products are subjected to rigorous developmental and operational test requirements.

16.1.2.5. Ability to integrate increments/Interrelationships among the increments. When considering integration risk, all increments will need to integrate and be operationally compatible with each other and have no negative impact to the operational use of other increments if any one increment is cancelled. Consider access to ICDs and potential proprietary data of the parent system and other incremental "siblings" under parallel development. Each increment may have its own KPPs or play a role in satisfying one or more KPPs. To form a new increment of militarily useful capability, requirements should be traceable to a CDD/CPD that relates requirements (especially KPPs) to increments.

16.1.2.6. Sequential vs. Parallel Development - program dependencies on existing efforts or efforts under consideration. Consider the degree to which increments should be developed in parallel, based on how the capability developed in any one increment affects the development of the other increment(s), easing integration. Consider any efforts outside of a program that affect the development of the program's increments and how the effort affects the timing and sequential or parallel nature of a program's increments. Sequential and Parallel efforts should be portrayed on the Integrated Master Schedule showing relationships and dependencies impacting program execution.

16.1.2.7. Milestone documentation and reviews (amount of documentation, number of reviews, and compliance). Breaking a program into a series of increments requires each increment to have its own APB, CDD, and other documents, or be parts/annexes of overarching program documents. The PM should evaluate whether or not an overarching CDD or an individual CDD covers the program. Each increment should have its own milestone, technical, and test reviews, and be subject to individual compliance standards.

16.1.2.8. Cost. Each increment takes into account the total life cycle cost. Consider affordability, current budgetary constraints, and funding uncertainty. Fiscal discipline and transparency of estimates will contribute to increment success.

16.1.2.9. Significant changes in configuration or capability. Consider increments if a new capability (updated technology) would result in significant configuration changes. Design increments to optimize configuration control and minimize impact to users. If an increment creates a new system configuration that increment should include funding to retrofit previous configurations, or the funding that requested to fund a retrofit are explicitly identified.

16.1.2.10. Budgetary constraints. Cost in any one increment impacts the development of all increments. FYDP resources at the program level require the practice of strong fiscal

discipline to ensure increments remain viable as planned; as any increment whose resources suffer due to cost issues in other increments should require rationale for continuation.

16.1.2.11.  Exposure to cost, schedule, performance, and budget risk. The PM ensures the user fully understands the cost/schedule/performance risks associated with the proposed increment structure. The sponsoring MAJCOM considers the degree to which the AF Corporate Structure would be willing to risk AF total obligation authority when scoping the increments with respect to total funding required, duration of investment commitment before IOC, and probability of program success.

16.1.2.12.  ACAT Level/Oversight. Breaking into increments may drive separate ACAT levels, MDA, and oversight based on each increment's size, interest, and place within the overarching program. The amount of visibility to Air Staff, OSD, & Congress may change based on the increment structure.

16.1.2.13.  Acquisition Strategy (competition, data access, OEM limitations, maximum allowable length of contracts). Increments have a significant interplay with acquisition strategy and contracts. Competition is required prior to MS B (e.g. competitive prototyping). Additional competition is desired throughout the life-cycle, possibly for each increment depending on the program's acquisition strategy. Data access and data rights are critical if each increment is, or could possibly be, developed by separate contractors. This will add cost to each increment. OEM limitations could drive the length of the contracts and competition. Maximum allowable length of contract could be driven by external conditions and could drive (perhaps limit) increment scope.

16.1.2.14.  Severable Increments. The capability of each increment should be complete and not be dependent on future or parallel increments.

16.1.2.15.  Systems Engineering. As a basis, there needs to be a flow down of requirements from a System of Systems (or Enterprise) architecture (and CONOPS/Enabling Concept of Operations) to System requirements and CONOPS, and on to lower-level requirements and CONOPS. In this flow down process and analysis of the trade-offs between various factors (such as requirements, CONOPS, technology maturity, design challenges, schedule, cost, etc.), consider how potential separate increments (either sequential or in parallel) contribute to better solutions to the capability.

16.1.2.16.  Increment Development & Production Timing. A large gap in production may result in the need for significant investment to re-establish or retool and may drive an evolutionary strategy.

16.1.2.17.  Amount of Non-Recurring Engineering (NRE). If the scope of the overall NRE effort (in terms of cost and schedule) is significant, a separate increment should be considered in order to provide a high confidence program with a manageable scope of control.

16.1.2.18.  User Delivery Needs. Consider user timing and needs when determining evolutionary strategy.

16.1.2.19.  Level of Risk within the Program. Examine individual program risks and consider how breaking out these risks into increments would improve the opportunity to

perform risk burn-down activities as early as possible. Examine the combined risks in each increment and consider the overall risk to successful integration and execution of each increment. Include manufacturing readiness (to include DMS Issues) and producibility in these risk assessments. Explicitly consider technology maturity. When structuring program increments, the maturity level of the associated technology is a factor. If technology for a planned increment is not TRL 6 or higher, MS B success is highly unlikely. Technology maturation for future increments is a consideration in increment identification.

16.1.2.20.  Requirements Maturity. When a desired capability is identified but not all end state requirements are well refined, then those less-refined requirements should be candidates for future increments. Refinement occurs through demonstration and risk management with continuous user feedback ensuring each increment provides the user with the best possible high confidence capability.

16.1.2.21. Maintenance & Sustainability. Consider sustainment impacts in increment identification, to include: Compliance with Core and 50/50 requirements; Partnering for depot maintenance; Impacts on product support; Impact to Operational Maintenance; Other 'ilities'.

16.1.3.  Increment Scope. There are many ways to align related increments to programs. In an ideal world, it might be preferred for each increment to be its own short, small program. When the program/increment is completed, it would then end and further efforts that were not part of the original increment plan would be initiated as new programs.

16.1.3.1.  However, in actual practice multiple increments are often merged into a single program, as depicted in **Figure 16.1** In this scenario, as new content is added to existing programs via additional increments, the risk of Nunn-McCurdy breach rises.

**Figure 16.1.  Merged Increments to Single Program.**

Increment 1

Increment 2

Increment 3

**Increment A**

Increment 4

Increment 5
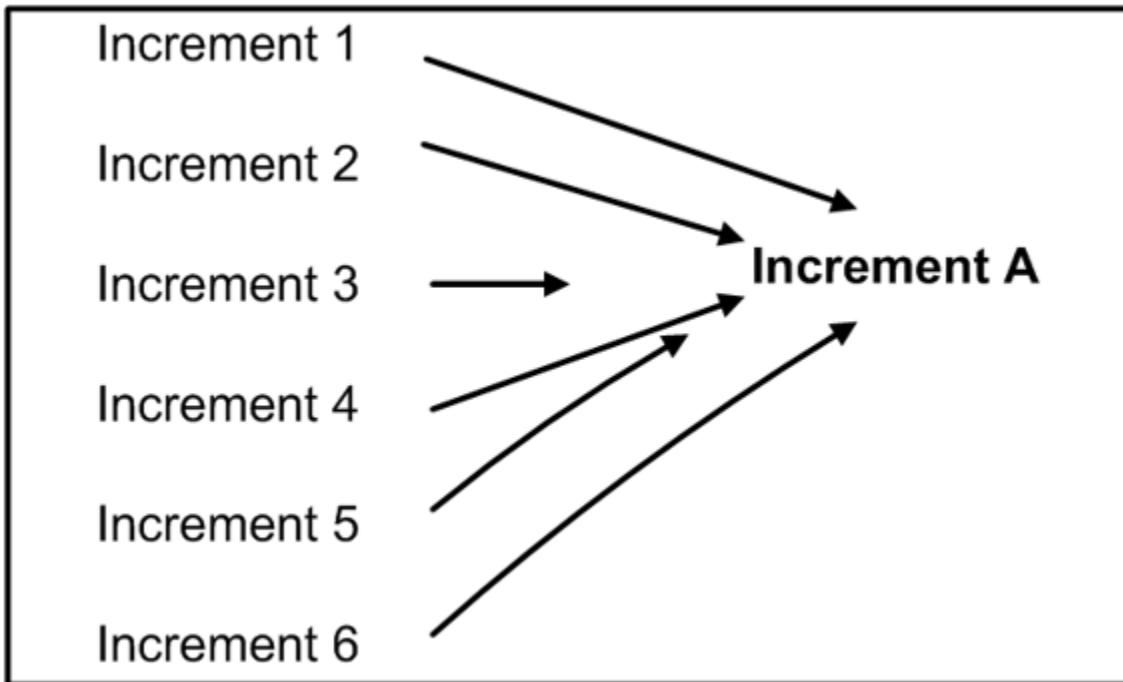
Increment 6

16.1.3.2. **Figure 16.2** illustrates the clearest delineation of increments and programs. However, MDAP rules do not permit this structure, as an MDAP includes all planned increments in the program.

**Figure 16.2.  Direct Increment to Program.**

Increment 1      ⟶      **Program A**

Increment 2      ⟶      **Program B**

Increment 3      ⟶      **Program C**

Increment 4      ⟶      **Program D**

Increment 5      ⟶      **Program E**

Increment 6      ⟶      **Program F**
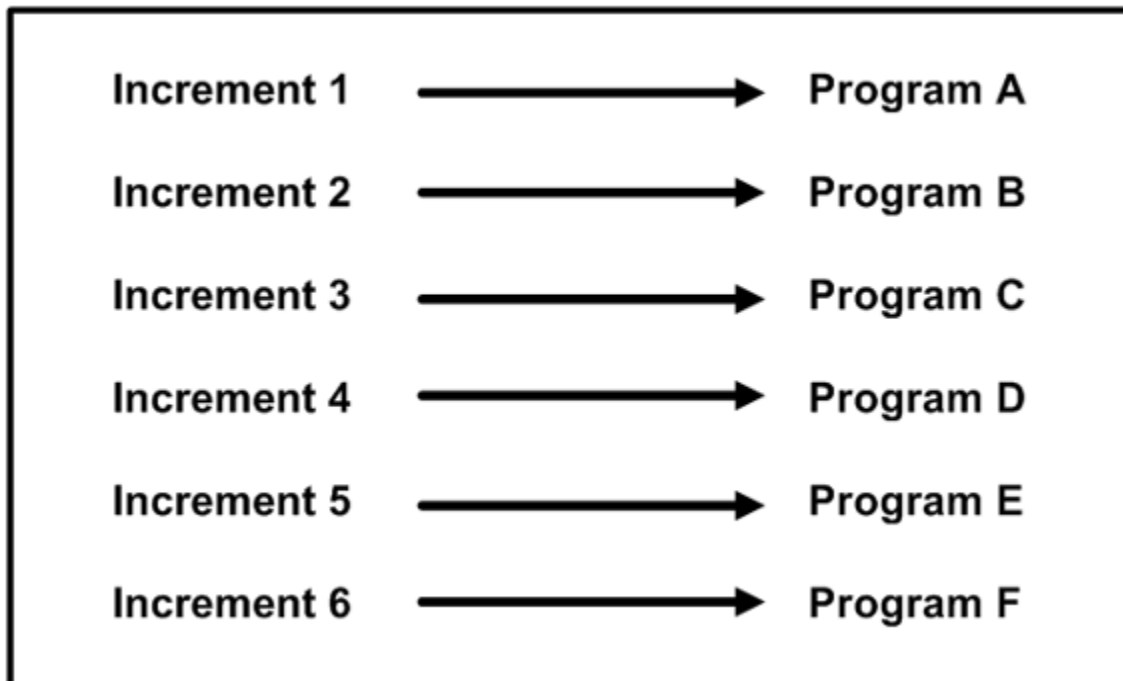
16.1.3.3.  **Figure 16.3** represents an increment-to-program mapping which is deliberately determined for each development effort. As mentioned previously, the COA delineated in AFI 63-101/20-101 offers further specifics on how to craft and implement this strategy.

**Figure 16.3.  Increments to Multiple Programs.**
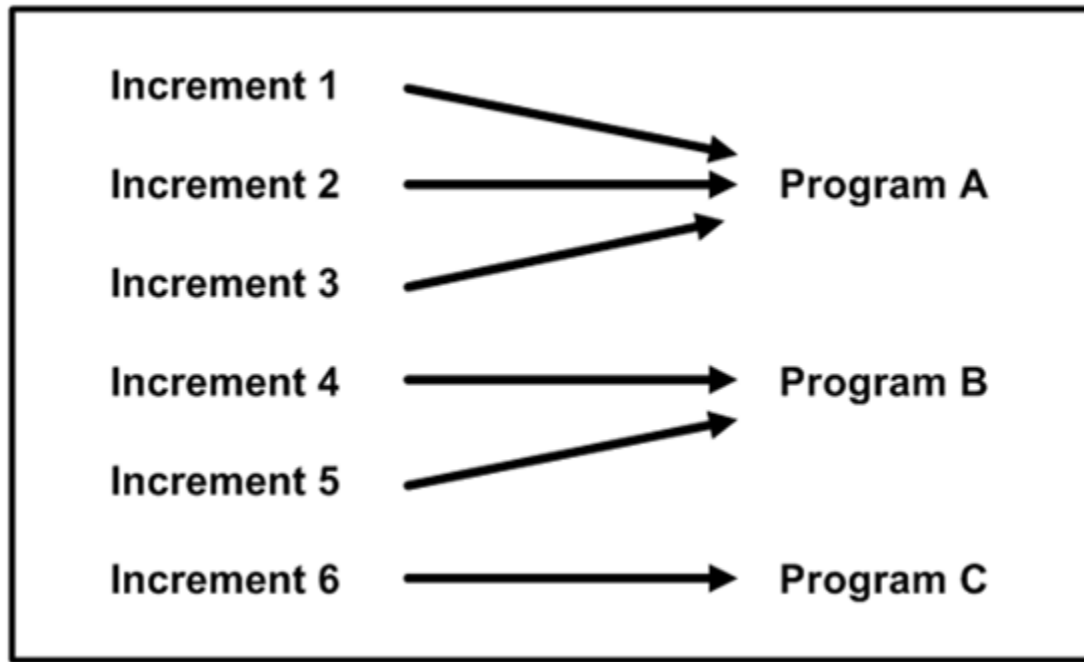


**16.2.  Subprograms for MDAPS.**

16.2.1. The decision whether to establish subprograms for an MDAP requires careful analysis and are made on a case-by-case basis. Structuring an MDAP with subprograms should reflect the way the program is being managed, and represent the most efficient and informative way to convey information about a program to senior defense acquisition officials as well as to the Congress. When a MDAP is divided into increments, the increments could be designated as subprograms. Pitfalls of this approach include:

16.2.1.1.  When one subprogram is established, all remaining elements should be organized into one or more other subprograms.

16.2.1.2.  In the event a subprogram has a Nunn-McCurdy breach, the program certification required are done on the full program level.

16.2.2. Using a subprogram designation is therefore high risk. If such an approach is directed by OSD, careful selection of increment content is paramount. Consider the following:

16.2.2.1.  Avoid structuring small subprograms such that a small increase could derail an entire overarching MDAP.

16.2.2.2.  Ensure each subprogram can be properly baselined in an APB.

16.2.2.3.  Account for technology development, risk reduction, testing, and sustainment.

**Chapter 17**

**POLICY COORDINATION, REVIEW, AND WAIVERS**

**17.1. Integrated Life Cycle Management Publication Coordination.** Major Command (MAJCOM) Commanders are requested to convene a cross-functional team-based process for the review and coordination of official ILCM AF departmental publications (e.g. policy directives, instructions, manuals, and pamphlets). These publications are the authoritative voice of the Headquarters Air Force (HAF) and document how ILCM requirements established by law, the President, the Secretary of Defense (SECDEF), and the SECAF are to be fulfilled.

17.1.1. The cross-functional team consists of the appropriate subject matter expertise relevant to the content of the publication under review. The purpose of the cross-functional team is assemble technical/functional staffing in order to develop a timely, consolidated and integrated position on behalf of the MAJCOM Commander and gives document publishers contact to adjudicate comments. The cross-functional team should provide recommendations and supporting rationale for all comments to increase the quality of the ILCM publication.

17.1.2. MAJCOM Commanders should assign a lead office responsible for staffing, identification of relevant subject matter experts and process owners to support the cross-functional team, and act as the single point of contact between the MAJCOM and the HAF publication OPR. MAJCOM Commanders can designate a lower-level office to provide the response and sign off on the coordination form, but the lower office is still responsible for ensuring the correct offices within their organization review the publication.

**17.2. Waivers.** Waivers from guidance are based on a programmatic course of action approved by the SAE or MDA through the program's governance chain of authority and documented in the appropriate program documentation. Notification is made to Headquarters Air Force (HAF) in accordance with AFPD 63-1/20-1. Waivers from tiered compliance items in publications can be processed using AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*.

**17.3. Changes.** Refer recommended changes and questions about this publication to SAF/AQXS Policy using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s from the field through MAJCOM publications/forms managers.

## Chapter 18

## FINANCIAL AUDIT ACTIVITIES

**18.1.  The DoD Financial Improvement and Audit Remediation (FIAR) Process.**

18.1.1.  A balanced Consolidated Financial Statement is a sign of a well-run organization. Federal agencies have been challenged to balance financial books and attest to the accountability of resources. FIAR refers to the process federal agencies, like DoD, are implementing to achieve financial excellence. FIAR includes internal and independent audits to ensure that agencies are establishing and following standard financial processes (and can prove it). Acquisition personnel and processes are critical to accounting for and valuing government property.

18.1.2.  The Chief Financial Officer (CFO) Act of 1990, along with subsequent legislation, requires federal agencies to produce auditable financial statements. One of the mandatory financial statements in the audit process is the Consolidated Balance Sheet. The Balance Sheet outlines resources owned or managed by the Air Force that are available for future economic benefits (assets); amounts owed by the Air Force that will require payments from resources or future resources (liabilities); and residual amounts retained by the Air Force, comprising the difference (net position). The DoD Financial Improvement and Audit Remediation (FIAR) Guidance of 2017 requests the DoD validate the audit readiness of all financial statements by September 30th of every Fiscal Year (FY). All costs should be captured in an Accountable Property System of Record (APSR) and aligned with SECDEF's Audit Priorities outlined for a particular FY. Audits will continue until DoD and its military services are in compliance. Corrective Action Plans outline how the Air Force will move into audit compliance.

18.1.3. Information on FIAR processes is still being generated. AFLCMC's process document, *Standard Process (SP) to Conduct Valuation of AFLCMC Government Equipment (GE), Military Equipment (ME), and Operation Materials & Supplies (OM&S)* can be used to support most Air Force (AF) programs. It outlines items within the Balance sheet line item called General Property Plant & Equipment (GPP&E) as well as the line item called Inventory & Related Property. It also addresses the need to collect and maintain Key Supporting Documents (KSDs), to validate the cost data (e.g., contracts), and identifies the correct APSR to use depending on the commodity. All general equipment (GE), military equipment (ME) and operating materials and supplies (OM&S) will be valued according to Generally Accepted Accounting Principles. The Program Manager of Record is responsible for valuing all asset procurements and modifications. The Program Manager of Record (PMoR), working with contracting officer and, when applicable, the Defense Contract Management Agency (DCMA) will oversee the process for the sale, donation, disposal, or retirement of assets under their purview. Additionally, the PMoR ensures all KSDs for an asset procurement, modification, sale, donation, disposal or retirement are documented and maintained. In addition, the Program Manager of Record ensures that the valuation is uploaded, validated, and maintained in the APSR.

18.1.4. In accordance with DoDI 5000.64, DoDI 5000.76, and AFI 63-101/20-101, the accountability and management of Internal Use Software is the responsibility of the PM.  The

accounting and inventorying of program assets is accomplished with an accuracy of 98%; accuracy for controlled items is 100%.

18.1.5.  In order to be audit ready, program offices will document processes, systems, and controls to properly capture valuation data. This is accomplished in part by program offices gathering and maintaining KSDs (e.g., contracts, labor rates, DD Form 250s, etc.) that support the value of procured and modified assets. It is the responsibility of the Virtual Integrated Product Team (VIPT) Lead to maintain a Key Supporting Document repository for valuation purposes. This Key Supporting Document repository is separate from official contract files.

18.1.6.  To quickly summarize the FIAR objectives, the amounts reported in the Air Force's financial statements should be accurate and supportable. Valuation methodologies (e.g., in calculating environmental liabilities or valuing cost of historical assets) should be appropriate, reasonable, and well-documented. Effectively designed controls should be implemented to ensure all transactions are recorded in the appropriate amounts. All these costs should be captured in an Accountable Property System of Record (APSR).

**18.2. Chief Financial Officer (CFO) Compliance.** The purpose of the CFO compliance is five-fold: Bring more effective general and financial management practices to the Federal Government; improve systems of accounting, financial management, and internal controls in each agency of the Federal Government; assure the issuance of reliable financial information; provide for the production of complete, reliable, timely, and consistent financial information for use by the executive branch of the Government and the Congress in the financing, management, and evaluation of Federal programs; and deter fraud, waste, and abuse of Government resources.

18.2.1.  Public Law. The following Federal Laws are pertinent to CFO compliance:

18.2.1.1.  Chief Financial Officers (CFO) Act of 1990 (P.L. 101-576) - Requires all federal agencies, including the AF, to prepare annual financial statements that conform with generally accepted accounting practices and are certified by the department or agency inspector general or auditor general. (Title III - Sections 303 & 304)

18.2.1.2.  Government Performance and Results Act (GPRA) of 1993 (P.L. 103-62) provides for the establishment of strategic planning and performance measurement in the federal government.

18.2.1.3.  Government Management Reform Act (GMRA) of 1994 (S. 2170 (103rd)) requires agency-wide audited financial statements for all agencies covered by the CFO Act.

18.2.1.4.  Federal Financial Management Improvement Act (FFMIA) of 1996 (P.L. 104-208) provides for consistent accounting by an agency from one fiscal year to the next, and uniform accounting standards throughout the federal government. The act requires federal financial management systems to support full disclosure of financial data to the citizens, the Congress, the President, and agency management.

18.2.2.  DoD Policy/Guidance. The DoD guidance document governing CFO Compliance is OUSD(C) *Financial Improvement and Audit Remediation (FIAR) Guidance*. It is updated annually and provides instructions for implementing a consistent, department-wide plan toward achieving the DoD's financial improvement and audit remediation objectives. It also

details reporting entities and service providers roles and responsibilities, and defines the department's goals, strategy and methodology processes to achieve audit readiness. DoD also follows the Federal Accounting Standards Advisory Board's Statement of Federal Financial Accounting Standards (SFFAS). These include SFFAS 3 Accounting for Inventory and Related Property; SFFAS 48 Opening Balances for Inventory, Operating Materials and Supplies, and Stockpile Materials; SFFAS 6 Accounting for Property, Plant, and Equipment; SFFAS 50 Establishing Opening Balances for General Property, Plant, and Equipment; and SFFAS 10 Accounting for Internal Use Software.

18.2.2.1.  Roles and Responsibilities as outlined in OUSD(C) *Financial Improvement and Audit Remediation* follow:

18.2.2.1.1.  Reporting Entities (MAJCOMs/HAF Functional Offices) execute FIAR and Financial Improvement Plans (FIPs), perform discovery & evaluation tasks, test and strengthen internal controls, correct deficiencies, design and implement control activities to limit the risk of material misstatements by meeting the key control objectives, and support account balances with appropriate audit documentation.

18.2.2.1.2.  Service Providers are responsible for providing a description of controls that may represent or affect customer reporting entities' control environment, risk assessment, control activities, information systems, and monitoring activities. The description of controls is presented at a level of detail that provides reporting entity auditors with sufficient information to assess the risks of material misstatement. See Section 3.B.4 in the FIAR Guidance for a complete list of the internal controls to be described.

18.2.2.1.3.  Service Providers and Reporting Entities provide access to subject matter experts or contractors supporting those organizations in agreed upon timeframes. These organizations agree on rules for the creation, completion, and retention of supporting documentation for service provider-affected financial transactions. This includes, by business process and transaction type, defining which organization should retain specific documents, and establishing the retention period for the documents.

18.2.2.1.4. FIAR requirements as outlined in DoDI 5010.40, *Managers' Internal Control Program*, DoDI 5000.64 and DoDI 5000.76. Requirements for Information Technology are found in AFMAN 17-1203, *Information Technology Asset Management (ITAM)*. Here is a short summary of these requirements:

18.2.2.1.5.  Evaluation and Discovery. Management documents its business and financial environment, defines and prioritizes its processes into assessable units, assesses risks and tests controls, evaluates supporting documentation, identifies weaknesses and deficiencies, and defines its audit readiness environment.

18.2.2.1.6.  Corrective Action. Management develops and executes CAPs that include implementation of the audit ready environment, solutions to resolve deficiencies and weaknesses, identification of resources required and committed, and tests and strengthens internal controls requirements.

18.2.2.1.7.  Evaluation. Management evaluates corrective action effectiveness through testing and determines whether it is ready to assert audit readiness.

18.2.2.1.8. Assertion. Management prepares documentation and asserts audit readiness to the OUSD(C) and DoD Office of Inspector General (OIG).

18.2.2.1.9. Sustainment. Management maintains audit readiness through risk based periodic testing of internal controls utilizing the OMB Circular A-123, Appendix A, processes and procedures, and resolves any identified weaknesses timely (e.g., before the next annual reporting cycle).

18.2.2.1.10. Validation. OUSD(C) and DoD OIG review management's assertion, and auditors perform an examination on audit readiness assertion using GAO Financial Audit Manual (FAM) as guidance. The FAM, which consists of three volumes, presents a methodology to perform financial statement audits of federal entities in accordance with professional standards

18.2.2.1.11. Audit. Reporting entity engages an auditor and supports the audit of assessable unit or financial statements.

18.2.2.2. Requirements for Service Providers illustrated in Figure 30, Section 3.B.2 of the FIAR Guidance.

18.2.3.  Key FIAR terms.

18.2.3.1. Capitalization: the process of recognizing the total costs of an asset, including property, plant, and equipment in the financial statements and depreciating the asset over its useful life.

18.2.3.2. Depreciation: is the systematic and rational allocation of the acquisition cost of an asset, less its estimated salvage or residual value, over its estimated useful life. ME estimates of useful life should consider factors such as usage, physical wear and tear, and technological change.

18.2.3.3. Direct Cost: cost of resources consumed by individual activities that are specifically identified with the production of the asset.  Examples of resources consumed include:

18.2.3.3.1.  Materials used in the production of the asset.

18.2.3.3.2.  Labor hours directly worked on the asset

18.2.3.3.3.  Facilities and equipment used exclusively in the production of the asset

18.2.3.3.4.  Goods or services received from other entities that are directly used in the production of the asset

18.2.3.4. Expense: for asset valuation purposes, it refers to those costs that should be excluded from the recorded cost of an asset. Note: Generally, costs are expensed because they are related to post- production activities (e.g., maintenance); related to the acquisition of other reportable property (e.g., spare parts); or because the entire asset cost is below the $1M capitalization threshold.

18.2.3.5. Government Furnished Property (GFP): property in the possession of or acquired by the Government and subsequently furnished to the Contractor for performance of a contract. There are two types of GFP: Government Furnished Equipment (GFE) and Government Furnished Material (GFM).

18.2.3.5.1. GFE: consists of equipment, special tooling, or special test equipment provided to the contractor for activities such as research and development, acquisition, repair, maintenance, overhaul, or modification. GFE also includes contractor acquired property (CAP) when the CAP is delivered and accepted by the government for use on the same or another contract.

18.2.3.5.2. GFM: is another form of government property that is provided to the contractor in the performance of a contract. GFM consists of raw titanium, nuts, bolts, washers, screws, spares, reparables, and could also include GFP components that are include in the item being delivered. GFM is normally consumed or expended by the contractor during the performance of the contract. GFM does not include equipment, special tooling, or test equipment. GFM also includes CAP when the CAP is delivered and accepted by the Government for use on the same or another contract.

18.2.3.6. Gross Book Value: Original (historical) price paid for an asset, without any depreciation.

18.2.3.7. Indirect Cost:  cost of resources jointly or commonly used to produce two or more types of assets but not specifically identifiable with any one of the assets. Examples of indirect costs include: costs of general administrative services, general research and technical support, security, rent, employee health and recreation facilities, and operational and maintenance cost for buildings, equipment, and utilities (commonly referred to as "overhead" expenses).

18.2.3.8. Key Supporting Documents: any documentation that supports/substantiates the derived values for the asset. Note: KSDs should identify the source of the cost data (i.e., contracts, TCTO), demonstrate how the asset values were determined (i.e., Contract Line Item Number (CLIN) analysis), and indicate the valuation methodology (i.e., Contract Based). KSDs should be maintained in a manner that supports prompt retrieval upon request (i.e., during an audit), document why a specific valuation methodology was selected, and allow a knowledgeable third person to review the documentation, conduct a similar process, and arrive at approximately the same value for the asset.

18.2.3.9. Line of Accounting: identifies the funding source associated with an organization's budget to ensure accurate accounting of transactions (e.g., Inventory and Related Property or GPP&E).

18.2.3.10. Unit Cost: is synonymous with "full cost" and includes all costs incurred to bring the asset to a form and location suitable for its intended use.

18.2.3.11. Useful Life: normal operating life in terms of utility to the USAF. For aircraft, this may be the total number of flying hours the program office anticipates the aircraft should be able to perform its mission (e.g., 10,000 hours). For other equipment, the useful life may be the number of years the program office anticipates the asset should be able to perform its mission.

18.2.3.12. Useful Life Value: is generally based on the engineering analysis (i.e., number of flying hours, time, launch & recoveries, etc.) stated in the acquisition proposal (basic asset or modification to the asset).

**18.3. Government Property in Possession of Contractors (GFP).** The term Government Furnished Property (GFP) refers to property acquired by, or in the possession of the government that is subsequently provided to the Contractor for the performance of a contract. GFP consists of Government Furnished Equipment (GFE) and Government Furnished Material. Examples of GFE include support equipment, special tooling and special test equipment. Government Furnished Material consists of nuts, bolts, washers, screws, spares and reparable assets. Policies and procedures for obtaining GFP are outlined in AFI 23-119, *Exchange, Sale, or Temporary Custody of Non-excess Personal Property* and the GFP Process Guide, as well as in **paragraph 8.2.6.5** of this pamphlet.

**18.4. Contractor Inventory Control Point (C-ICP).** Contractor Inventory Control Point (C-ICP) refers to assets held by a contractor assigned the primary responsibility for the materiel management of a group of peculiar items for the Air Force and the Department of Defense. In addition to being the Integrated Materiel Manager (IMM), a C-ICP may perform other logistics functions in support of a particular end item. This includes elements of supply chain management such as requisition processing, storage, shipment, delivery, pick-up, receiving, shipping, in-transit visibility/tracking/reporting, property accountability and handling of classified material.

18.4.1. C-ICP Policy. All components procured by the government and managed by the contractors will be managed as GFP) and identified within the contract. The list of components outlined in the contract is the authorizing document for C-ICP managed inventory.

18.4.1.1. Information Management System (IMS) Implementation. The Contractor will implement an Information Management System (IMS) implementation capable of interfacing with DoD and Air Force systems through the Defense Logistics Agency's Defense Automated Addressing System (DAAS) using Defense Logistics Management Standards (DLMS) transactions.

18.4.1.2. This includes maintaining accountability records in the Air Force Accountable Property System of Record (APSR), the Defense Property Accountability System (DPAS) for property in the contractor's possession. Status of serialized items should be updated in APSR and/or DPAS within 5 days after completion of DD250. Contractors that do not have an IMS capable of interfacing with DPAS can use the Self-Service module to maintain accountability records.

18.4.2. For additional guidance on the C-ICP processes, please refer to DoD Manual 4140.01, Volume 8, DoD Supply Chain Materiel Management Procedures: Materiel Data Management and Exchange and AFI 23-101, Materiel Management Policy as amended by Air Force Guidance Memorandum 2019-01 and AFI 23-111, Management of Government Property in Possession of the Air Force.

**18.5. Military Equipment.** Specific FIAR guidance on tracking military equipment is currently being drafted, but AFI 23-101 as amended by Air Force Guidance Memorandum 2019-01 updates management of equipment to address requirements and processes that will ensure audit readiness.

**18.6. Uninstalled (Spare) Engines.** Policies and procedures for managing accountability of Uninstalled (Spare) Engines are outlined in AFI 21-101, Aircraft and Equipment Maintenance Management. Send to AF/A4LM for concurrence per agreement with A4 and SAF/FM.

**18.7. Uninstalled Missile Motors.** Specific FIAR guidance on tracking uninstalled missile motors is being written, but until printed, use the procedure found in AFI 21-101.

**18.8. Munitions.** Specific FIAR guidance on tracking munitions is being written, but until printed, use the procedures found in AFI 21-101.

**18.9. Real Property.** As outlined in DoDI 4165.70, Real Property Management, Secretaries of the Military Departments will manage real property conforming to applicable law, policies, and procedures.

**18.10. Working Capital Fund Inventory.** As outlined in DoDI 7000.14, Department of Defense Financial Management Policy and Procedures, incorporating Change 1, Air Force will use DoD 7000.14R, Department of Defense Financial Management Regulation (DoD FMR), Volumes 1-15 as guidance on financial related issues.

**18.11. Information Technology (IT).** Additional FIAR considerations apply when procuring or managing hardware and software, especially IT used as part of the audit process. See AFMAN 17-1203 for hardware and software asset management requirements. AFMAN 17-1203 also provides tables to determine if software is IUS or non-IUS, determine capitalizations cost, identify commercial-off-the-shelf (COTS), and provide CFO IT Compliance Criteria. A system is CFO IT compliant after it has undergone a review of IT controls IAW with the Federal Information System Controls Audit Manual (FISCAM), undergone a review of CFO IT Compliance questions/answer in ITIPS, and been issued a CFO IT Compliance Certification Letter signed by SAF/FMPA. PMs should work with their contracting officers and MAJCOM Accountable Property Officers (APO) to ensure IT assets and associated costs are properly tracked. PMs should update Milestone Decision Authority (MDA) at decision points of audit readiness related to IT assets. IT that supports the financial audit process comes under additional scrutiny, PMs should also:

18.11.1. Have proof that the information reflected in the financial statements comes from reliable data sources that conform to Federal system and accounting standards.

18.11.2. Ensure an external auditor is able to trace information contained in AF financial statements back to the original authorized transaction.

18.11.3. Have confidence regarding the reliability of data associated with the management controls and accounting processes in a compliant system are supported by documented evidence.

18.11.4. Meet document requirements for program management offices. Fulfillment of documentation requirements are accomplished by providing information in ITIPS. Documentation includes results of DoD Risk Management Framework (RMF), Federal Information Security Management Act (FISMA), and Federal Information System Controls Audit Manual (FISCAM) controls.

18.11.5. Be prepared to provide or provide links to:

18.11.5.1. The most recent document that describes and indicates the control of data processing, and the management and reporting of the system.

18.11.5.2.  The document that identifies and describes how error conditions are handled.

18.11.5.3.  The most current user access control list (not older than 30 days).

18.11.5.4.  System root Access Control List (ACL) (S38b).

18.11.5.5.  IA Control Interconnection Documentation (DCID-1) (CFO6).

18.11.5.6.  Security Technical Implementation Guide & Configuration Management Diagrams (DCCS-1) (CFO7).

18.11.5.7.  SV-1, "Systems Interface Description" (interconnectivity diagram) (A130).

18.11.5.8.  The document that indicates how the transfer of data to/from source system is authorized/controlled (A8a).

18.11.5.9.  System Identification Profile (SIP) (S63).

18.11.5.10.  Information Support Plan (ISP) (S64a).

18.11.5.11.  Most current POA&M (S209a).

18.11.5.12.  Prepare and submit the CFO Compliance Process Report from ITIPS. Before the report is created, ensure ITIPS questions A130, A7, A8, A8a, CFO8, and C40 in the CFO IT Compliance Filter are answered. Also, attach to the email a copy of the System Identification Profile (SIP) if it is not readily available in eMASS, the AF C&A workflow tool.


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**Attachment 1**

**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION**

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**Prescribed Forms**

No forms are prescribed by this publication

**Adopted Forms**

DD Form 250, *Material Inspection and Receiving Report*

AF Form 525, *Records Disposition Recommendation* (RDS): found in
**https://afrims.cce.af.mil/afrims/rds/rds_series.cfm**

AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*

AF Form 847, *Recommendation for Change of Publication*

AF Form 1067, *Modification Proposal*

AF Form 1341, *Electronic Record Inventory*

**Abbreviations and Acronyms**

**ACAT**—Acquisition Category

**ACE**—Acquisition Center of Excellence

**ADM**—Acquisition Decision Memorandum

**AECO**—Advance Engineering Change Order

**AESO**—Advance Engineering Supplemental Order

**AETC**—Air Education and Training Command

**AF**—(United States) Air Force

**AF/A4**—Deputy Chief of Staff, Logistics, Engineering and Force Protection

**AF/A6**—Chief of Warfighting Integration and Chief Information Officer (CIO)

**AF/A8**—Deputy Chief of Staff for Plans and Programs

**AFFARS**—Air Force Federal Acquisition Regulation Supplement

**AFI**—Air Force Instruction

**AFIT**—Air Force Institute of Technology

**AFMC**—Air Force Materiel Command

**AFNIC**—Air Force Network Integration Center

**AFPD**—Air Force Policy Directive

**AFRC**—Air Force Reserve Command

**AFRL**—Air Force Research Laboratory

**AIS**—Automated Information System

**AIT**—Automatic Identification Technology

**AML**—Acquisition Master List

**AoA**—Analysis of Alternatives

**APAT**—Acquisition Process Architecture Team

**APB**—Acquisition Program Baseline

**APUC**—Average Unit Procurement Cost

**AS**—Acquisition Strategy

**ASP**—Acquisition Strategy Panel

**A&S**—Acquisition and Sustainment

**ATO**—Authority to Operate

**AV**—All Viewpoint

**BES**—Budget Estimate Submission

**C4ISP**—Command, Control, Communication, Computer and Intelligence Support Plan

**CAD**—Computer Aided Drafting/Computer Aided Design

**CAGE**—Commercial and Government Entity

**CAP**—Contractor Acquired Property

**CARD**—Cost Analysis Requirements Description

**CBA**—Capability Based Assessment

**CC**—Commander

**CCA**—Clinger-Cohen Act

**CDA**—Current Design Activity

**CDD**—Capability Development Document

**CDR**—Critical Design Review

**CDRL**—Contract Data Requirements List

**CFO**—Chief Financial Officer

**CLIN**—Contract Line Item Number

**CLS**—Contractor Logistics Support

**CM**—Corrective Maintenance

**CMRS**—Collaboration and Measurements Requirements Summary

**CNEO**—Change Notice Engineering Order

**CONOPs**—Concept of Operations

**CPAF**—Cost-Plus Award Fee

**CPD**—Capability Production Document

**CPI**—Critical Program Information

**CPIF**—Cost Plus Incentive Fee

**CRA**—Cost Risk Assessment

**CTA**—Capability Threat Assessments

**CTE**—Critical Technology Elements

**CV**—Capability Viewpoint

**DAE**—Defense Acquisition Executive

**DAES**—Defense Acquisition Executive Summary

**DAF**—Department of the Air Force

**DAFPAM**—Air Force Pamphlet

**DAG**—*Defense Acquisition Guidebook*

**DAMIR**—Defense Acquisition Management Information Retrieval

**DAU**—Defense Acquisition University

**DBS**—Defense Business System

**DBSMC**—Defense Business System Management Committee

**DCAA**—Defense Contract Audit Agency

**DCMA**—Defense Contract Management Agency

**DCR**—DOTmLPF-P Change Recommendation

**DFARS**—Defense Federal Acquisition Regulation Supplement

**DID**—Data Item Descriptions

**DISA**—Defense Information Systems Agency

**DIV**—Data and Information Viewpoint

**DMAWG**—Depot Maintenance Activation Working Group

**DMI**—Depot Maintenance Interservice

**DMSMS**—Diminishing Manufacturing Sources and Material Shortages

**DoDD**—Department of Defense Directive

**DoDI**—Department of Defense Instruction

**DOTMLPF**—Doctrine, Organization, Training, Materiel, Leadership & Education, Personnel, and Facilities

**DOTMLPF-P**—Doctrine, Organization, Training, Materiel, Leadership & Education, Personnel, Facilities and Policy

**DP**—Development Planning

**DRU**—Direct Reporting Unit

**DSOR**—Depot Source of Repair

**DT&E**—Developmental Test and Evaluation

**EA**—Economic Analysis

**EDM**—Engineering Data Manager/Engineering Data Management

**EMD**—Engineering and Manufacturing Development

**EO**—Engineering Order

**ESOH**—Environmental, Safety and Occupational Health

**EVM**—Earned Value Management

**FAR**—Federal Acquisition Regulation

**FFP**—Firm Fixed Price

**FFRDC**—Federally Funded Research and Development Centers

**FIAR**—Financial Improvement and Audit Remediation

**FIP**—Federal Information Processing

**FISCAM**—Federal Information System Controls Audit Manual

**FISMA**—Federal Information Security Management Act

**FMS**—Foreign Military Sales

**FOA**—Field Operating Agency

**FOC**—Full Operational Capability

**FPAF**—Fixed-Price with Award Fee

**FPIF**—Fixed-Price Incentive

**FPRA**—Forward Price Rate Agreements

**FRP**—Full Rate Production

**FYDP**—Future Years' Defense Program

**GE**—Government Equipment

**GFE**—Government Furnished Equipment

**GFP**—Government Furnished Property

**GOSG**—General Officer Steering Group

**HAF**—Headquarters Air Force (The Secretariats and Air Staff)

**HFE**—Human Factors Engineering

**HQ AFMC/A4**—Directorate of Logistics and Sustainment, Air Force Materiel Command

**HSI**—Human Systems Integration

**IBR**—Integrated Baseline Review

**IC**—Intelligence Community

**ICD**—Initial Capabilities Document

**ICE**—Independent Cost Estimate

**ICP**—Inventory Control Point

**ICS**—Interim Contract Support

**IDE**—Integrated Data Environment

**ILCM**—Integrated Life Cycle Management

**IMDS**—Integrated Maintenance Data System

**IMP**—Integrated Master Plan

**IMS**—Integrated Master Schedule

**IOC**—Initial Operational Capability

**IOT&E**—Initial Operational Test and Evaluation

**IPA**—Independent Program Assessment

**IPS**—Intellectual Property Strategy

**IPT**—Integrated Product Team

**IRAD**—Independent Research and Development

**IRB**—Investment Review Board

**ITIPS**—Information Technology Investment Portfolio Suite

**ISO**—International Organization for Standardization

**ISP**—Information Support Plan

**IT**—Information Technology

**IUID**—Item Unique Identification

**JCIDS**—Joint Capabilities Integration and Development System

**JCTD**—Joint Capability Technology Demonstration

**JEDMICS**—Joint Engineering Data Management Information and Control System

**KPP**—Key Performance Parameters

**KSA**—Key System Attributes

**LCCE**—Life Cycle Cost Estimate

**LCMC**—Life Cycle Management Center

**LCRM**—Life Cycle Risk Management

**LCSP**—Life Cycle Sustainment Plan

**LDTO**—Lead Developmental Test & Evaluation Organization

**LHA**—Logistics Health Assessments

**LRIP**—Low Rate Initial Production

**LRU**—Line Replaceable Unit

**M&S**—Modeling and Simulation

**MAIS**—Major Automated Information System

**MAJCOM**—Major Command

**MAR**—Monthly Acquisition Report

**MER**—Manpower Estimate Reports

**MDA**—Milestone Decision Authority

**MDAP**—Major Defense Acquisition Program

**MDID**—Milestone Document Identification

**MDD**—Materiel Development Decision or Maintenance Data Documentation

**ME**—Military Equipment

**MFP**—Materiel Fielding Plan

**MOA**—Memorandum of Agreement

**MOE**—Measure of Effectiveness

**MOP**—Measure of Performance

**MOS**—Measure of Suitability

**MOSA**—Modular Open Systems Approach

**MOU**—Memorandum of Understanding

**MRA**—Manufacturing Readiness Assessments

**MRR**—Materiel Release Review

**MS**—Milestone

**MSA**—Materiel Solution Analysis

**MUA**—Military Utility Assessments

**NEPA**—National Environmental Policy Act

**NGB**—National Guard Bureau

**NGS**—Non-Government Standards

**NRE**—Non-Recurring Engineering

**NSS**—National Security System

**OA**—Operational Assessment

**OEM**—Original Equipment Manufacturer

**OIPT**—Overarching IPT

**O&M**—Operations and Maintenance

**O&S**—Operations and Support

**OM&S**—Operation Materials & Supplies

**OSD**—Office Secretary of Defense

**OSHA**—Occupational Safety and Health Administration

**OSS&E**—Operational Safety, Suitability, and Effectiveness

**OTA**—Operational Test Agency

**OT&E**—Operational Test and Evaluation

**OUSD(A&S)**—Office of the Under Secretary of Defense for Acquisition and Sustainment

**OV**—Operational Viewpoint

**PAD**—Program Action Directive

**PAUC**—Program Acquisition Unit Cost

**PBA**—Performance Based Agreement

**PBL**—Performance Based Logistics

**PDR**—Preliminary Design Review

**PE**—Program Element

**PESHE**—Programmatic Environment, Safety, and Occupational Health Evaluation

**PEM**—Program Element Monitor

**PEO**—Program Executive Officer

**PGM**—Product Group Manager

**PHS&T**—Packaging, Handling, Storage, and Transportation

**PIA**—Privacy Impact Assessments

**PM**—Program Manager

**PMO**—Program Management Office

**POC**—Point of Contact

**POE**—Program Office Estimates

**POM**—Program Objective Memorandum

**PoPS**—Probability of Program Success

**PPLANS**—Programming Plans

**PPP**—Program Protection Plan

**PRA**—Performance Risk Assessment

**PSM**—Product Support Manager

**PV**—Project Viewpoint

**QRC**—Quick Reaction Capability

**RAMS**—Reliability, Availability Maintainability and Supportability

**RCA**—Regulatory Contracting Approval

**RDS**—Records Disposition Schedule

**RFP**—Request for Proposal

**RI3**—Risk Identification: Integration & -Ilities

**RMF**—Risk Management Framework

**RMP**—Risk Management Plan

**RPIE**—Real Property Installed Equipment

**SAE**—Service Acquisition Executive

**SAF/AQ**—Secretary of the Air Force (Acquisition, Technology & Logistics)

**SAF/AQX**—Deputy Assistant Secretary for Acquisition Integration

**SAF/FMC**—Deputy Assistant Secretary (DAS) of the Air Force for Cost and Economics

**SAF/GCQ**—Deputy General Counsel (Acquisition)

**SAR**—Selected Acquisition Report

**SATAF**—Site Activation Task Force

**SCP**—Service Cost Position

**SE**—Systems Engineering

**SEAM**—Systems Engineering Assessment Model

**SE/ATS**—Support Equipment/Automatic Test System

**SEP**—Systems Engineering Plan

**SFR**—System Functional Review

**SIM**—Serialized Item Management

**SMART**—System Metric and Reporting Tool

**SMCA**—Single Manager for Conventional Ammunition

**SORAP**—Source of Repair Assignment Process

**SORN**—System of Records Notice

**SRA**—Schedule Risk Assessment

**SRR**—System Requirements Review

**SSOM**—Standard Surveillance Operating Manual

**SSP**—Source Selection Plan

**STA**—System Threat Analysis

**STAR**—System Threat Assessment Report

**StdV**—Standards Viewpoint

**STINFO**—Scientific and Technical Information

**STP**—System Training Plan

**SV**—System Viewpoint

**SvcV**—Services Viewpoint

**T&E**—Test and Evaluation

**TBD**—To Be Determined

**TCTO**—Time Compliance Technical Order

**TD**—Technology Development

**TEI**—Text Element Identifiers

**TEMP**—Test and Evaluation Master Plan

**TES**—Test and Evaluation Strategy

**TO**—Technical Order

**TPM**—Technical Performance Measures

**TPT**—Training Planning Team

**TRA**—Technical Readiness Assessment

**TRL**—Technology Readiness Level

**TSP**—Transition Support Plan

**TSRA**—Training System Requirements Analysis

**TTP**—Technology Transition Plan

**UID**—Unique Identification

**UII**—Unique Item Identifiers

**UON**—Urgent Operational Need

**USC**—United States Code

**USSF**—United States Space Force

**USSF/CSO**—Chief of Space Operations, US Space Force

**V&V**—Verification and Validation

**WAWF**—Wide Area Workflow

**WBS**—Work Breakdown Schedule

*Terms*

**Acquisition**—The conceptualization, initiation, design, development, testing, contracting, production, deployment, and disposal of a directed and funded effort that provides a new, improved, or continued materiel, weapon, information system, logistics support, or service capability in response to an approved need.

**Acquisition Center of Excellence (ACE)**—ACE is a structure to provide direct program acquisition planning and execution (pre- and post-award) support to acquisition leadership and program teams. ACEs exist at SAF and field centers levels. Center ACEs focus on the "nuts and bolts" aspects of the program and documentation. The SAF-level ACE function is performed by SAF/AQXC and builds on Center ACE work by adding its expertise and the perspective of the SAE, HAF functional staffs, OSD staffs, and Congress. Center ACEs focus on all programs; the SAF ACE focus is primarily on ACAT I, ACAT IA and non-delegated ACAT II programs.

**Acquisition Intelligence**—Acquisition Intelligence is the program office function that identifies and manages intelligence dependencies for the acquisition effort and applies threat insights to guide design and development decisions. Based on the National Defense Strategy, each Service requires increasing investment in a cadre of program-organic Acquisition Intelligence specialists with the tools, knowledge, and means to leverage the full range of Defense Intelligence and Security Enterprise capability to support PMs.

**Air Force Engineering Data Group (AFEDG)**—A group of representatives from Air Force activities chartered to review and recommend changes to engineering drawing policy. Functions involved with Air Force engineering drafting issues select representatives for the group.

**Air Force Engineering Drawing**—An engineering drawing generated with an Air Force drawing number and Commercial and Government Entity (CAGE) code in the title block as the Original design activity. An engineering drawing acquired through the design activity transfer process is also considered an Air Force engineering drawing.

**Capability**—The ability to complete a task or execute a course of action under specified conditions and level of performance through combinations of means and ways across the Doctrine, Organization, Training, Materiel, Leadership & Education, Personnel, Facilities, and Policy (DOTmLPF-P) to perform a set of tasks to execute a specified course of action.

**Capability Directorates**—Directorates under SAF/AQ responsible for policy, direction, resource allocation, and oversight of programs within mission area as assigned by SAF/AQ. They facilitate the interaction between the SAE and the PEO and function as program focal point and conduits for interfaces with Congress, OSD, JCS, other services Air Staff, MAJCOMs, and foreign governments or international organizations. CDs provide acquisition inputs to Programming, Planning, and Budgeting Execution (PPBE).

**Center Intelligence Office/Intelligence Division**—The singular focal point at each AFMC installation specifically dedicated to supporting research, development, test, evaluation and sustainment activities with analytical services and intelligence products and information.

**Component Acquisition Executive (CAE)**—Term used by the DoD for Service Acquisition Executive (SAE). The preferred AF term for this person is the Service Acquisition Executive. See Service Acquisition Executive (SAE).

**Concept**—A prospective materiel solution to an identified operational capability need.

**Concept Characterization and Technical Description (CCTD)**—CCTD's document the results of early System Engineering (SE) and concept development activities and are the principal artifacts of Early SE. They provide relevant information about prospective materiel solutions to the Lead Command and SAF/AQ in support of MDD and AoAs. CCTDs are also key input documents to the AoA Study Plan. The *AF Early SE Guide* and the *AF CCTD Guide* provide additional information.

**Concept of Operations (CONOPS)**—a CONOPS describes how a system will be used from the viewpoints of its various stakeholders, derived from and consistent with the validated/approved capability requirements document. Provided to the MDA at the specified decision events and normally provided to industry as part of the RFP.

**Contract Support (CS)**—A generic term for the support of a system, subsystem, training system, equipment, or end item provided by a commercial vendor pending transition to, or in lieu of, organic support.

**Contract Sustainment Support (CSS)**—A planned contractor support method used to provide all or part of the logistics support elements for a system, subsystem, training system, equipment, or end item for extended periods of time or for the life cycle.

**Contractor Drawing**—A drawing generated by a contractor with that contractor's drawing number and CAGE code in the title block as the original design activity.

**Contractor Logistics Support (CLS)**—A method of contract support for a program, system, subsystem, training system, equipment, or end item used to provide all or part of the sustainment elements in direct support of the approved sustainment strategy. It may include work managed and/or accomplished by the Government but for which the contracted communities are responsible for performance output.

**Controlled Unclassified Information (CUI)**—Unclassified information, including technical data, to which access or distribution limitations have been applied in accordance with United States laws, policies, and regulations. Examples include Unclassified Scientific and Technical Information (STINFO), Unclassified Export Controlled Information, Unclassified Proprietary (Intellectual Property), Information exempted from public release by Freedom of Information Act (FOIA) (For Official Use Only (FOUO)), Competition Sensitive, Source Selection Information, and Controlled Unclassified Military Information (CUMI).

**Core Capability**—Skills and resources maintained within organic repair depots to meet contingency requirements. Core comprises a minimum level of mission-essential capability either under the control of the individual DoD component or a consolidated capability under the control of a jointly determined DoD component where economic and/or strategic considerations warrant.

**Course of Action (COA)**—A planning and decision process that culminates in a MAJCOM decision.

**Critical Asset**—A specific entity that is of such extraordinary importance that its incapacitation or destruction would have a very serious, debilitating effect on the ability of a nation to continue to function effectively. (JP 3-07.2)

**Critical Component**—A component of a nuclear weapon system that if bypassed, activated, or tampered with could result in, or contribute to, deliberate or inadvertent authorizing, prearming, arming, or launch of a combat delivery platform carrying a nuclear weapon, or the employment of a nuclear weapon against anything other than an authorized target. (AFI 91-101)

**Critical Program Information (CPI)**—Program information, technologies, or systems which, if disclosed or compromised, would degrade combat effectiveness, shorten the expected combat effective life of the system, significantly alter technological capabilities or program direction, or require additional research, development, test, and evaluation (RDT&E) resources to counter the impact of the compromise. CPI can be classified information or controlled unclassified information (CUI) about technologies, processes, applications, or end items. CPI includes but is not limited to: system capabilities and vulnerabilities, CPI inherited from another programs and CPI identified in pre-acquisition activities or as a result if non-traditional acquisition techniques (e.g. Joint Concept Technology Development, flexible technology insertion); components, formulas, algorithms, ranges, frequencies, specialized hardware/software, programs, engineering, design, or unique manufacturing processes; system capabilities or vulnerabilities; and other information. CPI includes combinations of technologies, subsystems, and systems that individually may not be considered CPI.

**Critical Technology Elements (CTE)**—A technology element is "critical" if the system being acquired depends on this technology element to meet operational requirements (with acceptable development, cost, and schedule and with acceptable production and operation costs) and if the technology element or its application is either new or novel. Said another way, an element that is new or novel or is being used in a new or novel way is critical if it is necessary to achieve the successful development of a system, its acquisition, or its operational utility.

**Current Design Activity**—The design activity currently responsible for the design of an item. This may be the original Design Activity or a design activity to which the design responsibility has been transferred. (ASME Y14.100)

**Cybersecurity**—A global domain within the information environment consisting of the interdependent networks of information technology infrastructures and resident data, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers. (DOD Dictionary of Military and Associated Terms)

**Data Rights**—Different classes of licenses that the Government may purchase by contract as discussed in **Table 11.1.**

**Defense Acquisition Executive (DAE)**—The OUSD(A&S) has responsibility for supervising the Defense Acquisition System. The DAE takes precedence on all acquisition matters after the Secretary and the Deputy Secretary.

**Depot Maintenance**—Material and/or software maintenance or repair requiring the overhaul, upgrade or rebuild of parts, assemblies, subassemblies or software programs, regardless of source of funds, location, or if accomplished organically or commercially. The term does not include procurement of modifications for performance improvement. It does include testing,

installation of parts for modifications, and reclamation of materiel. Reference Title 10, USC, Section 2460.

**Depot Maintenance Capability**—The aggregation of all resources required to perform depot maintenance. These resources include facilities, skilled personnel, tools, test equipment, drawings, technical publications, ongoing training, maintenance personnel, engineering support, and spare parts.

**Depot Maintenance Interservice (DMI)**—The review/study process used for assignment of the final Depot Source of Repair (DSOR) for depot level maintenance. This process is intended to identify existing depot repair sources for new acquisitions programs and thereby preclude inadvertently duplicating depot maintenance workload assignments. The process also identifies opportunities for joint contracting for further cost savings and will identify alternate sources of repair for existing depot programs planned for relocation.

**Depot Source of Repair (DSOR)**—Combination of a two-part process (source of repair assignment process (SORAP) and the depot maintenance interservice (DMI) recommendation) that results in a final assignment of a coordinated, joint service recommendation for assignment of the depot repair source to a specific organic depot maintenance activity or to the commercial sector. The first part is done within the AF to determine whether to use organic or contract repair source. The second part is done within the Joint Service community to determine which specific DoD organic repair source or commercial sector will be used. It is designed to ensure compliance with all applicable factors, including public law, which merit consideration in achieving best value depot maintenance source of repair (SOR).

**Design Activity**—An activity that has, or had, responsibility for the design of an item. (ASME Y14.100)

**Design Activity Transfer Drawing**—A drawing with the drawing number and CAGE code of the original design activity to which an Air Force CAGE code has been added to transfer the design to a specific Air Force activity. It is subject to all conditions imposed on an Air Force drawing.

**Development Planning (DP)**—DP encompasses the engineering analysis and technical planning activities that provide the foundation for informed investment decisions on the fundamental path a materiel development will follow to meet operational needs effectively and affordably. DP facilitates integrated capability development. Early planning, analysis, and systems engineering activities provide linkages among operational needs, system performance requirements, technology needs and opportunities, and potential life cycle costs, and establishes a technical foundation for materiel development. As a result, requirements will be fiscally and technologically informed; concepts will be mature and, fiscally and technically feasible; and areas for Science &Technology investment will be identified to reduce technology risks.

**Direct Sale Agreement (DSA)**—An arrangement, currently authorized primarily for depot maintenance activities designated as Centers of Industrial and Technical Excellence (CITE), and other working capital funded industrial facilities under specified circumstances, whereby military and commercial entities enter into a contractual relationship for the sale of depot maintenance articles and/or services to an outside (non-government) entity, usually a contractor.

**Drawing Change**—Any change to an original drawing by direct manual or electronic means, or by a separate engineering change order.

**Electromagnetic Compatibility (EMC)**—EMC is the ability of systems, equipment, and devices which utilize the electromagnetic spectrum to operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation because of electromagnetic radiation. It involves the application of sound electromagnetic spectrum management; system, equipment, and device design configuration that ensures interference-free operation; and clear concepts and doctrines that maximize operational effectiveness.

**End Item**—Final combination of assemblies, components, parts, and materiel that performs a complete operational function and needs no further augmentation to make it ready for its intended use.

**Energetics (Energetic Materials)**—Chemical compounds, or mixtures of chemical compounds, that are divided into three groups according to use: explosives, propellants, and pyrotechnics. Energetic materials are sensitive to four external energy sources; these are impact, shock, electrostatic, and thermal.

**Engineering Order**—A basic form document that allows you to supplement design information for an existing drawing.

**Enterprise Architecture**—A strategic information asset base, which defines the mission, the information necessary to perform the mission, the technologies necessary to perform the mission, and the transitional processes for implementing new technologies in response to changes in mission needs. An enterprise architecture includes a baseline [as-is] architecture, target [to-be] architecture, and a sequencing plan.

**Family of Systems (FoS)**—Family of Systems is a set or arrangement of independent systems that can be arranged or interconnected in various ways to provide different capabilities. A family of systems is basically a grouping of systems having some common characteristic(s). The mix of systems can be tailored to provide desired capabilities, dependent on the situation.

**Fielding**—Occurs when supported and supporting commands collaboratively plan and execute the delivery and bed-down of an operationally effective and suitable platform or system, or a major system modification/upgrade, from a total system capability perspective, that is sustainable over its planned life cycle.

**Government Purpose Rights**—Permit the Government to use data or software for any Government Purpose which does not include competition against the owner of the data or software in the commercial marketplace.

**Horizontal Protection**—Common security countermeasures for protecting similar technologies used by more than one program or technology project. It may extend across military Components. Horizontal protection ensures cost-effective application of technology protection efforts. (See DoDI 5200.39)

**Human Systems Integration (HSI)**—The integrated and comprehensive analysis, design, and assessment of all human-related considerations in requirements, concepts, and resources addressed through the coordination of the technical activities of its seven domains, which include: Human Factors Engineering (HFE), Safety and Occupational Health (SOH), Habitability, Force Protection and Survivability, Manpower, Personnel, and Training

**Increment**—Militarily useful and supportable operational capability that can be effectively developed, produced, acquired, deployed, and sustained. Each increment of capability will have its own set of threshold and objective values set by the user. See Threshold Objective.

**Incremental Development**—Evolutionary acquisition process where using evolutionary acquisition the 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.

**Information Technology**—Any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency. IT includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources, including National Security Systems (NSS). It does not include any equipment that is acquired by a federal contractor incidental to a federal contract.

**Integrated Life Cycle Management (ILCM**—)**—The seamless governance, transparency, and integration of all aspects of infrastructure, resource management, and business systems necessary for successful development, acquisition, fielding, and sustainment of systems, subsystems, end items, and services to satisfy validated warfighter capability needs.

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

**Interim Contract Support (ICS)**—A temporary support method for an initial period of operation for a system, subsystem, training system, equipment, or end item.

**Joint Capability Technology Demonstration (JCTD)**—Demonstration of the military utility of a significant new technology and an assessment to clearly establish operational utility and system integrity.

**Key Performance Parameters (KPP)**—Those minimum attributes or characteristics considered most essential for an effective military capability.

**Lead Developmental Test and Evaluation Organization (LDTO)**—The lead government developmental test organization on the Integrated Test Team (ITT) that is qualified to conduct and/or be responsible for overseeing a confederation of Developmental Test and Evaluation (DT&E) organizations, each with different but necessary skills, in support of an acquisition program.

**Lead Major Command**—The command that serves as operators' interface with the PM for a system as defined by AFPD 10-9, *Lead Command Designation and Responsibilities for Weapon Systems.*

**Lead System Integrator (LSI)**—1) "Lead system integrator with system responsibility" means a prime contractor for the development or production of a major system if the prime contractor is not expected at the time of award to perform a substantial portion of the work on the system and the major subsystems, 2) "Lead system integrator without system responsibility' means a contractor under a contract for the procurement of services whose primary purpose is to perform

acquisition functions closely associated with inherently governmental functions with regard to the development or production of a major system.

**Life Cycle**—The span of time associated with a system, subsystem, or end item that begins with the conception and initial development of the requirement, continues through development, acquisition, fielding, and sustainment until the time it is either consumed in use or disposed of as being excess to all known materiel requirements.

**Life Cycle Mission Data Plan (LMDP)**—The LMDP defines specific Intelligence Mission Data requirements for a program, and becomes more detailed as the system progresses toward IOC. For each requirement, the PM should provide as much clarification as possible to explain the need and type of Intelligence Mission Data necessary for the system to perform as designed. In addition, the PM should enhance specificity as the program advances through each milestone, taking into account team feedback and lessons learned.

**Limited Rights**—Permit the Government to make internal use of data, but does not permit disclosure outside the Government except in very limited circumstances.

**Low Rate Initial Production (LRIP)**—Production of the system in the minimum quantity necessary to: provide production-configured or representative articles for operational tests; establish an initial production base for the system; and 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.

**Maintainability**—The ability 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 resources, at each prescribed level of maintenance and repair.

**Measure of Effectiveness (MOE)**—(DoD) A criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect A measure of operational success that closely relates to the objective of the mission or operation being evaluated. For example, kills per shot, probability of kill, effective range, etc. A meaningful MOE should be quantifiable and a measure to what degree that real objective is achieved. See also combat assessment; mission.

**Measure of Performance (MOP)**—(DoD) A criterion used to assess friendly actions that is tied to measuring task accomplishment. Measures of lowest level of performance representing subsets of measure of effectiveness (MOEs). Examples are speed, payload, range, time on station, frequency, or other distinctly quantifiable performance features.

**Measure of Suitability (MOS)**—A MOS typically relates to readiness or operational availability, and hence reliability, maintainability, and the item's support structure. Several MOSs and/or MOPs may be related to the achievement of a particular MOE.

**Milestone (MS)**—Major decision points that separate the phases of an acquisition process.

**Milestone Decision Authority (MDA)**—The individual designated in accordance with criteria established by the USD (A&S) to approve entry of an acquisition program into the next phase.

**Military Utility Assessment (MUA)**—A determination of how well a capability or system in question responds to a stated military need, to include a determination of its potential effectiveness and suitability in performing the mission. It is a "characterization" of the capability

or system as determined by measures of effectiveness, measures of suitability, measures of performance, and other operational considerations as indicators of military utility, as appropriate, and answers the questions, "What can it do?" and "Can it be operated and maintained by the user?"

**Mission Critical System**—System whose operational effectiveness (OE) and operational suitability (OS) are essential to successful mission completion or to aggregate residual combat capability. If this system fails, the mission most likely will not be completed. Such a system can be an auxiliary or supporting system, as well as a primary mission system.

**Modification**—For the purposes of this instruction, a modification is defined as a change to the form, fit, function, or interface (F3I) of an in-service, configuration-managed AF asset.

**Non-Developmental Item (NDI)**—Any previously developed item of supply used exclusively for governmental purposes by a Federal agency.

**Non-Standard Rights**—Also called "Special" or "Specifically Negotiated" Rights. Any rights negotiated by the contractor and agency that are different than the foregoing classes of rights and having a degree to which these are permitted depends on the particular regulations applicable to the procurement.

**Non-Technical Information Text**—Supplemental textual information, such as rights status clarification or other research information needed for clarification or expansion of original drawing information to fulfill the requirements of the completed technical data package.

**Operability**—The ability to keep a system or subsystems in a functioning and operating condition and also work together to accomplish a common task or mission - The argument could be presented that the human plays a large and important role in this specialty, as well. A non-optimized design of the human- machine interface will adversely affect this characteristic of the system.

**Operational Assessment (OA)**—An analysis of progress toward operational capabilities made by an operational test organization, 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 necessary to support full production decisions.

**Operational Capability Requirements (OCR)**—A system capability or characteristic to accomplish approved capability needs. Operational (including supportability) requirements are typically performance parameters, but they may also be derived from cost and schedule. For each parameter, an objective and threshold value should also be established.

**Operational Effectiveness (OE**—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.

**Operational Safety**—The condition of having acceptable risk to life, health, property, and environment caused by a system or end-item when employing that system or end-item in an

operational environment. This requires the identification of hazards, assessment of risk, implementation of mitigating measures, and acceptance of residual risk in accordance with the process in MIL-STD-882.

**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, natural environmental effects and impacts, documentation, and training requirements.

**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. 2) Testing and evaluation conducted in as realistic an operational environment as possible to estimate the prospective system's operational effectiveness, suitability, and operational capabilities. 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.

**Organic**—Logistics support provided by Government-owned material/ equipment/ facilities and Government personnel.

**Original Design Activity**—The design activity originally responsible for the design and identification of an item whose drawing number and activity identification is shown in the title block of the drawings and associated documents. (ASME Y14.100)

**Performance Based Contracting**—Structuring all aspects of an acquisition around the purpose of the work to be performed with the contract requirements set forth, in clear, specific, and objective terms with measurable outcomes as opposed to either the manner by which the work is to be performed or by broad and imprecise statements of work.

**Performance Based Agreement (PBA)**—An agreement between organic entities to delineate measurable performance outcomes that correspond to support requirements and the resources to achieve both. PBAs are to support established performance baselines and define required metrics necessary to achieve the performance requirements. They may be used as a basis for support arrangements or contracts and as a tool to ensure accountability in meeting requirements by defining the expectations, range of support requirements, and roles and responsibilities.

**Performance Based Logistics (PBL)**—Product support strategy where PM develops and implements strategies that optimize total system availability while minimizing cost and logistics footprints. Trade-off decisions involving cost, useful service, and effectiveness should consider corrosion prevention and mitigation. Sustainment strategies should include the best use of public and private sector capabilities through government/industry partnering initiatives, in accordance with statutory requirements.

**Personnel Survivability**—The area of survivability which consists of those system design features that reduce the risk of fratricide, detection, and the probability of being attacked; and that enable the crew to withstand man-made hostile environments without aborting the mission or suffering acute chronic illness, disability, or death.

**Pre-Operational Support (POS)**—Support for test and evaluation efforts, system risk reduction and demonstration, production readiness or other temporary periods during the acquisition or modification of a system, equipment or end item.

**Product Group Manager (PGM)**—Designated individual for overall management of a specified product group; includes responsibility for cost, schedule and performance aspects along with the sustainment elements of the group's products. PGMs should support overall system objectives as required by the PM. The PGM is not a DoDD 5000.01 PM of an acquisition program unless assigned separately and in accordance with guidance on assigning PMs.

**Product Support Manager**—The individual responsible for managing the package of support functions required to field and maintain the readiness and operational capability of major weapon systems, subsystems, and components, including all functions related to weapon system readiness, in support of the PM's life cycle management responsibilities.

**Product Support Strategy**—The planning and directing for effective integrated logistics support throughout the life cycle of a weapon system that will maximize system capabilities, reduce the logistics footprint, minimize total system sustainment cost, and satisfy the requirements of the warfighter.

**Program**—Systems, subsystems, end items, services, or activities on the AF Acquisition Master List (AML), weapon or business system in sustainment, weapon systems designated in AFPD 10-9 (*Lead Command Designation and Responsibilities for Weapon Systems)*, or identified as Services Category activities.

**Program Executive Officer (PEO)**—The individual dedicated to executive management and supervision of a portfolio of mission-related ACAT and selected programs. The PEO is accountable to the SAE.

**Program Manager (PM)**—The DoDD 5000.01 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 for acquisition programs should be accountable for credible cost, schedule, performance, and materiel readiness to the MDA. ACAT I, ACAT IA, and ACAT II PM should be appointed by the SAE and the PEO. Delegated ACAT II and III PM should be appointed by the PEO. The PM for sustainment programs should be accountable for credible cost, schedule, performance, and materiel readiness to the AFMC/CC or designee.

**Program Protection Plan (PPP)**—PMs employ system security engineering practices to prepare the principal document that identifies a system's critical program elements, assets, (critical program information (CPI) and critical components), threats, and vulnerabilities throughout the system's life cycle, the PPP. Program protection is a comprehensive effort that encompasses the security, technology transfer, intelligence, and counterintelligence processes through the integration of embedded system security processes, security manpower, equipment and facilities. It is the integrating process for managing risks to AF warfighting capability from foreign intelligence collection; from hardware, software, and cyber vulnerability or supply chain exploitation; and from battlefield loss throughout the system life cycle. Program protection procedures and program protection planning throughout the life cycle are discussed in detail in DAFPAM 63-113, *Program Protection Planning for Life Cycle Management*. Also see DoDI 5000.02T.

**Programmatic Environment, Safety, and Occupational Health (ESOH) Evaluation (PESHE)**—A required program office document that describes the PM's strategy for integrating across the ESOH disciplines and into systems engineering using a MIL-STD-882 System Safety methodology; provides a repository for ESOH risk data; provides a method for tracking progress; and includes a compliance schedule for appropriate portions of Occupational Safety and Health Administration (OSHA) (29CFR §1910 and §1926), National Environmental Protection Act (NEPA) (42 USC §4321), Environmental Impact Assessment Program (EIAP) (32 CFR 989), and Executive Order 12114 (*Environmental Effects Abroad of Major Federal Actions)*. The PESHE is developed for MS B, and updated for MS C, for the Full-Rate Production Decision Review/Full Deployment Decision Review, and as required throughout the life of the program.

**Prototype**—A model suitable for evaluation of design, performance, and production potential. *Note:* The AF 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.

**Public-Private Partnership (P-PP)**—A cooperative arrangement between a depot-level maintenance activity and one or more private-sector entities to perform DoD or defense-related work, utilizing DoD personnel, facilities and equipment. Reference Title 10 U.S.C. 2474.

**Real Property Installed Equipment (RPIE)**—Equipment permanently installed in or attached to buildings or structures that becomes part of the real property. It includes: Heating, Ventilation, and Air Conditioning systems (HVAC), elevators, fume hoods, exhaust systems, etc.

**Relative Environment**—The specific subset of the operational environment required to demonstrate critical "at risk" aspects of the final product performance in an operational environment. It is an environment that focuses specifically on stressing the technology in question. Not all systems, sub-systems, and/or components need to be operated in the operational environment in order to satisfactorily address performance margin requirements. **Note**: A relevant environment is required for Technology Readiness Levels 5 and 6.

**Release Activity**—The activity responsible for ensuring all required administrative actions accomplished before a drawing is released.

**Reliability**—The ability of a system and its parts to perform its mission without failure, degradation, or demand on the support system.

**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. 1, Budget Guidance and Procedures) **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.

**Restricted Rights**—These apply only to computer software and generally restrict the Government's use to a single computer per copy of software, and prohibit all but backup or archival copies.

**Revision**—Any change to an original drawing which requires the revision level to be advanced. (ASME Y14.35M)

**Safety**—Freedom from conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

**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 users 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.

**Senior Procurement Executive (SPE)**—The SPE is the individual responsible for management and direction of the procurement system including implementation of the unique procurement policies, regulations, and standards of the AF. The SPE under 41 USC §414 is the Assistant Secretary of the Air Force (Acquisition) (SAF/AQ) as delegated. Delegation is contained in the HAF Mission Directive 1-10, Assistant Secretary of the Air Force (Acquisition), 08 Apr 2009 and SECAF memo 21 Aug 06, Air Force Acquisition Authorities and Responsibilities.

**Service Acquisition Executive (SAE)**—The SAE is the individual responsible for the development of programs to meet defined needs, and as such develops, coordinates, and integrates plans, policy, and programs for systems and the acquisition of AF programs. The SAE for AF programs is the Assistant Secretary of the Air Force (Acquisition) (SAF/AQ) as delegated by the Secretary of the Air Force (SECAF); authority remains with the SECAF if not delegated. Delegation is contained in the HAF Mission Directive 1-10, Assistant Secretary of the Air Force (Acquisition), 08 Apr 2009 and HAF Mission Directive 1-2, Undersecretary of the Air Force, 08 Sep 2008.

**Software Maintenance**—Those activities necessary to correct errors in the software; add incremental capability improvements (or delete unneeded features) through software changes; and adapt software to retain compatibility with hardware or with other systems with which the software interfaces. Software maintenance comprises software maintenance performed on military materiel (e.g. weapon systems and components, space control systems and components, automated test equipment and test package sets, and systems integration laboratories).

**Source of Repair (SOR)**—An industrial complex (organic, commercial contract, or inter-service facility) with required technical capabilities to accomplish repair, overhaul modification, or restoration of specific types of military hardware or software.

**Source of Repair Assignment (SORA)**—A part of the total Depot Source of Repair (DSOR). It is the primary process by which the AF postures its depot level workloads for both hardware and software. It applies to both new acquisition and fielded programs.

**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.

**Stakeholders**—Individual or organizational entities (users, developers, acquirers, technologists, testers, budget analysts, sustainers, and industry) that are, or will be, associated with implementing and supporting the associated system, subsystem, or end-item capability requirements.

**Standard Commercial License Rights**—Rights provided by the contractor in a license that accompanies commercial software. In most contexts, the Government is obligated to abide by the commercial license accompanying commercial software.

**Supply Chain Management**—Meeting customer-driven materiel requirements through the acquisition, maintenance, transportation, storage, and delivery of materiel to customers, and managing materiel returns, movement of reparable materiel to and from maintenance facilities, and ensuring the exchange of information among customers, maintainers, supply chain managers, and suppliers.

**Supply Chain Risk Management**—A systematic management process identifying susceptibilities, vulnerabilities and threats throughout DoD's "supply chain" and development of mitigation strategies to combat those threats whether presented by the supplier, the supplied product and its subcomponents, or the supply chain (e.g., initial production, packaging, handling, storage, transport, mission operation and disposal).

**Support Equipment/Automatic Test Systems (SE/ATS)**—Equipment required to make a system, end item or facility operational in its intended environment. It includes: aeronautical/ground equipment e.g., maintenance stands, electrical generators, servicing carts, etc.; test measurement diagnostic equipment (TMDE) e.g., automatic test equipment (ATE), oscilloscopes, multimeters, etc.; tools e.g., torque wrenches, manufactured jigs, borescopes, etc.; and automatic test systems (ATS) e.g., ATE, test program sets (TPSs), and interface test adapters (ITAs).

**Support Equipment Family**—Support equipment that is interoperable and has the capability to support a variety of weapon system requirements through flexible hardware or software architectures that permit addition or expansion of capability with minimal impact to the support equipment logistics support profile.

**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.

**Survivability**—The ability of a system, subsystem, component, or equipment to withstand the effects of adverse environmental conditions such as battle damage, Chemical, Biological, Radiological, and Nuclear warfare, weather, or Acts of God that could otherwise render the ship, aircraft, or weapon system unusable or unable to carry out its designed function. Survivability also enables rapid restoration of the system, subsystem, component, or equipment to increase the sustainability of the war-fighting operations. A survivability analysis, accomplished early in the acquisition phase, influences the design and identifies additional support resources required to maintain system readiness.

**Sustainability**—The ability to maintain the necessary level and duration of operational activity to achieve military objectives – Sustainability is a function of providing for and maintaining those levels of ready forces, materiel, and consumables necessary to support military effort.

**Sustainment**—Continuing materiel support which consists of the planning, programming, and execution of a logistics support strategy for a system, subsystem, or major end item to maintain operational capabilities from system fielding through disposal.

**System**—Any organized assembly of resources and procedures united and regulated by interaction or interdependence to perform a set of specific functions.

**System of Systems (SoS)**—A set or arrangement of interdependent systems that are related or connected to provide a given capability. The loss of any part of the system could significantly degrade the performance or capabilities of the whole. The development of an SoS solution will involve trade space between the systems as well as within an individual system performance.

**System Training Plan (STP)**—An iterative planning document that defines the justification, design, development, funding, resources, support, modification, operation, and management of a Training System. The STP is designed to provide for planning and implementation of training and to make sure all resources and supporting actions required for establishment and support are considered. The STP may be a stand-alone document or part of a Life Cycle Management Plan (AS) or other appropriate planning document when LCMP is not required. All references to the STP in this document incorporate the possibility that the intended documentation may be part of a AS.

**Systems Engineering (SE)**—An interdisciplinary approach encompassing the entire set of scientific, technical, and management efforts needed to conceive, evolve, verify, deploy, and support an integrated and life cycle balanced set of system solutions that satisfy customer needs. Systems engineering, through technical and management processes, addresses architectures; requirements development; design; technical management; test and evaluation; verification and validation; operational safety, suitability, and effectiveness (OSS&E); environment, safety, and occupational health (ESOH); (system safety); and human systems integration. These fundamental elements are accomplished on all development, acquisition, and sustainment activities to develop a relevant technical knowledge base that is matured, maintained, and transferred in a disciplined manner.

**Tailoring**—The manner in which certain core issues (program definition, program structure, program design, program assessments, and periodic reporting) are addressed in a particular program. The Milestone Decision Authority (MDA) seeks to minimize the time it takes to satisfy an identified need consistent with common sense, sound business management practice, applicable laws and regulations, and the time sensitive nature of the requirement itself. Tailoring may be applied to various aspects of the acquisition process, including program documentation, acquisition phases, the time and scope of decision reviews, Supportability Analysis, and decisions levels consistent with all applicable statutory requirements.

**Technical Data**—Information, regardless of the form or method of the recording, of a scientific or technical nature, including computer software documentation. It includes information required for the design, development, production, manufacture, assembly, operation, training, testing, repair, maintenance, or modification of defense articles. Relative to software it includes information on system functional design, logic flow, algorithms, application programs, operating systems, and support software for design, implementation, test operation, diagnosis, and repair. It does not include computer software or data incidental to contract administration or general scientific, mathematical, or engineering principles commonly taught in schools, or information in the public domain.

**Technical order (TO)**—AF procedures developed or acquired for performance of organic operation, maintenance, inspection, modification, or management (exclusive of administrative procedures) of centrally-acquired and managed AF systems or commodities. TOs include paper and digital media developed to Technical Manual Specifications and Standards (TMSS), contractor-developed manuals adopted for AF use, and approved commercial-off-the-shelf (COTS) manuals. The term "Technical Order (TO)" is equivalent to the DoD term "Technical Manual (TM)."

**Technology Readiness Assessment (TRA)**—A systematic, metrics-based process and accompanying report that assesses the maturity of Critical Technology Elements (CTE) used in systems. The resulting TRA report details how the CTEs are identified, why they are important to the program, and a program-independent assessment of maturity. The TRA also provides supporting information for the Title 10 (§2366b) Milestone Decision Authority certification that the technology in the program has been demonstrated in a relevant environment for major defense acquisition programs (MDAP) prior to Milestone B approval.

**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)**—A document detailing 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 critical operational issues (COIs); critical technical parameters; objectives and thresholds documented in the requirements document; and Milestone decision points. The TEMP may be included in an AS as a T&E annex.

**Test and Evaluation Strategy**—The overarching integrated T&E outline 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.

**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.

**Total Contract Training (TCT)**—A contractor support (CS) method to provide a contractor-operated performance-based training system.

**Total Ownership Cost (TOC)**—Total ownership cost encompasses all cost associated with development, production, operations, support, and disposal of a weapon system.

**Training Devices**—Aircrew training systems, maintenance training systems, ground based training systems, training devices for mission command and control, training equipment, range/scoring systems, maintenance trainers, physiological/aeromedical and treatment devices, space and missile training devices/systems, etc., which provide individual training for personnel assigned as pilots, navigators, radar operators, flight engineers, maintenance personnel, boom operators, load masters, gunners, and/or crew training in aspects of the operational mission. The term "training devices" does not include trainer aircraft.

**Training Planning Team (TPT)**—Responsible accomplishing the Training System Requirements Analysis (TSRA) and then documenting training requirements for inclusion in the Acquisition Strategy (AS) or the System Training Plan (STP). It is recommended that TPT meetings will be held annually. This meeting will maintain and document training system quality and concurrency with the operational system. The TPT should be established and operational before the system acquisition strategy is developed, as early as Milestone A (Defense Acquisition Board); the acquisition strategy will be coordinated by the TPT Chair.

**Training System Requirements Analysis (TSRA)**—The TSRA is a formal and systematic front-end analysis of the weapon system to determine training system requirements and provides alternative solutions for a training system acquisition or modification. The TSRA uses the Instructional System Development (ISD) process and supportability analyses to address total training requirements (training hardware, software, facilities, instructional media, etc.) throughout the life cycle of the weapon system being defined.

**Unlimited Rights**—Permits the Government to use technical data and computer software without and limits whatsoever, including offering the data to other companies for competition with the owner of the data or software in the commercial marketplace as well as in the Government marketplace.

**Validated Needs**—Capability objectives identified and approved by the capability based planning (CBP) process, or requirements development within the CBP process.

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

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

**Vulnerability**—The characteristics 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. Vulnerability in an information system is a weakness in system security procedures, internal controls, or implementation that could be exploited.

**Warfighter**—An individual or organization who executes military force or is responsible for making operational decisions that result in the use of military force. The term includes field level

personnel assigned to an Air and Space Expeditionary Force (AEF) whose duties support AF core competencies and distinctive capabilities.

**Weapon System**—A combination of elements that function together to produce the capabilities required for fulfilling a mission need, including hardware, equipment, software, and all performance based logistics (PBL) sustainment elements, but excluding construction or other improvements to real property.

**XR**—Term used to describe the Developmental Planning/Capability Planning/Requirement Directorates located at the product centers.

*Websites*—*Note: Some websites require Air Force Portal sign-on or membership to gain access.*

United States Code (main search page): https://www.govinfo.gov/features/uscode-2018
DoD Issuances: http://www.dtic.mil/whs/directives/index.html
Defense Acquisition Guidebook (formerly DoD 5000.2-R): https://www.dau.edu/tools/dag
Federal Acquisition Regulation : https://www.acquisition.gov/browse/index/far AFFARS: https://www.acquisition.gov/affars
*Acquisition Community Connection:* www.dau.edu/training/career-development/logistics/blog/Defense-Acquisition-Portal-(DAP)-and-Acommunity-Community-Portal(ACC)
https://www.dau.edu/cop/log/Pages /Default.aspx
https://www.dau.edu/cop/log/Pages/Topics/12%20Integrated%20Product%20Support%20IPS%20Elements.aspx
Air Force e-Publishing website: http://www.e-publishing.af.mil/
Air Force Privacy Office: https://www.privacy.af.mil/
Air Force Records Disposition Schedule (RDS): in the Air Force Portal> AFRIMS (AF Records Management System > RDS
AFPEO/CM website: https://ww3.safaq.hq.af.mil/organizations/peo/*Defense Logistics Information Service Commercial and Government Entity (CAGE) Code*:
https://cage.dla.mil/Home/UsageAgree
DFARS: https://www.acq.osd.mil/dpap/dars/dfarspgi/current/index.html
DoD Anti-Tamper website: https://at.dod.mil/
DoD ATS Executive Directorate: https://www.acq.osd.mil/ats/
*DOD Guidance on Using Incentive and Other Contract Types:*
https://www.acq.osd.mil/dpap/cpic/cp/guidance_on_using_incentive_and_other_contract_types.html
*DoD Corrosion and Prevention Guidebook (Home - CorrDefense):*
https://apps.dtic.mil/dtic/tr/fulltext/u2/a606227.pdf /
DoD Diminishing Manufacturing Sources and Material Shortages (DMSMS) Guidebook:
https://www.dmea.osd.mil/docs/sd22dmsms_Guidebook.pdf
*DoD Financial Management Regulation (FMR)*: https://comptroller.defense.gov/FMR.aspx
DISA GIG Technical Guidance Federation: https://gtg.csd.disa.mil
Defense Pricing and Contracting (DPC): http://www.acq.osd.mil/dpap/pdi/uid/guides.html
http://www.acq.osd.mil/dpap/sitemap.html
Earned Value Management: https://www.acq.osd.mil/evm/#/home
JCTD webpage: http://acqnotes.com/acqnote/acquisitions/joint-capability-technology-demonstration

Military Engineering Data Asset Locator System (MEDALS):
https://public.logisticsinformationservice.dla.mil/PublicHome/MEDALS/default.aspx
*Office of Management and Budget Circular A-11, Part 7*: https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf
OSD IUID Website: http://www.acq.osd.mil/dpap/pdi/uid/index.html
Department of Defense Risk, Issue, and Opportunity Management Guide for DoD Acquisition
Programs: http://acqnotes.com/wp-content/uploads/2017/07/DoD-Risk-Issue-and-Opportunity-Management-Guide-Jan-2017.pdf
SAF/AQ Sharepoint Site: https://cs2.eis.af.mil/sites/10263/default.aspxWide Area Workflow
(WAWF) process: https://wawf.eb.mil/piee-landing/

**Attachment 2**

**HSI-RELATED STANDARDS, HANDBOOKS, AND DIDS; SAMPLE HSI CHECKLISTS; AND KEY HSI-RELATED TERMS**

**A2.1.  Human System Integration Tables and Checklists. Table 2.1** provides a list of Human System Integration (HSI) related standards, handbooks, and DIDs.

**Table A2.1.  HSI-Related Standards, Handbooks, and DIDs.**

| Sample HSI and HIS DIDs | |
|---|---|
| **Title** | **Item** |
| **HSI in Systems Engineering** | |
| System Engineering Management Plan (SEMP) | DI SESS-81785 |
| **Human Systems Integration** | |
| Human Systems Integration Program Plan (HSIPP) | DI-HFAC-81743 |
| Human Systems Integration Report (HSIR) | DI-HFAC-81883 |
| Standard Practice for Human Systems Integration | SAE 6906 |
| **Manpower and Personnel** | |
| Logistics Product Data Summaries | DI-SESS-81759 |
| **Training** | |
| Training Situation Document | DI-SESS-81517 |
| Instructional Performance Requirements Document | DI-SESS-81518 |
| Instructional Media Requirements Document | DI-SESS-81519 |
| Instructional Media Design Packages | DI-SESS-81520 |
| Training Program Structured Document | DI-SESS-81521 |
| Course Conduct Information Package | DI-SESS-81522 |
| Training Conduct Support Document | DI-SESS-81523 |
| Training Evaluation Document | DI-SESS-81524 |
| Test Package | DI-SESS-81525 |
| Instructional Media Package | DI-SESS-81526 |
| Training System Support Document | DI-SESS-81527 |
| **Human Factors Engineering** | |
| DoD Design Criteria Standard Human Engineering | MIL-STD-1472 |
| DoD Standard Practice for Human Engineering Requirements for Military Systems, Equipment, and Facilities | MIL-STD-46855 |
| Human Engineering Simulation Concept (HESC) | DI-HFAC-80742 |
| Human Engineering Test Plan (HETP) | DI-HFAC-80743 |
| Human Engineering Test Report (HETR) | DI-HFAC-80744 |
| Human Engineering System Analysis Report (HESAR) | DI-HFAC-80745 |
| Human Engineering Design Approach Document – Operator (HEDAD-O) | DI-HFAC-80746 |
| Human Engineering Design Approach Document – Maintainer (HEDAD-M) | DI-HFAC-80747 |
| Human Engineering Program Plan (HEPP) | DI-HFAC-81742 |
| Annel (Metric) | DoD-HDBK-743 |
| Definitions of Human Factors Terms | MIL-HDBK-1908 |

| | |
|---|---|
| Anthropometry of U.S. Military Person | MIL-HDBK-743 |
| Electronic Reliability Design Handbook | MIL-HDBK-338 |
| Designing and Developing Maintainable Products and Systems | MIL-HDBK-338 |
| **Capabilities Based Assessment** | |
| Environmental Engineering Considerations and Laboratory Tests | MIL-STD-810 |
| DoD Standard Practice for Systems Safety | MIL-STD-882 |
| Safety Design Requirements for Military Lasers and Associated Support Equipment | MIL-STD-1425 |
| Electroexplosive Subsystem Safety Requirements and Test Methods for Space Systems | MIL-STD-1576 |
| Ammunition Data Card | DI-MISC-80043 |
| System Safety Hazard Analysis Report | DI-SAFT-80101 |
| Safety Assessment Report | DI-SAFT-80102 |
| Engineering Change Proposal System Safety Report | DI-SAFT-80103 |
| Waiver or Deviation System Safety Report | DI-SAFT-80104 |
| System Safety Program Progress Report | DI-SAFT-80105 |
| Health Hazard Assessment Report (HHAR) | DI-SAFT-80106 |
| Radiation Hazard Control Procedures | DI-SAFT-80184 |
| Safety Engineering Analysis Report | DI-MISC-80370 |
| Safety Studies Plan | DI-SAFT-81066 |
| Threat Hazard Assessment | DI-SAFT-81124 |
| Hazard Assessment Test Report | DI-SAFT-81125 |
| Vibration Test Data | DI-SAFT-81128 |
| Explosive Hazard Classification Data | DI-SAFT-81299 |
| Mishap Risk Assessment Report | DI-SAFT-81300 |
| Hazardous Material Management Program (HMMP) Report | DI-MISC-81397 |
| Hazardous Materials Management Program (HMMP) Plan | DI-MGMT-81398 |
| Ozone Depleting Substance (ODS) Plan | DI-MISC-81479 |
| Failure Mode, Effects, Criticality Analysis Report | DI-SESS-81495 |
| System Safety Program Plan (SSPP) | DI-SAFT-81626 |
| Explosive Ordinance Disposal Data | DI-SAFT-80931 |
| Safety Studies Report | DI-SAFT-81065 |
| **Force Protection and Survivability** | |
| Currently no dedicated DIDs or standards | |
| **Habitability** | |
| Color Coordination Manual(s) for Habitability Spaces | DI-MISC-81123 |
| **Multi-purpose** | |
| Technical Report – Study Services | DI-MISC-80508 |

**Table A2.2.  Sample HSI Checklist (by Phase).**

| **Capabilities Based Assessment** |
|---|
| Draft an initial Target Audience Description for the populations expected to operate, maintain, sustain, and  train the capability |

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| Document the analyses needed to identify the human related impacts on operational performance for each potential materiel solution |
| Review the CONOPS and Operational Concepts for new and existing tactics and doctrine that may influence capability design and human related requirements |
| Review the projected threat environment for potential new threats and the impact they may have on crew survivability |
| **Materiel Solutions Analysis** |
| Support IPTs to incorporate a comprehensive set of human centered requirements into the design at the outset |
| Integrate requirements from the ICD into the AoA process |
| Review historical information from similar predecessor systems to identify potential HSI issues and recommend improvement points. |
| Ensure all HSI drivers of the concept definition are identified, captured and managed as an integral human centered design effort |
| Define and relate human performance to: capability needs, the updated CONOPS, and emerging system architecture views. |
| Develop HSI plan |
| Provide HSI inputs to SEP, TEMP, LCSP, SOO/SOW/PWS/RFP/RFI, draft CDD |
| Assess and document derived human related requirements at the system performance level |
| Establish a process for identification, tracking and mitigation of human related risks into the program's risk management activities |
| Analyze human related implications of critical performance elements of the alternative materiel solutions |
| Determine costs associated with HSI support through the system life cycle and ensure these costs are included in cost estimates |
| Support identification and allocation of functions and tasks to humans and automation |
| Support identification of preliminary environment, safety and occupational health risks/issues for materiel solution alternatives |
| Plan and execute modeling and simulation activities, to include mock-ups, prototypes and other simulations, to address human-related risks |
| **Technology Maturation & Risk Reduction** |
| Assess human readiness/suitability of potential critical technology assets and identify the human/system performance impacts if a technology item is unavailable |
| Support IPTs/WGs to develop a comprehensive design that incorporates human centered requirements and participate in trade-off decisions. |
| Ensure contractor HSI activities/tasks (e.g. HSIPP, HSI evaluations and studies) are included in SOW/SOO/PWS and RFI/RFP. |
| Establish HSI related measures for use in system test activities |
| Plan / participate in the execution of modeling and simulation activities, to include mock-ups, prototypes and other simulations, to address human-related risks |
| Participate in engineering trade studies to ensure human capabilities/limitations and impacts on operational performance are included in decisions and documentation |
| Ensure that human related risks are included in the comprehensive risk assessment |

| Identify human related system performance attributes and develop HSI-related requirements for inclusion of these attributes in requirements documents; ensure appropriate translation/derivation into in any/all system or subsystem performance specifications |
| --- |
| Analyze all identified subsystem human interfaces to establish performance and design requirements |
| Develop a plan for ensuring continuity of user/representation of Target Audience throughout the acquisition life cycle |
| Participate in prototype testing and performance criteria refinement |
| Update HSI planning and inputs to SEP, TEMP, LCSP, manpower estimates, cost and risk planning; participate in technical/design reviews |
| **Engineering & Manufacturing Development** |
| Provide support to Program IPTs to ensure human considerations are included in design analyses and decision making. Refine design concepts for optimizing human performance, especially human interfaces with hardware and software. Consider maintainers and other support personnel in this activity. |
| Refine training requirements as system design matures and provide input to Training System Plan |
| Support efforts to update hazard and risk analysis and identify the impacts of those to the HSI domains |
| Ensure HSI-critical design specifications are included in requirements tracking system and detailed design specifications |
| Plan for and support DT&E/OT&E/FOT&E activities to ensure the impact of human capabilities and limitations on operational performance are captured and measured effectively |
| Refine human related requirements which have significant impact on Total Life Cycle costs, including manpower, training and safety/hazard mitigation requirements |
| Ensure requirements for all personnel groups who interact with the system are considered in system/subsystem specifications |
| Participate in DT&E, and operational assessments of the system's ability to meet HSI-related requirements and roll up assessments into the program risk management process |
| Plan for and execute transition of HSI-related system elements (training requirements, hazard mitigation measures, etc.) from acquisition community to user community |
| Review contractor deliverables for adequacy of HSI implementation and performance of HSI-related evaluations and studies. |
| Update HSI planning and inputs to SEP, TEMP, LCSP, manpower estimates, cost and risk planning; participate in technical/design reviews |
| **Production & Deployment** |
| Support development and implementation of training programs and devices |
| Participate in operational, maintenance, and sustainment assessments of the system's ability to meet HSI-related requirements and roll up assessments into the program risk management process |

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|---|
| Analyze any operational deficiencies in the system's ability to meet HSI-related requirements to help determine and assess corrective actions. Include these deficiencies in risk management activities |
| Capture relevant lessons learned from IOT&E and LFT&E and catalogue for use in future modification or system development efforts |
| Update HSI planning and inputs to SEP, TEMP, LCSP, manpower estimates, cost and risk planning; participate in technical/design reviews |
| **Operations & Support** |
| Participate in system safety/incident reviews to identify human related root causes |
| Evaluate test results for HSI implications and to determine the effectiveness of design decisions and risk mitigation measures |
| Monitor engineering change proposals and modification plans to mitigate unintended consequences between all HSI domains |
| Capture relevant lessons learned from follow on testing and catalogue for use in future modification or system development efforts |
| Participate in the disposal decisions |

**Table A2.3.  Sample HSI Checklist (by Domain).**

| |
|---|
| **Manpower** |
| 1. Is there a legacy system to use as a manpower baseline? |
| 2. Do the manpower levels need to be constrained to the same level as the predecessor |
| 3. Will the manpower mix (military, civilian, contractors) change significantly? |
| 4. Is there a mandate to optimize or reduce manpower authorizations? |
| 5. Have manpower authorizations been justified and/or modified to meet mission needs, to include full range of military operations (ROMO)? |
| 6. Will an increase in end-strength be required? |
| 7. What are the end-strength offsets? |
| 8. Approximately how many authorizations will it take to operate, maintain, train and support the full capability? (Full capability includes all operational and maintenance [local and remote] components.) |
| 9. What manpower estimate was used for the affordability assessment? |
| 10. How does the manpower estimate compare to current requirements and authorizations? |
| 11. How much could manpower grow before it would impact the affordability decision? |
| 12. If the manpower estimate is greater than authorizations, what is the resource sponsor's position regarding funding? |
| **Personnel** |
| 1. Are there any current or projected recruiting, retention, and/or career development issues for the personnel who are most likely to be required to operate, maintain, and support the |
| 2. Are there any current or projected pay/bonus/incentives required for the personnel communities who are most likely to be required to man the capability? Does this affect cost estimates and affordability assessments? |
| 3. Are there any career path implications based on manning concepts being considered? |

| 4. Are there any implications for rotation, deployed time, turnover/detailing based on the manning strategy discussed? |
| 5. Will significantly new skill sets, knowledge bases, and abilities be required to support the capability? |
| 6. Is there a need for increased experience or pay grades? |
| 7. Is there a desire and/or need for unique combinations of skill sets, knowledge bases, and abilities? |
| 8. Are the skill sets, knowledge base, and abilities required by the new capability projected to be available in sufficient numbers in the timeframe required? |
| 9. Are there any known or projected changes to gender mix, cognitive abilities, physical characteristics, psychomotor skills, and/or experience level? |
| 10. Does the materiel solution take into account the projected personnel pool? |
| 11. Does the materiel solution require a change in the Air Force Specialty Code (AFSC) structure? See AFI 36-2101, *Classifying Military Personnel (Officer and Enlisted)*. |
| 12. Are new AFSCs required? Can the AFSCs be combined? |
| 13. Are current accession screening methods (i.e., ASVAB) sufficient to ensure the new capability can be operated, maintained, and supported? |
| **Training** |
| 1. Was any part of the capability gap related to human performance or training deficiencies? |
| 2. Could temporary or interim training be implemented to partially satisfy the capability gap, and/or improve mission performance with current systems until the proposed materiel solution can be developed and deployed? |
| 3. Will deployment/employment of the new capability change tactics and decision-making? Will changes in either individual or team training be required to address the change to tactics and/or decision–making? |
| 4. Will the training cover all aspects of personnel including operations, maintenance and |
| 5. Has the crew been tested for preliminary workload estimates in visual, auditory, motor, and cognitive capacity? Do they meet requirements? |
| 6. Is there any new training needed to address unique combinations of skill sets, knowledge bases, and abilities, such as that required for new AFSC, changes to existing AFSCs? |
| 7. Will there be sufficient time to adjust and implement required changes to training? |
| 8. Have total system operational performance, support, or life cycle cost objectives and thresholds been defined? |
| 9. Will the materiel solution change who is to be trained (Active Duty, Air Force Reserve, Air National Guard, Civilian, or Contractor)? |
| 10. Will the materiel solution change who is to conduct the training (Government, |
| 11. Will the materiel solution change where the training is conducted (Contractor Facilities, AF Technical Centers)? |
| 12. Will the materiel solution impact the timing of the training (Duration, Availability)? Does this affect cost estimates and affordability assessments? |
| 13. Will the materiel solution change the method of training used (Classroom, Computer-based, On-the-job)? |
| **Human Factors Engineering** |

| |
|---|
| 1. Does the materiel solution being discussed present any significant challenges, implications or constraints in the following areas:<br><br>Work/living space System or display integration<br><br>Operability/Maintainability Anthropometry/Ergonomics Automation/Human machine teaming<br><br>Ambient environment |
| 2. Does the materiel solution require a new system interface or modification to an existing interface? |
| 3. Does the materiel solution require new forms of collaboration between humans and/or across systems? |
| 4. Are there new lighting conditions? (night, all weather) |
| 5. Is there special gear required that may impact task performance (Mission Oriented Protective Posture (MOPP) Gear, Cold Weather Gear)? |
| 6. Are there human factors manpower or personnel issues that may impact the system interfaces? |
| 7. Will new technology impact the interface (Automation, Aiding)? |
| 8. Will a new task analysis or critical task analysis be accomplished? Does the materiel solution require the performance of additional tasks? |
| 9. Are there specific performance thresholds and objectives that impact mission outcome? |
| 10. Are there time limitations for task accomplishment? |
| 11. Are there accuracy requirements for task accomplishment? Will the design minimize critical errors? |
| **Safety and Occupational Health** |
| 1. Has a safety risk assessment been completed? |
| 2. Have safety risks concerning power sources been considered? Electrical<br><br>Mechanical Hydraulics/Pneumatics Chemical/explosive/propellants |
| 3. Look for safety risks associated with: Exposed, moving equipment<br><br>Radio Frequency (RF)/Microwave (MW) antenna Hazardous materials or by-products<br><br>Combustion processes High temperature devices Vehicular movement/flight Gun systems<br><br>Missile systems |

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| 4. Ensure design requirement statements have been developed to address/prevent the impact of: Catastrophic loss of materiel system or Airman due to failure/malfunction of component or procedural error/omission<br><br>Operational loss of system or disabling injury due to failure/malfunction of component or procedural error/omission<br><br>Loss of system effectiveness or injury due to failure/malfunction of component or |
| 5. Is the system safe to operate, maintain, repair, and support? |
| 6. What types of Hazardous Materials (HAZMAT) will be required for Operations and Maintenance? Can these be substituted and/or eliminated? |
| 7. What are the anticipated air emissions from the system? Can they be reduced? |
| 8. What are the anticipated hazardous waste streams? Can they be recycled and/or |
| 9. What are the noise levels for the system? Can they be reduced? |
| 10. If HAZMAT and Waste cannot be eliminated then there will be additional training requirements for use, handling, storage and disposal. |
| 11. What are the system demilitarization and disposal requirements? Will this process generate waste with special handling/disposal requirements? |
| 12. Does this system meet the standards for steady state noise under the most severe operational and maintenance scenarios? |
| 13. Does this system meet the standards for impulse noise under the most severe operational and maintenance scenarios? |
| 14. Does this system meet the standards for blast overpressure under the most severe operational and maintenance scenarios? |
| 15. Does the system configuration preclude exposure of personnel to microorganisms, their toxins and enzymes? |
| 16. Does this system produce or release any toxic substance during maintenance and |
| 17. Are personnel exposed to unacceptable levels of gases/vapors/fumes generated by the operation? |
| 18. Are there any unacceptable levels of toxic gases in the crew compartment when the vehicle is operating and/or during weapons firing? |
| 19. Will any materials used decompose or react under extreme heat (pyrolytic) or in the presence of another substance to produce toxic fumes, gases, or vapors? |
| 20. Is the crew effectively/adequately protected against Nuclear, Biological, and Chemical agents? |
| 21. Has each chemical or toxic material used in or with the system been identified in the health hazard assessment report? |
| 22. Does a hazard from exposure to anything within the system exist? |
| 23. Are personnel adequately protected from fire extinguishing agents? |
| 24. Do hazards from excessive dust in crew compartments exist? |
| 25. Have fire-related hazards been addressed, such as fire prevention, smoke generation and toxicity, smoke clearance and the use of fire retardant materials? |
| 26. Is there any potential for an oxygen deficient atmosphere in occupied spaces or compartments? |

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| 27. Will occupied spaces contain Halon 1301 automatic fire extinguishing systems that comply with Office of the Surgeon General (OTSG) and National Fire Protection Association (NFPA) requirements? |
| 28. Are there hazards or potential hazardous exposures from ionizing and non-ionizing radiation sources during operation training, and maintenance? |
| 29. Does the system contain any lasers detrimental to health? |
| 30. Has the system been evaluated for potential radiation health hazards? |
| 31. Will this system cause any long term disability issues? |
| 32. Is adequate protection provided to preclude trauma to the eyes or body surface during system operation or from personal protective equipment? |
| 33. Does the system meet vibration and shock requirements under all operational |
| 34. Are there potential hazards from high pressure gases or fluids? |
| 35. Is there any potential exposure to extreme heat or cold during operation or maintenance that will adversely affect personnel? |
| 36. Does the system provide adequate heating, cooling, and ventilation under routine, severe, and emergency conditions? |
| 37. Are there any hazards associated with cryogenics? |
| 38. Have health problems identified with reference systems and components been addressed and abated in this system? |
| 39. Are health hazards identified during DT&E, IOT&E and OT&E being resolved? |
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| **Habitability** |
| 1. Does the system exhibit unacceptable conditions that might affect human performance capabilities (i.e., vision, olfaction, taste, hearing, reaction time, motor skills, strength, and cognitive skills)? |
| 2. What is the overall acceptability of the physical environment (i.e., noise, lighting, odor, temperature control, humidity, temperature, contaminants)? |
| 3. Have personnel services (i.e., nutrition, water, sleep, exercise, medical care (preventive, diagnostic, treatment)) been considered for the maximum number of personnel involved and the maximum mission duration? |
| 4. Were living conditions (i.e., personal hygiene, body waste management, crew quarters, mess, exercise area, recreation, trash, stowage, etc.) considered for the maximum number of personnel involved and the maximum mission duration? |
| **Force Protection and Survivability** |
| 1. Will the proposed capability increase the number/type (especially civilians and/or contractors) of individuals placed in harm's way? |
| 2. Does the materiel solution introduce a new threat? |
| 3. Does the materiel solution change egress systems requirements (if applicable)? |
| 4. Was any part of the capability gap related to a fratricide incident or failure of personnel to survive a mishap? |
| 5. Does the Concept of Operations (CONOPS) for the proposed capability increase the likelihood of fratricide and/or need for improved personnel survivability features? |
| 6. Does the materiel solution impact Identify Friend/Foe (IFF) equipment? |

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| 7. Is the related IFF or target identification system effective to ranges at least as long as the weapons range? |
| 8. Is the system's signature (visible, electromagnetic, etc.) similar to potential threat |
| 9. Is the IFF system a non-cooperative target recognition system (i.e., if an enemy tries to target you to find your position, does the system refuse to cooperate so as not to give any information to the enemy)? |
| 10. Does the self-location equipment provide sufficient resolution to reduce fratricide? |
| 11. Is the system's ability to distinguish between friendly and enemy targets compatible with mission oriented protective posture level IV (MOPP IV) (CBRN individual protective equipment) conditions? |
| 12. Does the materiel solution change detectability? |
| 13. Is the system likely to be detected by unfriendly forces because of: Visible static signature? Thermal (infrared) signature? Radio-frequency signature? |
| 14. Have any electro-optical or optical components on the system been hardened to reduce optical cross-sectional measurements that are the cause of wide-angle and at-range |
| 15. Will unfriendly forces' use of obscurants prevent the system from detecting approaching systems? |
| 16. Does the materiel solution change the probability of attack? |
| 17. Is the system able to deflect attack by the use of: Active ballistic interdiction to deflect or destroy incoming munitions? Electronic jamming or spoofing of munitions sensors? |
| 18. Has the system microprocessor code been protected from the presence or insertion of malicious code? |
| 19. Does the system present a unique or highly recognizable signature (visual, thermal, |
| 20. Does the materiel solution reduce damage? |
| 21. Does the materiel solution require a change in attack and attack prevention measures? |
| 22. Does the system adequately protect the crew from direct- and indirect-fire munitions through the specific damage mechanism of spall? |
| 23. Does the system provide crew protection from secondary explosions of the on-board munitions if the system is attacked, e.g. separation of ammunition storage in a compartment isolated from the crew? |
| 24. Does the system provide adequate crew protection from directed-energy weapons such as lasers? |
| 25. Does the system provide adequate warning and protection for the crew in a nuclear, chemically or biologically contaminated environment? |
| 26. Will the system be able to operate in the presence of external electromagnetic environmental effects without affecting crew members and other military personnel? |
| 27. What are the potential sources for personnel injury in the system design and when the Airman and equipment are functioning in the field? |
| 28. What is the system's ability to prevent further injury to the Airman after being attacked or exposed to a hostile environment? |
| 29. What is the ability of the system to support treatment and evacuation of the injured? |
| 30. What are the physical constraints and workload placed on the Airman by the system? |
| 31. What are the cognitive constraints and workload placed on the Airman by the system? |

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| 32. What is the system's ability to minimize the effect of environmental stressors on the Airman? |
| 33. What is the system's ability to minimize the effect of mechanical (system-produced) stressors on the Airman? |
| 34. What is the system's compatibility with crew life support and continuous operations? |
| 35. What are the extreme environments in which the Airman will use the system? |
| 36. What is the system's ability to minimize the effect of arctic temperatures? |
| 37. What is the system's ability to minimize the effect of high climatic temperatures? |
| 38. What are the special considerations concerning extreme conditions to maintain an individual's life when operating in a sea or air environment until rescued or an improved situation on land is reached? |

**A2.2. Key HSI-Related Terms. Note:** Here are explanations or clarifications of terms used in an HSI context:

**Accessible**—Refers to a design that enables ingress, egress, reach, and/or pass-through a confined space to perform a specified task set. See MIL-HDBK 1908B for a detailed description.
**Accessibility**—A measure of the relative ease of admission to the various areas of an item for the purpose of operation or maintenance.
**All-weather (or Adverse-weather)**—Typically used when trying to describe the environmental conditions under which a system operates without performance degradation. The term is usually intended to ensure that weather conditions (such as rain, fog, heat or cold) do not adversely impact the system or the operator.
**Cognitively Ergonomic Display/Control Configuration**—Arrangement of components of information and control/input devices in complex, multiple display/control systems to most effectively support all critical task functional sequences and decision processes; complementary with Situational Awareness goals and design considerations.
**Comfortable**—Refers to a desirable quality of a component system design such that it accommodates the human body or parts, across a range of sizes and ensembles, so as not to cause pain or interfere or stress the individual's capacity to perform. Best practice is to describe the impacts of the following specific comfort-related items on overall performance: pressure points, hot spots, restrictions in movement, chafing, restricted space, restricted circulation, distraction, blisters, forced extra movement, strains (physical, muscle), extra tension, long term injury, weight distribution, or repetitive motion injuries.
**Commonality**—A quality that applies to materiel or systems; such as (a) possessing like and interchangeable characteristics enabling each to be used, or operated and maintained, by personnel trained on the others without additional specialized training; (b) having interchangeable repair parts and/or components; and, (c) applying to consumable items interchangeably, equivalent without adjustment.
**Compatibility**—The ability of systems, equipment, devices and materiel to operate in the intended operational environments without suffering unacceptable degradation or without causing unacceptable performance interactions or responses; it involves the application of sound system, equipment, device and materiel design configurations that ensures interference-free operation, and clear concepts that maximize operational effectiveness.
**Dependability**—The ability to fulfill the required performance under given conditions, taking degradation of performance due to failure and maintenance into consideration.

**Environment**—Considers measures to directly protect the human element of the total system from the operational environment (e.g., shock, vibration, extreme temperatures, etc.) and to indirectly protect the human by protecting the environment (e.g., water, air, land, space, cyberspace, markets, organizations, and the relationships that exist among them and with all living things) from adverse effects associated with system development, manufacturing, operations, sustainment, and disposal activities.

**Fatigue**—Refers to the consequence (both physical and mental) of sustained performance over time. Best practice is to address specific metrics that can be impacted by fatigue such as: error rate, error rate variability (more errors observed with prolonged performance), missed cues, reduced vigilance (incorrectly categorized signals), reduced maximum strength ("lift" requirement) or reduced sustained strength ("carry" requirement). Describe or specify the expected task performance duration(s) so that test and evaluation activities can test performance over time.

**Force Protection (FP)**—The FP KPPs may include many of the same attributes as those that contribute to survivability; however, the FP KPP places emphasis on protecting the system operator or other personnel rather than protecting the system itself (cf. Survivability KPP). Many HSI-related requirements and attributes can be traced to and/or derived from the FP KPP.

**Habitability**—Involves characteristics of system living and working conditions such as lighting; ventilation; adequate space; vibration, noise, and temperature control; availability of medical care, food, and/or drink services; suitable sleeping accommodations, sanitation and personal hygiene facilities, and fitness/recreation facilities. Attention to such characteristics is necessary to sustain high levels of personnel morale, motivation, quality of life, safety, health, and comfort, contributing directly to personnel effectiveness and overall system performance, especially during sustained/extended operations/performance. These habitability characteristics also directly impact personnel recruitment and retention. Some operational/organizational, technical, or mission issues may preclude completely addressing all habitability concerns: hence, other HSI domains may need to engage to mitigate the resulting effects on system personnel and performance.

**Human Factors Engineering (HFE)**—Involves an understanding of human capabilities (i.e., cognitive, physical, sensory, and team dynamic) and comprehensive integration of those capabilities into system design beginning with conceptualization and continuing through system disposal. A key objective for HFE is to clearly characterize the actual work to be performed, and use this information in creating effective, efficient, and safe human hardware/software interfaces to achieve optimal total system performance (i.e., use, operation, maintenance, support, and sustainment). HFE seeks to maximize usability for the targeted range of users/customers and to minimize design characteristics that induce frequent or critical errors, extensive training or workload intensive tasks or produce safety/health hazards.

**Interchangeable**—The ability of systems, units, or forces to replace like systems, units, or forces that possess common capabilities and like characteristics to fulfill relevant requirements without causing unacceptable performance degradations when exchanged.

**Interoperability**—The ability of systems, units, or forces to provide data, information, materiel, and services to, and accept the same from, other systems, units, or forces, and to use the data, information, materiel, and services exchanged to enable them to operate effectively together. IT interoperability includes both the technical exchange of information and the end-to-end operational effectiveness of that exchange of information as required for mission accomplishment. Interoperability is more than just information exchange. It includes systems,

processes, procedures, organizations, and missions over the life cycle and are balanced with cybersecurity (formerly information assurance). (DoDI 8330.01)

**Intuitive (control)**—Intuitive here refers to a control that is typical of controls widely used and/or is consistent in directions, locations or types of force applications in a way that most intended users quickly understand and use as they support the intended task set.

**Intuitive (display)**—Intuitive refers to a display that, beyond readability and regardless of modality, presents relationships among critical components of information in a way that most intended users quickly understand as they support the intended task set.

**Manpower**—Addresses the number and type (military, civilian and contract support) of personnel in the various occupational specialties required and potentially available to train, operate, maintain, and support the deployed system within the range of military operations (ROMO) - The manpower community promotes pursuit of engineering designs that optimize the efficient and economic use of manpower, keeping human resource costs at affordable levels. Determination of required manpower positions recognize the evolving demands on humans (cognitive, physical, and physiological) and consider the impacts that technology can make on humans integrated into a system.

**Occupational Health**—Promotes system design features and procedures that serve to minimize the risk of injury, acute or chronic illness, and disability; and enhance job performance of personnel who operate, maintain, or support the system. The occupational health community prompts design features to prevent health hazards where possible and recommends personal protective equipment, protective enclosures, or mitigation measures where health hazards cannot be avoided. Prevalent issues include noise and hearing protection; chemical exposures and skin protection; atmospheric hazards (e.g., confined space entry and oxygen deficiency); vibration, shock, acceleration, and motion protection; ionizing/non-ionizing radiation and personnel protection; human factors considerations that can result in chronic disease or discomfort (e.g., repetitive motion injuries or other ergonomic-related problems).

**Personnel**—Considers the type of human knowledge, skills, abilities, experience levels, and human aptitudes (i.e., cognitive, physical, and sensory capabilities) required to train, operate, maintain, and support a system; and the means to provide (i.e., recruit and retain) such people. Personnel recruitment, testing, qualification and selection are driven by system requirements. The personnel community helps define the human performance characteristics of the user population and then determine target populations to select for occupational specialties, manage recruitment, and track retention trends. The personnel community manages occupational specialties to include career progression and assignments. Adequate numbers of workers in these specialties are recruited, trained, and assigned to meet the entire career field need. Personnel population characteristics can impact manpower and training as well as drive design requirements.

**Physically Ergonomic Display/Control Configuration**—Combines anthropometric and biomechanical considerations to generate a physical configuration of displays and controls that optimize task set performance potential; most relevant in complex, multiple display/control systems; Complementary to Cognitively Ergonomic Display/Control Configuration.

**Readability (or Legibility)**—Information presented on the display should exceed thresholds for sensation and perception taking into account all environmental and ensemble conditions anticipated in operational use. A display that is "readable" does not imply that the information presented is also understandable to the user. The physical quality of readability is distinguished

from the cognitive workload associated with "understandable." See MIL-STD-2525, MIL-STD-411, MIL-STD-1787, and/or MIL-STD-1472 for readability design standards.

**Safety**—Promotes system design characteristics and procedures to minimize the risk of accidents or mishaps that cause death or injury to operators, maintainers, and support personnel; threaten the operation of the system; or cause cascading failures in other systems. Using safety analyses and lessons learned from predecessor systems, the safety community prompts design features to prevent safety hazards to the greatest extent possible and to manage safety hazards that cannot be avoided. The focus is on designs that have back-up systems, and where an interface with humans exists, to alert them when problems arise and also help to avoid and recover from errors. Prevalent issues include factors that threaten the safety of personnel and the operation of the system; walking and working surfaces, emergency egress pathways; personnel protection devices; pressure and temperature extremes; prevention/control of hazardous energy releases such as mechanical, electrical, fluids under pressure, ionizing or non-ionizing radiation, fire, and/or explosions. See MIL-STD-882.

**Situation Awareness**—Perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future. Knowledge and understanding of the current situation which promotes timely, relevant and accurate assessment of friendly, competitive and other operations within the battle space in order to facilitate decision making. An informational perspective and skill that fosters an ability to determine quickly the context and relevance of events that unfolds.

**Survivability**—Addresses human-related characteristics of a system (e.g., life support, body armor, helmets, plating, egress/ejection equipment, air bags, seat belts, electronic shielding, etc.) that reduce susceptibility of the total system to mission degradation or termination; injury or loss of life; and partial or complete loss of the system or any of its components. These issues are considered in the context of the full spectrum of anticipated operations and operational environments and for all people who will interact with the system (e.g., users/customers, operators, maintainers, and/or other support personnel). Adequate protection and escape systems should provide for personnel and system survivability when they are threatened with harm. Design considerations will include primary and secondary effects of the threats.

**Training**—Encompasses the instruction and resources required to provide personnel and units with requisite knowledge, skills, and abilities to properly operate, maintain, and support systems. The training community develops and delivers individual and collective qualification training programs, placing emphasis on options that enhance user capabilities to include operator, maintainer, and support personnel; maintain skill proficiencies through continuation training and retraining; expedite skill and knowledge attainment; and optimize the use of training resources. Training systems, such as simulators and trainers, should be developed in conjunction with the emerging system technology. The overall training system architecture is established from the manpower and personnel analyses, and the training delivery system may be required prior to fielding the system so that personnel can be adequately trained to operate, maintain, and support the system when it is fielded. Therefore, it also is important to develop the training system concurrent with the operational system. If engineering changes are made to the operational system, associated training architecture and delivery system changes should be re-evaluated, re-planned, and appropriate modifications funded.

**User friendly (or Usability)**—A term used to denote the ease with which people can use a system, component, tool, or other human-made object with little or no reference to operations manuals in order to achieve a particular goal. Best practice is to describe in terms of common,

standard conventions (e.g., color, shape, movement) and/or single-step-action (e.g., minimize/eliminate repetition of task steps). See other terms Accessible, Commonality, and Intuitive.

**User configurable (or Tailorable)**—Able to make or adapt for a special need or purpose. Best practice is to provide detailed descriptions of selectable features to accommodate the ergonomics of the intended user(s) and/or configurable options for multiple applications and/or multiple users.

**Workload**—Refers to perceived and actual performance-based level of physical and/or mental effort necessary to perform a task set in relation to a finite capacity or set of capacities. Best practice is to describe objective measures of workload such as error rate, time-to-complete, false negatives, interference with other tasks, measures of multitasking, etc. Sample workload related tools are the Improved Performance Research Integration Tool (IMPRINT), NASA Task Load Index (NASA TLX), electrocardiography (EKG), Infrared Facial Response, Galvanic Skin Response (GSR), eye tracking, etc.

**Attachment 3**

**ITEM UNIQUE IDENTIFICATION IMPLEMENTATION PLAN TEMPLATE**

*Note:  Remove italics prior to submission*

**A3.1.  System Description.**  *Briefly describes the military system, its mission, and its position in the acquisition life cycle. Explain the system and its point in the Program Development Life Cycle and current acquisition timeline. Explain the integrated components required to obtain the objective. Identify the overarching program if this system roles up to support a broader mission capability. This description should provide background on what the focus of IUID implementation will be for when the reader reviews other sections such as priorities, schedules and resource requirements.*

**A3.2.  References.**

A3.2.1. *Include applicable DoD Instructions, Directive and publications on Unique Identification (UID), Item Unique Identification (IUID), and Serialized Item Management (SIM).*

A3.2.2. *Include OSD IUID policy and guidance (see OSD IUID website at* **www.acq.osd.mil/dpap/pdi/uid/index.html**.

A3.2.3. *Include applicable AF policy and publications on IUID, SIM and Serial Number Tracking (SNT).*

A3.2.4. *Identify other IUID implementation plans for weapon systems, maintenance depots, contractor logistic support, Defence Logistics Agency, or other organizations that support this plan.*

A3.2.5. *Identify IUID unique training requirements. All personnel involved in IUID marking and tacking will complete DAU courses CLC 33, Contract Format and Structure for DoD eBusiness; CLE 40, IUID Marking; CLM 200, Item Unique Identification (IUID);* and CLM 201, Serialized Item Management, . Exemptions, Exceptions and Approval Source: *Exemptions are intended to preserve DoD resources by allowing for flexibility in implementing IUID requirements for legacy assets. Complete IUID markings and registration of all existing Supply Class II (Expendables) and Supply class IX (Reparable Items), as well as all embedded assets that meet the criteria for IUID. Additionally, programs that will be phased out of the inventory and will no longer be required to support FMS customer acquisitions or logistics support, may be exempt from IUID Requirements. Exemptions remove the UII creation, registration and physical marking requirements from all instances of an item. Exceptions are intended to alleviate the requirement on contractors to uniquely identify critical assets needed to support contingency operations and should not be requested for resource or workload limitations. This does not remove the UII creation, registration, and physical marking requirement from being performed by the AF.*

**A3.3.  Exceptions.**

A3.3.1. *For exemptions, identify in Appendix A by NSN and part number, or manufacturer Contractor and Government Entity (CAGE) code and part number for non-stocklisted items, all items that are being submitted for exemptions as part of the plan. To qualify, the item should no longer be procured, stocked in inventory, and/or used in weapon systems owned by*

*the Air Force, Army, Navy, or Marine Corps. Identify the attrition strategy being used as defined when complete attrition of the item population from inventory and use is expected, and state current asset balances for the NSN to include items in inventory and operational use.*

A3.3.2.  *For exceptions, see DoDI 8320.04 for the process to request exceptions. In Appendix B, identify by National Stock Number (NSN) and part number, or manufacturer CAGE and part number for non-stocklisted items, all items where DoDI 8320.04 has been invoked to support contingency operations. Identify the approval authority for each exception processed. Briefly state the strategy to ensure these items are uniquely identified and physically marked with a UII.*

A3.3.3.  *If not anticipating an exemption or exception, so state*

**A3.4.  Describe the overall IUID Implementation Strategy.**

A3.4.1. Parts-Marking—*Describe the overall strategy to physically uniquely identify items that will be marked (including embedded and deployable items); describe how items will be marked (label, direct mark, etc.) and who will mark them.*

A3.4.1.1. Current and future contracts—*Identify all contracts used by the program resulting in the delivery of items to the AF through new procurement and/or service contracts such as, but not limited to, contract repair, contract logistics support, performance based logistics, etc. (can be a separate appendix if necessary). State if DoDI 8320.04 has been incorporated into the contract(s) and is being enforced. If the DoDI 8320.04 clause has not been incorporated and enforced, state an anticipated date when DoDI 8320.04 clause will be incorporated and the plan of action. If applicable, provide rationale for each contract where modification to include the DoDI 8320.04 is considered infeasible.*

A3.4.1.2. Legacy and depot-manufactured items—*Identify all items by NSN and part number, or manufacturer CAGE and part number for non-stocklisted items, used by the program that meet the IUID criteria (can be a separate appendix if necessary). Identify the Source(s) of Supply according to the Federal Logistics Information System (FLIS), the Source(s) of Repair, and indicate if engineering analysis to determine how/where to physically mark the item has been completed. Also indicate if technical orders for the item have been updated.*

A3.4.1.3. Serialization and UII registration—*Describe implementation plans for serialization and registration of UIIs for the following methods of executing parts-marking:*

A3.4.1.3.1. New procurements and contract repair—*accomplished by the manufacturer or repair contractor.*

A3.4.1.3.2. Organic repair and depot-manufactured items—*current standardization requires 18S serialization and registration of items through Triad software being implemented on organic parts-marking capabilities.*

A3.4.1.4. Technical document strategy—*To minimize the non-recurring costs for parts marking, describe processes and efforts to mitigate or minimize non-recurring*

*engineering costs applicable to engineering drawings and technical order updates. Also describe efforts to standardize engineering and technical order document updates.*

A3.4.1.5.  Government-furnished equipment means an item of special tooling, special test equipment, or equipment, in the possession of, or directly acquired by the Government and subsequently furnished to the prime Contractor, who is accountable for the equipment and may reissue GFE to subcontractors named in the contract for the performance of that contract. *State when DFARS clause 252.211-7007, Reporting of Government-Furnished Equipment in the DoD Item Unique Identification (IUID) Registry, will be incorporated into contracts where GFE exists. Identify the strategy to uniquely identify and register GFE in the IUID Registry and DPAS as applicable. If virtual UIIs will be used, state the conditions under which they will be used, and the planned trigger events for applying physical UIIs to the GFE. Reference the DoD Guidelines            for            the            Virtual            UII,* **http://www.acq.osd.mil/dpap/UID/attachments/Virtual_UII_Guide_ver1_2a_28-20061128.pdf***, to assist with identifying applicable conditions and with planning trigger events.*

A3.4.1.6.  Maintenance Strategy—*Identify the maintenance strategy or strategies used to support a weapon system. Identify how IUID requirements are being incorporated into:*

*Performance Based Agreements/Performance Based Logistics;*
*Organic Repair;*
*Contract Repair/Contract Depot Maintenance;*
*Contracted Logistics Support;*
*Contractor Owned and Maintained Base Supply (COMBS).*

**A3.5.  IUID related actions to improve or enhance business processes.**  *– Describe any plans to utilize the data from IUID to improve current or planned business processes such as warranty tracking, failure tracking, etc. Include activities to make use of automatic identification and data capture in property management and maintenance.*

**A3.6.  List Metrics.**

A3.6.1.  Measures of success—*Identify metrics that the program will use to track the status of IUID implementation. Examples include:*

*Number of total items requiring IUID*
*Percent of total items assigned a virtual UII*
*Engineering analysis complete*
*Technical Orders updated*
*Percent of items assigned a UII reported to the IUID Registry*
*Percent of items assigned a virtual UII that had been physically marked with an IUID-compliant Data Matrix*
*Percent of total items marked with an IUID-compliant Data Matrix*
*Percent of new contracts including the IUID clause*
*Percent of existing contracts modified for IUID requirements*

A3.6.2.  Identify the exit criteria for completion of IUID implementation for the program*: Examples include:*

*100% legacy items marked and in registry*
*100% marking equipment for new items in place and tested*
*Infrastructure in place at depot; personnel 100% trained*

**A3.7.  Provide schedule by completing Schedule of Elements and Dates at  Table A3.1** *When a date cannot be provided, an explanation of when a date can be provided.*

**Table A3.1.  Schedule of Elements and Dates Completion.**

|  | **Elements and Dates** | **Qtr/FY Start Date** | **Qtr/FY Complete Date** |
|---|---|---|---|
| 1.0 | Preparation Activities |  |  |
| 1.1 | Priorities for application of IUID and associated data transfer established (specify in paragraph 7) |  |  |
| 1.2 | Listing of items requiring IUID completed for each application priority (1.1 application categories) |  |  |
| 1.3 | IUID marking strategy studies and ROM estimates completed |  |  |
| 1.4 | Cross Program/Service AIS integration strategy studies and ROM estimates completed |  |  |
| 1.5 | Budget for IUID implementation submitted |  |  |
| 2.0 | Implementation/Execution Activities |  |  |
| 2.1 | Legacy contracts (issued prior to 1 Jan 2004) modified |  |  |
| 2.2 (.1-.N) | Key Program trigger events (physical marking of items) identified |  |  |
| 2.3 | Progress Reviews |  |  |
| 3.0 | Capability Achieved (physical marking & ability to transfer Pedigree data to Registry) |  |  |
|  |  |  | Full Capability Achievement Date |
| 3.1 | All New solicitations include IUID Requirement |  | N/A |
| 3.2 | Legacy Contracts Modified |  |  |
| 3.3 | Assignment of Virtual UIIs |  |  |
| 3.4 | Property in possession of contractors (in-plant GFP – virtual) |  |  |
| 3.5 | Items in operational use |  |  |
| 3.6 | Items in inventory (ICPs, Supply Depots etc.) |  |  |
| 3.7 | Depot maintenance & manufactured items achieved |  |  |
| 3.8 | IUID capable AIS |  |  |

**A3.8. Established priorities for application of IUID and associated data transfer. Note:** Insert priority number 1 (high), 2 (medium), 3 (low).

_____New solicitations:
_____Ongoing Contracts:
_____GFE in possession of contractors:
_____Operational Fleet:
_____Assets in inventory:
_____Assets in Depot Maintenance:

**A3.9. Key trigger events for physical marking of UIIs on legacy and GFE items.** _Examples include during production, following testing, prior to shipping, by government upon delivery, etc._

**A3.10. Program IUID Related Budget Information by Fiscal Year (Table A3.2).** _Provide plan on how unfunded requirements will be addressed (POM, reduce performance requirements, etc.). If new acquisition and will be included in contract, so state. If funding requests have been submitted via POM/APOM process, state the outcome of these budgetary submissions. If budget submissions were rejected or not funded, provide the rationale._

**Table A3.2. IUID Related Budget Information by Fiscal Year.**

| Program Resources | FY | FY | FY | FY | FY |
|---|---|---|---|---|---|
| Required for Infrastructure | | | | | |
| Required for Manpower | | | | | |
| Required for Training | | | | | |
| Total | | | | | |
| Funded | | | | | |
| Delta | | | | | |

**A3.11. DID References.**

A3.11.1. DI-MGMT-81803, 19 Jul 2011.

A3.11.2. DI-MGMT-81804, 12 Feb 2013.

**Attachment 4**

**GUIDELINES FOR ACQUISITION SUBJECT MATTER EXPERTS DURING DEVELOPMENT PLANNING**

**A4.1.  Introduction.**  The identification of sound requirements is the result of understanding the proper structure and having the right expertise to address development planning. This attachment provides some best practices to successfully conduct development planning.

**A4.2.  Organization.**

A4.2.1.  Development and acquisition organizations, typically a XZ or XR office, should inform the requirements generation process and is responsible for translating high-level operational requirements into more detailed system requirements. They, with the help of all stakeholders, generate and analyze alternative system concepts. They provide balanced estimates of effectiveness, performance, cost, schedule, and risk to the stakeholders for selection of preferred concepts. Risk estimates include assessing the impact of new technologies on the system, which is done in conjunction with the technologists. Once a system concept is selected, the Integrated Life Cycle Management (ILCM) governance structure manages the development, procurement, delivery, and continued evolution of the system over its life cycle. The program office provides supporting technical and programmatic rationale throughout the life cycle of the system.

A4.2.2.  A technology organization, typically AFRL or the early SE staff conducting concept development planning, is responsible for ensuring the latest relevant technologies are considered, and they conform to the desired time frame. It is their job to suggest new concepts are made possible by emerging technologies, as well as technologies that should improve or enhance a system's effectiveness or performance, and/or reduce its cost. They are also responsible for estimating the uncertainties associated with new technology and, in conjunction with the system analysts, help assess the impact of any new technology. Conversely, they should gain insight as to the warfighters' needs and should be able to better focus their technology roadmaps.

A4.2.3.  Materiel support should be provided during CBP as a requirement of a supporting MAJCOM. In addition, as system and program office teams are spun off from the mission-based and enabling development planning teams, the team construct provides an independent mechanism to verify the resulting systems and SoS support for the warfighter-identified capability need.

A4.2.4. Under the JCIDS process, the Initial Capabilities Document (ICD) is the most common starting point for new capability requirements.

A4.2.4.1.  Once validated, the ICD typically leads to an Analysis of Alternatives (AoA) and then the Capability Development Document (CDD).

A4.2.4.2.  An ICD may lead directly to a CPD if capability requirements and associated capability gaps can be satisfied through Commercial-Off-the-Shelf (COTS), Government-Off-the-Shelf (GOTS), or Non-Developmental Items (NDI), with no significant development or integration efforts.

A4.2.4.3.  In certain cases, a CDD or CPD may be generated without an associated ICD. This is typically done when there has already been a successful Joint Capability Technology Demonstration (JCTD) of the capability solution in an operational environment for a Joint Urgent Operational Need (JUON).

**A4.3.  Capability Requirements Generation.**

A4.3.1.  Requirements development is a process that consists of a set of activities that produces requirements for a product. The systems engineering standard (EIA 632, *Processes for Engineering a System)* defines 'requirement' as 'something that governors what, how well, and under what conditions a product will achieve a given purpose.' Requirements define functions, performance, and environment of the system under development to a level that can be built.

A4.3.2.  KPPs are key system capabilities that should be met for a system to meet its operational goals. The Capability Development Document identifies KPPs that contribute to the desired operational capability in a threshold and objective format. Each KPP is supported by analysis that takes into account technology maturity, fiscal constraints, and schedule before determining threshold objectives values. If an attribute is considered important but not critical to meeting system goals, it can be classified as a KSA.

A4.3.3.  The threshold value of a KPP or KSA is the minimum acceptable value considered cost, schedule, and technology. Performance below the threshold value is not operationally effective or suitable. A KPP also has an objective value that is the desired operational goal considering cost, schedule, and technology. Performance above the objective value does not justify additional expense. The difference between the threshold and objective value sets the trade space for a system.

A4.3.4.  KPPs should be:

A4.3.4.1.  Broad and few in number

A4.3.4.2.  Comprehensive, clearly, and simply defined covering required capabilities, availability, and reliability

A4.3.4.3.  Sufficiently complete to be the source of lower-level system requirements

A4.3.4.4.  Sufficiently mature that little change is needed after MS B, and prior to IOC

A4.3.5.  CONOPS needs to be developed sufficiently to ensure that the concept can:

A4.3.5.1.  Perform in the environment in which it will operate

A4.3.5.2.  Handle the expected throughput

A4.3.5.3.  Meet response-time operational requirements

**A4.4.  Materiel Solutions Analysis Development.**

A4.4.1.  System concept development should:

A4.4.1.1.  Minimize complexity both within the system and with regard to the system's external interfaces.

A4.4.1.2.  Avoid the use of high-risk, immature technologies

A4.4.1.3. Favor concepts that can achieve initial operational capability (IOC) in fewer than about five years

A4.4.1.4. Conduct tradespace analysis before selecting a final concept.

A4.4.2. System architecture should:

A4.4.2.1. Partition to achieve segments that can be procured and tested separately

A4.4.2.2. Minimize the complexity of the interfaces among the segments

A4.4.2.3. Establish data, structure, and architecture standards where appropriate

A4.4.2.4. Maintain the independence of the functional system requirements

A4.4.3. Performance assessment should be sufficient to:

A4.4.3.1. Predict performance against mission needs

A4.4.3.2. Assess the impact of segment-level performance on end-to-end performance

A4.4.3.3. Include the development of system performance models to support performance assessment in the acquisition phase

A4.4.4. Risk identification should:

A4.4.4.1. Identify the top-level risk factors that are inherent in the concept, architecture, and CONOPS

A4.4.5. Cost estimates should:

A4.4.5.1. Support capability/cost tradeoff analysis to ensure people understand the cost impact of achieving each capability and help weigh the cost and benefits of each concept.

A4.4.5.2. Be compared to available funding to ensure preferred concepts are affordable.

A4.4.5.3. If necessary, facilitate the development of a cost model that is extended later to support "should costs" for contractor-proposed options.

**A4.5. Additional Resources.**

A4.5.1. The AF/A5 Web page has additional information for Cross-Functional Team participation and JCIDS document creation and review.

**Attachment 5**

**EXAMPLE PROGRAM CHARTERS**

**A5.1.  Example of Program Charters. Figure A5.1** is an example of a PM Charter. **Figure A5.2** is an example of a PEO Charter.

**Figure A5.1.  Example PM Charter.**

## PROGRAM MANAGER

**By authority of the Air Force Acquisition Executive
and by the designation of the undersigned
as the Program Executive Officer for insert portfolio,
I hereby charter**

### Rank, First, Mi, Last

as the Program Manager for

### Insert Program Name

**in accordance with the Defense Acquisition System.**

As Program Manager (PM) for insert program name, you will perform as the Air Force designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. You shall be accountable for credible cost, schedule, and performance reporting to the Milestone Decision Authority (MDA). In no case, shall there be more than two levels of review between the Program Manager and the MDA.

You will, as the responsible management official, manage your assigned program consistent with the statutes, policies and principles articulated in Department of Defense and Air Force Acquisition life cycle management directives, instructions and transformation initiatives. You are responsible, along with your strategic partners, Air Force Materiel Command, Defense Contract Management Agency, Defense Logistics Agency, and Air Force Test and Evaluation Center, for the Life Cycle Management of your program and you will actively manage, to the best of your abilities, within approved resources, program cost, performance and schedule. In addition, you will also provide assessments of program status, risk, and contractor performance.

I will execute my full authority as the Program Executive Officer for insert portfolio to assist you in the management of your assigned insert program name. You will be provided with timely decisions by Senior Leadership and are expected to be candid and forthcoming without fear of personal consequences. This charter remains in effect until terminated or superseded.

First Middle Last
Rank, USAF
Program Executive Officer, insert portfolio

**Figure A5.2.  Example of a PEO Charter.**

# PROGRAM EXECUTIVE OFFICER

In accordance with statute, Department of Defense,
Air Force life cycle directives and instructions
and

My Appointment, by the Secretary of the Air Force,
as the

Air Force Acquisition Executive

I hereby designate

## Rank, First, Mi, Last

As the Program Executive Officer for

## Portfolio Title

As Program Executive Officer, your primary responsibility shall be dedicated to executive management and successful execution of a portfolio of assigned programs.  You will ensure insert PEO mission statement.

You will, as the responsible management official, provide overall direction and guidance for development, acquisition, testing, product improvement, and fielding while ensuring total ownership cost reduction. You will ensure interoperability through joint standards, open architectures and systems-of-systems concepts.  Your decisions will consider and quantify impacts across the life cycle of your programs.  You will establish processes that facilitate communication, cooperation, information exchange, and collective decision-making between and among organizations.

You will maintain the U.S. Air Force capability-based and life cycle objectives in managing your programs and will report directly to me on your assigned programs.  In no case will there be more than two levels of review between the Program Manager and the Milestone Decision Authority (MDA).  You will keep the leadership fully informed of status and report any matters that could affect the U.S. Air Force's ultimate commitment to the program.

You will place primary management emphasis and oversight on balancing cost, schedule, performance, and supportability while capitalizing on acquisition transformation initiatives.  You will ensure compliance with applicable national policies and life cycle policies and directives.

You will lead and directly control assigned program managers.  You will ensure that acquisition workforce career development and competency standards are actively pursued.  You will also serve as an advocate to ensure the necessary force structure is in place to support acquisition career development programs.

You are hereby appointed authority as the Program Executive Officer for the management of assigned programs.  Unless rescinded, this designation will remain in effect until your reassignment.

_____
Air Force Acquisition Executive

**Attachment 6**

**SUSTAINMENT METRICS CALCULATIONS**

**A6.1.  Introduction.** This attachment provides standard calculations for selected sustainment metrics for a variety of system types including aircraft, missiles, munitions, trainers, subsystems, software, space systems, automated information systems, and ground communications-electronics. The metrics are not meant to be all inclusive and can be tailored or revised based on the needs of the program. Whenever possible, however, the calculation provided here should be used to ensure standardization.

**A6.2.  Mandatory Sustainment Metrics.** The *Joint Capabilities Integration and Development System*, identifies Availability as the Sustainment KPPs (and two mandatory supporting KSAs (Reliability and Operational and Support Cost) that will be developed for all ACAT I programs. ACAT II and below programs, with materiel solutions, should include the Sustainment KPP or Sponsor defined sustainment metrics.

    A6.2.1.  Materiel Availability. Materiel Availability is the measure of the percentage of the total inventory of a system operationally capable (ready for tasking) of performing an assigned mission at a given time, based on materiel condition. This can be expressed mathematically as (number of operational end items/total population). The total population of operational end items include those in training, attrition reserve, and temporarily in non-operational materiel condition, such as depot level repair.

    A6.2.2.  Materiel Reliability. Materiel Reliability is a measure of the probability that the system will perform without failure over a specific interval. Reliability should be sufficient to support the war fighting capability needed. Materiel Reliability is generally expressed in terms of a mean time between failures (MTBF), and once operational can be measured by dividing actual operating hours by the number of failures experienced during a specific interval. Reliability may initially be expressed as a desired failure-free interval that can be converted to MTBF for use as a KSA (e.g., 95 percent probability of completing a 12-hour mission free from mission-degrading failure; 90 percent probability of completing 5 sorties without failure). Specific criteria for defining operating hours and failure criteria should be provided together with the KSA. Single-shot systems and systems for which other units of measure are appropriate to provide supporting analysis and rationale.

Material Reliability = Mean Time Between Failure

Material Reliability = $\dfrac{\text{Total Operating Hours}}{\text{Total Number of Failures}}$

    A6.2.3.  Ownership Cost. Ownership Cost provides balance to the sustainment solution by ensuring that the O&S costs associated with materiel readiness are considered in making decisions. For consistency and to capitalize on existing efforts in this area, the Cost Assessment and Program Evaluation (CAPE) O&S Cost Estimating Structure should be used in support of this KSA. Only the following cost elements are required: 2.0 Unit Operations (2.1.1 (only) Energy (fuel, petroleum, oil, lubricants, electricity)); 3.0 Maintenance (All); 4.0 Sustaining Support (All except 4.1, System Specific Training); 5.0 Continuing System Improvements (All). Fuel costs should be based on the fully burdened cost of fuel. Costs are to be included regardless of funding source. The KSA value should cover the planned life cycle timeframe, consistent with the timeframe used in the Materiel Availability KPP.

Sources of reference data, cost models, parametric cost estimating relationships, and other estimating techniques or tools should be identified in supporting analysis. Programs should plan for maintaining the traceability of costs incurred to estimate and plan for testing and evaluation. The planned approach to monitoring, collecting, and validating operating and support cost data to supporting the KSA will be provided. Ownership Cost is the sum of the O&S costs using the CAPE O&S Cost Estimating Structure Selected cost element associated with Material Readiness as follows:

A6.2.3.1.  2.0 Unit Operations (2.1.1 (only) Energy (Fuel, POL, Electricity)) plus

A6.2.3.2.  3.0 Maintenance (ALL) plus

A6.2.3.3.  4.0 Sustainment Support (All except 4.1, System Specific Training) plus

A6.2.3.4.  5.0 Continuing System Improvement (ALL).

A6.2.3.5.  Although not required for the KSA (since it relates to material readiness), the PM may also want to consider other CAPE elements, such as personnel, as cost considerations when making decisions based on TOC.

**A6.3.  Aircraft Systems.**

A6.3.1. Overview. The following section defines selected mission capability and supportability measures for aircraft systems.

A6.3.2.  Availability and Sustainability Measures

A6.3.2.1.  Mean Time Between Critical Failure (MTBCF). Use MTBCF to measure the average time between failures of mission-essential system functions. Critical Failures occur when mission essential systems become inoperable or operate outside their specified range of performance. MTBCF includes critical failures of all hardware and software that occur during mission and non-mission time. Express MTBCF as:

$$\text{MTBCF} = \frac{\text{Number of operating hours}}{\text{Number of critical failures}}$$

A6.3.2.2.  Mission Capable (MC) Rate. Use the MC rate to measure how long, in percent of possessed time, a system can perform at least one of its assigned missions. Base the MC rate on the sum of the fully mission capable (FMC) and partially mission capable (PMC) rates, expressed as: The overall MC requirement addresses different design missions, the expected percentages of equipment use, and the desired MC rate for each mission. FMC status indicates that an aircraft can perform all of its assigned missions. PMC status indicates that an aircraft can perform at least one, but not all of its assigned missions. A multi-mission aircraft may be PMC even if it is unable to accomplish its primary mission. Consider system operating time when determining MC rate requirements in that the more a system operates in a given period of time, the more downtime for corrective and preventative maintenance is required. The MC rate is affected by, but does not accurately account for preventative maintenance efforts.

$$\text{MC Rate} = \frac{\text{FMC hours} + \text{PMC Hours}}{\text{Possessed Hours}} \times 100$$

A6.3.2.3. Utilization Rate (UR). Express UR as flight hours or sorties per aircraft per relevant period of time, such as a day or month, as follows:

Daily wartime sortie UR = Average number of sorties per day
Average number of aircraft authorized

A6.3.2.4. Essential System Repair Time per Flight Hour (ESRT/FH). Use ESRT/FH to compare clock time needed to repair mission-essential equipment and operating time measured in flying hours. ESRT/FH addresses both corrective maintenance (CM) and preventive maintenance (PM) performed on mission-essential equipment. This measurement pertains only to full system list (FSL) equipment. Express this calculation as:

ESRT/FH   =   Elapsed PM + Elapsed CM
Flight Hours

A6.3.3.  Mission Reliability Measures:

A6.3.3.1.  Weapon System Reliability (WSR). Use WSR to measure the probability that a system will perform satisfactorily for a given mission time when used under specified operational conditions. Compute WSR by dividing the number of missions completed successfully by the number of missions attempted. Define "mission" in terms of start-finish criteria, factor in the effect of crew changes, and relate the success of the mission to the satisfactory performance of mission-essential items during the mission. Base WSR on a design reference mission profile to allow for translation of WSR into contractual requirements. Determine functional profiles for storage, build-up, preflight, takeoff, ingress, over-target, weapons delivery, egress, landing, and shutdown. Determine environmental profiles such as temperature, air density, humidity, vibration, shock, and corrosive agents. Determine mission critical systems for these profiles and establish a single peacetime and wartime WSR value for each given mission. **Exception:** If the peacetime mission length differs significantly from the wartime mission length, establish two values for WSR. When more than one type of mission is specified, state the percentage of time and the desired WSR for each mission. Express this calculation for WSR as:

WSR = Successful Missions
Total Missions

A6.3.3.2.  Break Rate (BR). Use break rate to measure the percentage of sorties from which an aircraft returns with an inoperable mission-essential system that was previously operable. Break rate includes "Code 3" conditions, such as ground and air aborts. Calculate BR as:

Break rate (%) = Number of aircraft Code 3 breaks during measurement period x 100
Number of sorties flown during period

A6.3.3.3.  Combat Rate (CR). Use the combat rate to measure the average number of consecutively scheduled missions flown before an aircraft experiences critical failures. Combat Rate reflects the philosophy that scheduling and completing a mission are more important than changing it mid-flight because of equipment failures. Express CR as:

Combat Rate =                 Number of successful sorties flown

(Number of scheduled missions – Number of ground aborts – Number of air aborts)

A6.3.3.4.  Mean Time Between Critical Failure (MTBCF). Use MTBCF to measure the average time between failures of mission-essential system functions. Critical failures occur when mission essential systems become inoperable or operate outside their specified range of performance. MTBCF includes critical failures of all hardware and software that occur during mission and non-mission time. Express MTBCF as:

$$MTBCF = \frac{\text{Number of operating hours}}{\text{Number of critical failures}}$$

A6.3.4.  Logistics Reliability Measures:

A6.3.4.1.  Mean Time Between Maintenance (MTBM). Use MTBM to measure the average flying hours between scheduled and unscheduled maintenance actions. Select an appropriate MTBM parameter based on MAJCOM requirements. Current and planned information systems permit tracking of standard MTBM parameters, such as inherent malfunctions, induced malfunctions, no-defect events, total corrective events, preventive maintenance, mean time between removal, and mean time between demand. Specify peacetime and wartime values for MTBM if equipment used during these periods differ. Express MTBM for a selected type of maintenance event as:

$$MTBM = \frac{\text{Flight Hours}}{\text{Number of Maintenance Actions (of selected type)}}$$

A6.3.5.  Maintainability Measures:

A6.3.5.1.  Mean Downtime (MDT). Use MDT to measure the average elapsed time between losing MC status and restoring the system to at least PMC status. Downtime includes on-equipment (and in some instances off-equipment) repair labor time; non-labor time, such as cure time for composites; maintenance and supply response time; administrative delays; and time for other activities that result in NMC status, such as training and preventive maintenance. MDT requirements should take into account field conditions, such as technical order availability and adequacy; support equipment capability and availability, supply levels, and manning (including experience level and structure of duty shifts). MDT mainly addresses unscheduled maintenance, but it can also include scheduled maintenance, such as scheduled inspections. Develop a single peacetime and wartime value for MDT. **Exception***:* When you expect maintenance or support conditions in wartime to differ significantly from those in peacetime, describe those differences and describe separate values for MDT. Express MDT as:

$$MDT = \frac{\text{NMC Time}}{\text{Number of Downing Events}}$$

A6.3.5.2.  Fix Rate (FR). Use FR to calculate the percentage of aircraft that return as Code 3 and should be returned to MC status within a specified amount of time (for example, 70 percent in 4 hours or 85 percent in 8 hours). The FR time requirement includes direct maintenance time and downtime associated with administrative and logistics delays. Express FR as:

$$\text{Fix Rate} = \frac{\text{Number of aircraft fixed within "X" hours}}{\text{Total number of broken aircraft}}$$

A6.3.5.3. Mean Repair Time (MRT). Use MRT to measure the average on-equipment and/or off-equipment corrective maintenance time in an operational environment. State MRT requirements for on-equipment at the system level and for off-equipment at the line replaceable unit (LRU) level. MRT starts when the technician arrives at the aircraft site for on-equipment maintenance or receives the LRU at the off-equipment repair location. MRT includes all necessary corrective maintenance actions such as preparation; LRU access; troubleshooting; removing and replacing parts; repairing, adjusting; checking functions; and curing. Do not include maintenance or supply delays in MRT calculations. Express MRT as:

$$\text{MRT (overall)} = \frac{\text{Total corrective maintenance time}}{\text{Total number of maintenance events}}$$

$$\text{MRT (on-equipment)} = \frac{\text{Total on-equipment corrective maintenance time}}{\text{Total number of on-equipment maintenance events}}$$

$$\text{MRT (off-equipment)} = \frac{\text{Total off-equipment corrective maintenance time}}{\text{Total number of off-equipment maintenance events}}$$

*Note:* MRT uses crew size in the calculation of manhours and MTTR does not use crew size in the calculation of hours.

A6.3.6.  Manpower Measures:

A6.3.6.1. Maintenance Man-Hours per Life Unit (MMH/LU). MAJCOMs base their maintenance man-hours per flying hour (MMH/FH) on their specific needs. Specify MMH/FH peacetime and wartime values, since equipment usage, maintenance needs, and support concepts may differ during these periods. Current and planned maintenance information systems permit tracking of the following:

A6.3.6.1.1.  MMH/FH, support general work unit code (WUC 01-09)

A6.3.6.1.2.  MMH/FH, corrective (WUC 11-99) for inherent malfunctions, induced malfunctions, no-defect actions, or total events

A6.3.6.1.3.  MMH/FH, product improvement (time compliance technical order)

A6.3.6.1.4.  MMH/FH, preventive maintenance (time change items)

A6.3.6.1.5.  MMH/FH, all categories totaled

A6.3.6.2. Maintenance Personnel per Operational Unit (MP/U). Use MP/U to measure the total number of direct maintenance personnel needed for each specified operational unit to perform direct on-equipment and off-equipment maintenance. Develop manpower projections to support specified operating and maintenance concepts, taking into consideration basing, deployment, and operational scenarios. MP/U calculations include direct on-equipment and off-equipment maintenance personnel and specialties related to direct on-equipment and off-equipment support, such as structural repair (including sheet metal and composites) and nondestructive inspection. When analyzing manpower requirements, MAJCOMs should consider and use projected MC, PMC, MRT, and MTBM rates, coupled with aircraft battle damage repair analyses to determine overall manpower needs. MP/U calculations exclude maintenance staff agencies, logistics

command section operations and support personnel, powered support equipment personnel, and munitions supply and missile maintenance personnel.

A6.3.7. Deployability Considerations. MAJCOMs should consider building in deployability when describing top-level mission capability and supportability requirements for aircraft systems. Address capability of the system to be deployed to the theater of operations within the constraints of the user-defined requirements.

A6.3.7.1. Deployability Footprint. Deployability footprint is defined by the manpower, materiel, equipment, and infrastructure required to support the design reference mission profile under peacetime, wartime, or other contingency operations. As a basis of measure use, for example, equivalent pallet positions.

A6.3.7.2. Logistics Follow-on Support. Logistics follow-on support specifies the manpower, materiel, and equipment required to sustain the design reference mission profile under peacetime, wartime, or other contingency operations. Logistics support requirements should account for manpower, materiel, and equipment directly or indirectly associated with the weapon system under consideration. Logistics requirements are included in Initial Capability Documents (ICD), Capabilities Development Document (CDD), Concept of Operations (CONOPS), and other Acquisition Documents.

**A6.4. Strategic or Tactical Ground-Launched Missiles.**

A6.4.1. Overview. Use the following mission capability and supportability measures for strategic or tactical ground-launched missiles.

A6.4.2. Availability and Sustainability Measures:

A6.4.2.1. Mission Capable (MC) Rate. Use MC rate to calculate the percentage of possessed time that a weapon system can perform its assigned mission. MC rate is defined as the combination of the fully mission capable (FMC) and partially mission capable (PMC) rates. It can be obtained using the status reporting system defined in AFI 21-103, *Equipment Inventory, Status and Utilization Reporting*. MC rate is equal to the number of alert hours divided by the number of possessed hours (PH). Express MC as:

$$\text{MC rate } = \text{ Alert hours/PH} = \text{ FMC rate} + \text{PMC rate}$$

*Note:* Since these systems offer little or no repeat mission capability, calculate a single MC requirement for both peacetime and wartime.

A6.4.3. Mission Reliability Measures:

A6.4.3.1. Weapon System Reliability (WSR). Use WSR to measure the probability that a given system in MC status will successfully complete its designated mission or function. Operational commands base WSR on their specific requirements. For intercontinental ballistic missile (ICBM) systems, WSR gives the probability that an ICBM, launched in reaction to a valid execution order, will deliver a warhead that will detonate as planned in the target area. Express WSR as:

$$\text{WSR } = \text{ SAR x LR x COMR x IFR x RSR}$$

A6.4.3.1.1.  Strategic alert reliability (SAR) represents the probability that a deployed missile can react to a valid launch order. It is based on the ratio of FMC missile hours to total missile hours available.

A6.4.3.1.2.  Communications reliability (COMR) represents the probability that a combat crew in the deployed force will receive a transmitted launch order. It does not consider enemy action.

A6.4.3.1.3.  Launch reliability (LR) represents the probability that an MC missile will launch as planned and that the ancillary equipment functions properly. It does not take into account enemy action.

A6.4.3.1.4.  Inflight reliability (IFR) represents the probability that a launched missile will properly signal a re-entry vehicle and place it in the correct ballistic trajectory so that it impacts in the target area.

A6.4.3.1.5.  Re-entry subsystem reliability (RSR) represents the probability that a properly positioned re-entry subsystem will successfully deploy a re-entry vehicle so that it detonates a warhead in the target area.

A6.4.3.2. Mean Time Between Maintenance (MTBM). Use MTBM to measure the average life units between maintenance events, as the using command defines them. Use PH as the time base for missiles. PHs may include time in which the system is not operating or is in a storage or dormant condition. Current and planned maintenance information systems permit tracking of several MTBM parameters including inherent malfunctions, induced malfunctions, no-defect events, total corrective events, preventive maintenance, and mean time between removal (MTBR). Specify the same peacetime and wartime value for MTBM and MTBR, if possible, using a standard term. Use an appropriate MTBM or MTBR parameter based on specific MAJCOM needs.

A6.4.4.  Maintainability Measures:

A6.4.4.1. Mean Downtime (MDT). Use MDT to measure the average elapsed time between losing MC status and restoring the system to at least PMC status. Downtime continues until maintenance personnel return the system to at least PMC status. Downtime includes maintenance and supply response, administrative delays, actual on-equipment repair, and activities that result in not mission capable (NMC) status, such as training and preventive maintenance. When computing MDT, also consider TO availability and adequacy, support equipment capability and availability, supply levels, manning, experience levels, and shift structure. Specify a single peacetime and wartime MDT value. *Note:* Do not confuse MDT, which describes an operational environment, with mean time to repair (MTTR) which is used as a contractual term.

A6.4.4.2. Mean Repair Time (MRT). Use MRT to measure the average on-equipment and/or off-equipment corrective maintenance time in an operational environment. State MRT needs for on-equipment at the system level and off-equipment at the line replaceable unit (LRU) level. MRT starts when the technician arrives at the missile site for on-equipment maintenance or receives the LRU at the off-equipment repair location. The time includes all maintenance done to correct the malfunction, including preparing for tests, troubleshooting, removing and replacing parts, repairing, adjusting, and conducting functional checks. *Exception:* Do not include maintenance or supply delays

in MRT calculations. *Note:* Do not confuse MRT, an operational term, with MTTR, which is used as a contractual term. Express MRT as:

$$\text{MRT (overall)} = \frac{\text{Total corrective maintenance time}}{\text{Total number of maintenance events}}$$

$$\text{MRT (on-equipment)} = \frac{\text{Total on-equipment corrective maintenance time}}{\text{Total number of on-equipment maintenance events}}$$

$$\text{MRT (off-equipment)} = \frac{\text{Total off-equipment corrective maintenance time}}{\text{Total number of off-equipment maintenance events}}$$

A6.4.5.  Manpower Measures:

A6.4.5.1.  Maintenance Man-Hours per Life Unit (MMH/LU). Use MMH/LU to measure the average man-hours per life unit needed to maintain a system. Base missile time on PHs, in most cases. Current and planned maintenance information systems permit tracking of the following:

A6.4.5.1.1.  MMH/PH, support, general (WUC 01-09)

A6.4.5.1.2.  MMH/PH, corrective (WUC 11-99) for inherent malfunctions, induced malfunctions, no-defect actions, or total events

A6.4.5.1.3.  MMH/PH, product improvement (TCTO)

A6.4.5.1.4.  MMH/PH, preventive maintenance (time change items)

A6.4.5.1.5. MMH/PH, total of the above categories establish a single required peacetime and wartime value. Use an appropriate MMH/LU based on specific MAJCOM needs. PH is commonly used, but other life units may be more appropriate for different systems.

A6.4.5.2.  Maintenance Personnel per Operational Unit (MP/U). Use MP/U to calculate the number of maintenance personnel needed to support an operational unit under specified operating and maintenance concepts. Develop manpower projections to support operating and maintenance concepts.

A6.4.5.2.1.  **Exception:** Do not include depot-level and other personnel excluded by AFI 38-101 and AFMAN 38-102, when calculating MP/U. Specify peacetime and wartime levels of manning for Air Reserve Component (ARC) maintenance organizations. Peacetime MP/U reflects the number of full-time personnel needed to support daily peacetime flying operations. Wartime MP/U includes full-time and traditional reservists and is normally identical to the MB/U established by the gaining MAJCOM for a similar unit.

## A6.5.  Air Launched Missiles and Munitions.

A6.5.1. Air Launched Missiles and Munitions. Use the following mission capability and supportability measures for air-launched missiles and munitions.

A6.5.2.  Availability and Sustainability Measures:

A6.5.2.1. Missile/Munitions Availability. Missile/munitions availability is the percentage of total owned inventory capable of performing its intended mission. Calculate availability as the quotient of serviceable inventory divided by total owned inventory quantity. Unserviceable missiles/munitions include both those in the inventory in an unserviceable condition code and those that may be in depot for any type of maintenance action. Specify a single (both peacetime and wartime) value of availability, as requirement.

*Note:* MC rate can be used as an alternate measure of missile/munitions availability. MC rate may be more appropriate for systems that are inspected periodically and have maintenance data tracked in a maintenance data reporting system.

A6.5.2.2. Mission Capable (MC) Rate. Use MC rate to measure the percentage of possessed time that a system can perform any of its assigned missions. Establish required MC values for specific missions at the wartime utilization or sortie rate. Calculate the MC rate as the sum of FMC and PMC rates as follows:

MC rate = ((FMC hours + PMC hours) / Possessed hours) x 100

A6.5.2.3. Storage Reliability. Use storage reliability to calculate (at a wing level) the percentage of possessed or authorized missiles/munitions that can perform their intended functions. Storage reliability is defined as the probability assets pulled from storage are operationally ready by passing any technical order required pre-use visual and/or electronic inspections.

A6.5.3. Mission and Logistics Reliability Measures:

A6.5.3.1. Weapon System Reliability (WSR). Use WSR to measure the probability that an available or MC weapon system will successfully complete its designed mission or function. When defining "mission," take into account storage, alert, captive-carry, launch, and flight of the item. Calculate the value of WSR by dividing the number of successfully completed missions by the number of attempted missions. Success of the mission should relate performance to design capability. For most munitions, there may only be one mission, and thus a need for only one WSR value. Peacetime missions for missiles may significantly differ from wartime missions. In such cases, develop a WSR value for each mission. If platform environments differ dramatically, either provide a WSR value for the harshest environment or develop WSR values for each environment or pylon.

A6.5.3.2. Mean Time Between Maintenance (MTBM). Use MTBM to calculate the average life units between maintenance events, as defined by the operational command. Apply MTBM to those items that operate or are active during times other than actual free flight. If reported, use captive-carry and ground operating hours as the time base for applicable items; otherwise, use PHs. PHs include time in which the system is not operating or is in a storage or dormant condition. Current and planned maintenance information systems permit tracking of several standard MTBM parameters, including inherent malfunctions, induced malfunctions, no-defect events, total corrective events, preventive maintenance, and mean time between removal (MTBR).

A6.5.4. Maintainability Measures:

A6.5.4.1. Mean Downtime (MDT). Use MDT to measure the average elapsed time between losing MC status and restoring the system to at least PMC status. Downtime includes maintenance and supply response, administrative delays, actual on-equipment repair activities that result in not mission capable (NMC) status, such as training and preventive maintenance. When calculating MDT, also consider TO availability and adequacy, support equipment capability and availability, supply levels, manning, experience levels, and shift structure. *Note:* MDT describes an operational environment; it is not the same as the contractual term, mean time to repair (MTTR).

A6.5.4.2. Mean Repair Time (MRT). Use MRT to measure the average on-equipment and/or off-equipment corrective maintenance time in an operational environment. State MRT requirements for on-equipment at the system level and off-equipment at the LRU level. MRT starts when the technician arrives at the system or equipment for on-equipment maintenance or receives the LRU at the off-equipment repair location. The time includes all actions taken to correct the malfunction, such as preparing tests, troubleshooting, removing and replacing parts, repairing, adjusting, and conducting functional checks. Express MRT as:

$$\text{MRT (overall)} = \frac{\text{Total corrective maintenance time}}{\text{Total number of maintenance events}}$$

$$\text{MRT (on-equipment)} = \frac{\text{Total on-equipment corrective maintenance time}}{\text{Total number of on-equipment maintenance events}}$$

$$\text{MRT (off-equipment)} = \frac{\text{Total off-equipment corrective maintenance time}}{\text{Total number of off-equipment maintenance events}}$$

**Exception:**  Do not include maintenance or supply delays when calculating MRT.
**Note:**  Do not confuse the operational term MRT with the contractual term MTTR.

A6.5.5.  Manpower Measures:

A6.5.5.1.  Maintenance Man-Hours per Life Unit (MMH/LU). Use MMH/LU to calculate the average man-hours per life unit needed to maintain a system. Use the MTBM life units as the time base for maintenance man-hours. Operational commands define MMH/LU according to their specific needs. Current and planned maintenance data collection and processing systems use PHs as the time base and permit tracking of several standard MMH/PH terms. Establish a single required peacetime and wartime MMH/LU value. Use an appropriate MMH/LU measure based on specific MAJCOM needs. PH is commonly used, but other life units may be more appropriate in some cases.

A6.5.6. Deployability Considerations. MAJCOMs should consider building in deployability when describing top-level requirements for air-launched missiles and munitions. Address capability of the system to be deployed to the theater of operations within the constraints of the user-defined requirements.

A6.5.6.1.  Deployment Footprint. See A6.3.7.1

A6.5.6.2.  Logistics Follow-on Support. See A6.3.7.2

**A6.6.  Trainers and Support Equipment.**

A6.6.1.  Trainers and Support Equipment. This category includes the equipment needed to operate and maintain a weapon system, such as trainers and training equipment, all mobile and fixed equipment, and ground segment equipment for ground-launched missile systems.

A6.6.2.  Availability and Sustainability Measures:

A6.6.2.1. Mission Capable (MC) Rate. Use MC rates to calculate the percentage of possessed time that equipment can perform any of its assigned missions. Calculate the value of MC by using the sum of fully mission capable (FMC) and partially mission capable (PMC) rates. Express MC as:

$$MC = \frac{FMC \text{ Hours} + PMC \text{ Hours}}{Possessed \text{ Hours}} \times 100$$

A6.6.2.2. Materiel Availability. Use MA to calculate the percentage of time that operational equipment can satisfy critical mission needs relative to the designated operational capability (DOC). Express all times in clock hours. MA is similar to MC rate except that system status depends on current use of the system as well as the DOC. For example, a system with several DOC missions can be MC if at least one of those missions can be accomplished. However, if an immediate need exists for a mission capability that is "down" while other mission capabilities are "up", the overall system is considered to be "down." Express MA as:

$$MA = \frac{Total \text{ operating hours} - Total \text{ downtime hours}}{Total \text{ operating hours}}$$

A6.6.2.3. Utilization Rate (UR). Use UR to calculate the average life units used or missions attempted per system during a specified interval of calendar time. Establish required peacetime and wartime UR values. Express this term as a ratio of planned or actual operating hours to PHs for a given calendar period. For example:

$$UR = \frac{Operating \text{ hours}}{PH}$$

A6.6.3.  Reliability Measures:

A6.6.3.1. Mean Time Between Critical Failure (MTBCF). Use MTBCF to measure the average time between failures of mission essential system functions. For ground electronic systems, MTBCF equals the total equipment operating time in hours, divided by the number of mission essential system failures. MTBCF includes all critical hardware and software failures that occur during mission and non-mission time. Express MTBCF as:

$$MTBCF = \frac{Number \text{ of operating hours}}{Number \text{ of critical failures}}$$

A6.6.3.2. Mean Time Between Maintenance (MTBM). Use MTBM to calculate the average life units between maintenance events. Use the operating hours, if reported, as the time base for applicable items; otherwise, use PHs. Apply MTBM to items in active operation for long periods of time. Current and planned maintenance information systems permit tracking of several standard MTBM measures, including inherent malfunctions,

induced malfunctions, no-defect events, total corrective events, preventive maintenance, and mean time between removal (MTBR). Use the appropriate MTBM or MTBR measure based on specific MAJCOM needs.

A6.6.4.  Maintainability Measures:

A6.6.4.1. Mean Downtime (MDT). Use MDT to measure the average elapsed time between losing MC status and restoring the system to at least PMC status. Downtime includes maintenance and supply response, administrative delays, actual on-equipment repair, and activities that results in not mission capable (NMC) status, such as training or preventive maintenance. When computing MDT, also consider TO availability and adequacy, support equipment capability and availability, supply levels, manning, experience levels, and shift structure.

A6.6.4.2. Mean Repair Time (MRT). Use MRT to measure the average on-equipment and/or off-equipment corrective maintenance time in an operational environment. State MRT requirements for on-equipment at the system level and off-equipment at the assembly, subassembly, module, or circuit card assembly level. MRT starts when the technician arrives at the system or equipment for on-equipment maintenance or receives the assembly, subassembly, module, or circuit card assembly at the off-equipment repair location. The time includes all maintenance done to correct the malfunction, including test preparation, troubleshooting, removing and replacing parts, repairing, adjusting, and conducting functional checks. Express MRT as:

$$\text{MRT (overall)} = \frac{\text{Total corrective maintenance time}}{\text{Total number of maintenance events}}$$

**Exception:** MRT does not include maintenance or supply delays.
**Note:** MRT uses crew size in the calculation of man-hours and MTTR does not use crew size in the calculation of hours.

A6.6.5.  Manpower Measures:

A6.6.5.1.  Maintenance Man-Hours per Life Unit (MMH/LU). Use MMH/LU to measure the average man-hours per life unit needed to maintain a system. Use an appropriate MMH/LU term based on specific MAJCOM needs. Use PHs as the time base for ground electronic systems. Current and planned maintenance information systems permit tracking of several standard MMH/PH terms (see **A6.5.5.1**)

A6.6.5.2. Maintenance Personnel per Operational Unit (MP/U). Develop manpower projections to support operating and maintenance concepts.

**Exception:** When calculating MP/U, do not include depot level and other personnel that are excluded from maintenance planning factors by AFI 38-101.

A6.6.6.  Deployability Considerations. MAJCOMs should consider building in deployability describing top-level requirements for trainers and support equipment systems. Address capability of the system to be deployed to the theater of operations within the constraints of the user-defined requirements.

A6.6.6.1.  Deployment Footprint. See A6.3.7.1.

A6.6.6.2.  Logistics Follow-on Support. See A6.3.7.2.

**A6.7.  Subsystems, Line Replaceable Units, and Modules.**

A6.7.1.  Overview. Use the following mission capability and supportability measures for subsystems, line replaceable units, and modules.

A6.7.2.  Availability and Sustainability Measures:

A6.7.2.1.  Operational Availability (Ao). Use Ao to measure the percentage of time that a subsystem, line replaceable unit (LRU), or line replaceable module (LRM) can satisfactorily perform in an operational environment. Ao for subsystems, LRUs, and LRMS is similar to the MC rate for aircraft, communications, electronics, and some missile systems. Express Ao as:

$$A_o = \frac{MTBDE}{MTBDE + MDT}$$

Mean time between downing events (MTBDE) is the average time between events that bring the system down, including critical or non-critical failures, scheduled maintenance, and training. Mean downtime (MDT) is the average elapsed time to restore the subsystem, LRU, or LRM to full operational status, following a downing event. *Note:* Ao does not express whether an item can operate over a specific period of time. This characteristic is covered in WSR.

A6.7.2.2.  Other Parameters. For subsystems, LRUs, and LRMs, apply the definitions and discussion of the appropriate reliability and maintainability measures as described for the parent system in this instruction.

A6.7.3. Deployability. MAJCOMs should consider building in deployability when describing top- level requirements for aircraft subsystems, line replaceable units, and modules. Address capability of the system to be deployed to the theater of operations within the constraints of the user-defined requirements.

A6.7.3.1.  Deployability Footprint. See A6.3.7.1.

A6.7.3.2.  Logistics Follow-on Support. See A6.3.7.2.

**A6.8.  Software Design.**

A6.8.1.  Overview. MAJCOMs will consider software design and supportability measures when describing top-level logistics requirements for weapon system and support system software.

A6.8.2. Software Maturity. Use software maturity to measure the progress of software development toward satisfying operational requirements. This progress is based on the number and category/priority of problems that require software changes. Software maturity measures the rate at which software problems are discovered and resolved. Software problems are those which require software changes to correct errors in system design and improve or modify a system's function. As you make software changes to correct the problems, keep statistics and plot the results over time to provide indicators of overall software maturity. Indicators include trends of software unique failures versus time, the difference between software failures discovered versus software failures resolved, the average severity of the software failures versus the time necessary to implement software changes. Although there are no software deficiency categories in the discrepancy reporting categories, there is a subcategory in the Joint Discrepancy Reporting System that can be selected for discrepancy reports that have software related issues.

A6.8.2.1. Software Discrepancies. Although the total number of weighted software problems discovered and resolved may be very large, the resulting difference between problems discovered and resolved should be kept to a minimum. This is especially true for mission-critical, safety-critical, and high-reliability systems. None of the indicators are direct measures of software maturity, but should be considered together. Begin measuring software maturity after the software is placed under formal configuration control. Continuous measurement helps to prevent software from entering the field with known problems that could abort or degrade the mission (see IEEE 12207). For example, program restarts or reboots should be tracked in the Joint Discrepancy Reporting System—whether or not they are successful—based on the impact an unsuccessful restart or reboot had, or would have had, on the mission.

A6.8.2.2. Growth Capacity. Use growth capacity to calculate a computer system's capacity to handle added functions and system users. Growth capacity ensures that sufficient processing power and memory exists to make room for required changes after a system is delivered to the field. For example, growth capacity may be stated as a requirement for the delivered computer system to have a minimum of "X" percent of reserve computer memory in contiguous memory locations, a minimum of "Y" percent reserve timing for each computational cycle, an overall average of "Z" percent for all cycles, and the capability to expand by "A" percent.

A6.8.2.3. Block Release Cycle. Use block release cycle to calculate the anticipated frequency and number of software changes needed periodically. After a system is fielded, appropriate personnel normally develop and release new versions of software based on a block release cycle. Define this cycle using the interval of time during which personnel make software block changes and the number of changes in the block. For example, express block release cycle requirements as "block releases every 'X' months with an average of 'Y' changes per release."

A6.8.2.4. Reliability. Use reliability to calculate the probability that software will remain failure-free for a specified time under specified conditions. In a system context, software reliability is the probability that software will not cause failure of the system for a specified time under specified conditions. Sources of failure include system inputs and uses as well as existing software faults. Count software defects that cause the system to fail in the system-reliability allocation. In cases where this is not practical, specify software reliability separately. State the reliability requirement as:

$$MTBCF = \frac{\text{Cumulative central processing unit time}}{\text{Cumulative failures}}$$

A6.8.2.5. Machine Independence. Use machine independence to calculate software dependence on the machine's architecture. Machine-dependent software is tied to the inherent architecture of the computer processor. Machine-dependent software is generally more expensive to support over the software's life cycle than software that can run on several machines. A change in the processor forces a change in the machine-dependent code. Assess costs and risks associated with modifying machine-dependent code. The percentage of machine-dependent code varies with different systems under development. Communication systems, such as network control systems or operating systems, may

contain significant amounts of machine-dependent code because their functions are closely tied to the hardware. State requirements for machine-dependent software as:

Amount of machine independent code  =  "X" percent of total code

A6.8.2.5.1. Calculate machine independence for each module. If a module contains machine-dependent code, then the entire module qualifies as machine dependent. This encourages developers to use machine-dependent code in only a few small modules and helps to ensure that developers create software that personnel can easily and inexpensively modify. **Exception:** Do not assess machine dependence for assembly languages or special-purpose processors that use their own languages. Both of these cases require 100-percent machine- dependent software.

A6.8.2.6. Software Maintainability. Software maintainability is the ease in which changes to software source code and its associated documentation can be made. Software maintainability can be indirectly measured by evaluating the characteristics which impact future modifications. These characteristics include documentation (organization, description, and traceability); source code (modularity, description, consistency, simplicity, expandability testability, and traceability); and implementation (modularity, convention, simplicity, testability, and design). Use automated software evaluation tools to support the measurement of software maintainability.

A6.8.2.7. Software Support. MAJCOMs and SMs determine organizational and depot level support.

**A6.9. Space, Space Surveillance, and Missile Warning Systems.**

A6.9.1. Overview. Use the following definitions, mission capability and supportability measures for space, space surveillance, and missile warning systems.

A6.9.2. Availability and Sustainability Measures. The majority of space systems are forward deployed and perform at the same level of operational intensity in peacetime as in time of conflict. These systems are normally employed in networks (systems of systems) and can usually be described as being composed of space, launch, control, and user segments. Operational availability, operational dependability, and mission reliability parameters should be specified for each segment as well as the overall system. The methodologies used to combine the segment-level parameters into system-level parameters should be stated. The segments are defined as:

A6.9.2.1. Space segment - the satellites, payloads, and platforms that are placed into orbit to provide operational forces with intelligence, communications, navigation mapping/geodesy, meteorological, or surveillance information.

A6.9.2.2. Launch segment - the two basic types of launch vehicles (expendable and reusable) and their associated launch processing facilities and range support.

A6.9.2.3. Control segment - the resources which perform the functions required to monitor and control the orbiting space vehicles of the space segment.

A6.9.2.4. User segment - the transmit and/or receive equipment to communicate with the payload or control segment, processing equipment, and communications equipment linking the processed payload information to the end user.

A6.9.3. Top Level. MAJCOMs should consider the following measures in describing top-level mission capability and supportability requirements for space, space surveillance, and missile warning systems.

A6.9.3.1. Operational Availability (Ao). Ao is the probability that a system can be used for any specified purpose when desired. Ao includes both the inherent RAM and deployability parameters and logistics support effectiveness of the system that relates to the total time the system might be desired for use. Ao is defined as follows:

$$Ao = \frac{Uptime}{Uptime + Downtime} \times 100$$

A6.9.3.2. Operational Dependability (Do). Operational dependability of the system measures the probability that the system is operating satisfactorily at any point in time when measured under specified conditions where downtime for scheduled maintenance and training is excluded. It is expressed as follows:

$$D_o = \frac{Active\ Hours - NMCU\ Hours}{Active\ Hours}$$

A6.9.3.3. Mission Reliability. Mission reliability (denoted Rm) is the probability that the system is operable and capable of performing its required function for a stated mission duration or at a specified time into the mission. Rm is based on the effects of system reliability during mission time only. Rm does not take into account system maintainability. There are many missions and systems that do not allow restoration of specific functions during the mission. For systems whose times to failure exhibit an exponential probability density function (i.e., systems which exhibit constant failure rates), Rm is defined as:

$$R_m = e^{-(t/MTBCF)}$$

where "t" is the average mission time. If the system is used under significantly different mission lengths, the specific mission time should be used to determine the Rm for each mission.

A6.9.3.3.1. Mean Time Between Critical Failure (MTBCF). MTBCF is a measure of the average operating time between failures of mission-essential functions. MTBCF is defined as follows:

$$MTBCF = \frac{Operating\ hours}{Number\ of\ critical\ failures} \quad or \quad \frac{Active\ hours - NMC\ hours}{Number\ NMCMU\ events}$$

A6.9.3.3.2. Mean Time To Restore Function (MTTRF). MTTRF is the average elapsed time, as a result of a critical failure, required to restore a system to full operating status. MTTRF includes administrative and logistics delay times associated with restoring function following a critical failure. MTTRF is defined as follows:

$$MTTRF = \frac{NMCMU\ Hours}{NMCMU\ Events}$$

A6.9.3.4. Logistics Reliability. Logistics reliability is a measure of the system's frequency of maintenance under defined operational and support concepts, using specific logistics resources. A measure of logistics reliability is mean time between maintenance

(MTBM). It is the average time between all maintenance events, that is, both scheduled and unscheduled events. MTBM is most often defined as follows:

MTBM = $\dfrac{\text{Number of operating hours}}{\text{Number of maintenance events}}$

This is equivalent to:

MTBM = $\dfrac{(\text{MTBUM})(\text{MTBSM})}{\text{MTBUM} + \text{MTBSM}}$

where MTBUM is the mean time between unscheduled maintenance and MTBSM is the mean time between scheduled maintenance and are most often defined as:

MTBUM = $\dfrac{\text{Number of operating hours}}{\text{Number of unscheduled maintenance events}}$

and

MTBSM = $\dfrac{\text{Number of operating hours}}{\text{Number of scheduled maintenance events}}$

A6.9.3.5. Mean Repair Time (MRT). MRT is the average on-equipment and/or off-equipment corrective maintenance times. It includes all maintenance actions needed to correct a malfunction, including preparing for test, troubleshooting, removing and replacing parts, repairing, adjusting, reassembly, alignment and adjustment, and checkout. MRT does not include administrative and logistics delays. MRT is most often defined as:

MRT = $\dfrac{\text{Repair Manhours (ON)} + \text{Repair Manhours (OFF)}}{\text{Repair Actions (ON)} + \text{Repair Actions (OFF)}}$

**Note:** MRT differs from the contractual term mean time to repair (MTTR) in that it measures maintenance activities that occur in the operational environment.

A6.9.3.6. Launch Segment Specific Parameters:

A6.9.3.6.1. Maintenance Man Years Per Launch (MMY/L). MMY/L is the total manpower-maintenance resource requirements associated per launch. MMY/L includes non-mission time (for example, launch pad preparation and build-up) and active mission time (for example, prelaunch, launch, and postlaunch operations).

A6.9.3.6.2. Pad Turnaround Time. This is the total time associated with the preparation and configuration of the pad after the launch of a similarly configured launch vehicle.

A6.9.3.7. Contact Success Rate (CSR). Contact Success Rate is the ratio of successful contacts with respect to total attempts. The Contact Success Rate metric is calculated only at the Network level since a complete end-to-end configuration is required for a successful satellite contact. The Network Utilization metric is also calculated only at the Network level as a measure of overall AFSCN antenna utilization.

CSR = $\dfrac{(\text{Number of successful contacts})}{(\text{Total number of contacts})}$

A6.9.3.8. Space MICAP. A space MICAP is an item, that when it fails, causes a System Reporting Designator (SRD) down. This is not restricted to Single Point of Failure items, but could be the loss of a final triple redundant part in a SRD.

A6.9.3.9. Single Point of Failure (SPF). A space SPF item is a single item type within a SRD, that when it fails, brings a SRD down.

A6.9.3.10. Training Systems/Devices. Space systems trainers are required to be supported/managed by the SM on an equal priority to the space system they serve. This includes configuration management and sustainment.

## A6.10. Automated Information Systems (AIS).

A6.10.1. Overview. Use the following mission capability and sustainability measures for automated information systems (AIS).

A6.10.2. Availability and Sustainability Measures:

A6.10.2.1. Operational Dependability (Do). Use operational dependability to determine the percentage of the time the AIS is able to satisfy the need for critical management information. Mean time between critical failure (MTBCF) is based on user-provided guidance on information criticality and timing for Do to be meaningful. Mean time to restore function (MTTRF) is the average time required after a critical failure has occurred.

$$D_o = \frac{(MTBCF)}{(MTBCF + MTTRF)} \times 100$$

A6.10.2.2. Operational Availability (Ao). Use operational availability to determine the percentage of time the system can be used to perform any assigned task, critical and non-critical. Ao is calculated using mean time between downing events (MTBDE) and mean downtime (MDT).

$$A_o = \frac{(MTBDE)}{(MTBDE + MDT)} \times 100$$

A6.10.3. Reliability Measures:

A6.10.3.1. Mean Time Between Critical Failure (MTBCF). Use MTBCF to measure the average time between failures of mission-essential system functions. For AIS, MTBCF equals the total equipment operating time in hours, divided by the number of mission-essential system failures. MTBCF includes all critical hardware and software failures that deny the user critical management information based on user-determined critical and timing requirements. Express MTBCF as:

$$MTBCF = \frac{Number\ of\ operating\ hours}{Number\ of\ critical\ failures} = \frac{Active\ hours - NMCMU\ hours}{Number\ of\ NMCMU\ events}$$

A6.10.3.2. Mean Time Between Downing Events (MTBDE). Use MTBDE to calculate the average life units between downing events, scheduled and unscheduled. Use operating hours, if reported, as the time base for applicable items; otherwise, use PHs.

A6.10.4. Maintainability Measures:

A6.10.4.1. Mean Downtime (MDT). Use MDT to measure the average elapsed time between losing full operating status and restoring the system to at least partial operating status. The downtime clock continues to run until maintenance personnel return the system to a user-acceptable level of system operability. When computing MDT also

consider TO availability and adequacy, support equipment capability and availability, supply levels, manning, experience levels, and shift structure.

A6.10.4.2.  Mean Time to Restore Functions (MTTRF). This pertains to the average total elapsed time, as the result of a critical failure, required to repair and restore a system to full operating status with respect to providing critical information to the user. Users quantify and qualify the degree of MTTRF acceptable to perform assigned tasks effectively. Quantifiable objective evaluation criteria (average in hours) represent user satisfaction with the MTTRF of the AIS to support the performance of assigned tasks effectively. Express MTTRF as:

$$MTTRF = \frac{\text{Total critical restore time}}{\text{Number of critical failures}}$$

A6.10.5.  Manpower Measures:

A6.10.5.1.  Maintenance Man-Hours per Life Unit (MMH/LU). Use MMH/LU to measure the average man-hours per life unit needed to maintain a system.

A6.10.6.  Deployability Considerations. MAJCOMs should consider building in deployability when describing top-level requirements for automated information systems. Address capability of the system to be deployed to the theater of operations within the constraints of the user-defined requirements.

A6.10.6.1.  Deployment Footprint. See A6.3.7.1

A6.10.6.2.  Logistics Follow-on Support. See A6.3.7.2

**A6.11.  Ground Communications-Electronics (C-E).**

A6.11.1.  Overview. Use the following mission availability, capability, and supportability measures for ground communications-electronics (C-E), to include ground space C-E. For space-based systems, ITWAA Systems and Cheyenne Mountain, NORAD Instruction (NI) 10-3 and STRATCOM Instruction (SI) 508-10 should be used in conjunction with this attachment. See AFI 21-103, *Equipment Inventory, Status and Utilization Reporting*, for glossary of references and supporting information (terms).

A6.11.2.  Availability and Sustainability Measures. MAJCOMs should consider availability and sustainability measures when describing top-level logistics requirements for ground communications-electronics systems. Use the equations in this attachment to develop these measures.

A6.11.3.  Availability. Availability is the probability of a system being fully mission capable (FMC) or partially mission capable (PMC), at a random moment in time, or equivalently, the percent of the desired operating time a system is FMC or PMC. It is expressed using one of the following formulas.

A6.11.3.1.  Operational Availability (Ao). Operational availability measures the probability that, at any point in time, the system is either operating or can operate satisfactorily when operated under specified conditions. It is the preferred method of defining availability in capability requirements documents. It can be expressed as follows:

$$A_o = \frac{\text{Active hours – Downtime}}{} = \frac{\text{Active hours – NMC hours}}{}$$

Active hours                             Active hours
Downtime and NMC hours account for situations when the system is not mission capable for any reason.

   A6.11.3.2. Operational Readiness (OR). The operational readiness of the system measures the probability that the system is operating satisfactorily at any point in time when measured under specified conditions where downtime for scheduled maintenance and training is excluded. It is expressed as follows:

$O_R$ =   Active hours – NMCU hours
Active Hours

Not mission capable unscheduled (NMCU) refers to those times when the system is not mission capable because of unscheduled maintenance and associated delays. NMCU is a readiness status code, but factor is used to track operational readiness.

   A6.11.3.3. Utilization Rate (UR). Utilization rate is the average use of a system during a specified period of calendar time. Mathematically, it is the ratio of active hours to possessed hours in a given calendar period.

$U_R$ =   Active hours
Possessed Hours

   A6.11.3.4. Reliability. Reliability is the probability that a system and its parts will perform its mission without failure, degradation, or demand on the support system. Reliability is used to calculate the probability of mission success and to determine logistics needs.

   A6.11.3.5. Mean Time Between Critical Failure (MTBCF). MTBCF is a measure of the average operating time between failures of mission-essential system functions. MTBCF equals the total system operating time divided by the number of mission downing events, including all disabling hardware and software failure events. MTBCF excludes scheduled maintenance, and it can be expressed as follows:

MTBCF =          Operating hours   or   Active hours –NMC hours
Number of critical failures      Number NMCMU events

   A6.11.4. Maintainability. Maintainability is the ability of equipment to be maintained, and is typically expressed as the average time to complete a maintenance action.

   A6.11.4.1. Mean Time Between Failures (MTBF). MTBF is a measure of the average operating time between any failure of the system, excluding scheduled maintenance. It can be expressed as follows:

MTBF = Operating hours   or   Active hours – NMC hours)
Number of failures      Number of PMCMU + NMCMU events

   A6.11.4.2. Mean Time Between Maintenance (MTBM). MTBM measures the average operating time between maintenance events, scheduled and unscheduled. It can be expressed as follows:

MTBCF       = Operating hours    or   Active hours – NMC hours)
Number of maintenance events    Number of PMCM + NMCM events

A6.11.4.3. Mean Downtime (MDT). MDT is a measure of the average time between losing MC or PMC status and restoring the system to MC or PMC status. It includes, but is not limited to, active maintenance, maintenance and supply delays, administrative delays, scheduled maintenance, and all activities that result in NMC status, such as training and preventive maintenance. MDT can be expressed as follows:

$$\text{MDT} = \frac{\text{Downtime (in hours)}}{\text{Number of downing events}} = \frac{\text{NMC hours}}{\text{Number NMC events}}$$

A6.11.4.4. Mean Repair Time (MRT). MRT is a measure of the average maintenance repair hours per maintenance repair actions from Job Data Documentation (JDD). MRT includes all maintenance done to correct the malfunction, including preparation, LRU access, troubleshooting, removing and replacing parts, repair, adjusting, and conducting functional checks. MRT is expressed as follows:

$$\text{MRT} = \frac{\text{On-Equip + Off-Equip Repair Hours}}{\text{On-Equip + Off Equip Repair Actions}}$$

A6.11.5. Manpower. Manpower is an estimate or requirement for human resources to support operation and maintenance. Lead commands should consider manpower measures when describing top-level logistics requirements.

A6.11.5.1. Maintenance Labor-Hours per Active Hour (MLH/AH). The general formula for MLH/AH is obtained by dividing the total maintenance labor-hours by the active system hours accrued as shown by the following formula:

$$\text{MLH/AH} = \frac{\text{On-Equip + Off-Equip Maintenance Time}}{\text{Active Hours}}$$

A6.11.5.2. Maintenance Personnel per Operational Unit. This is the estimated manpower to support maintenance and operation. It does not include depot-level personnel and other as requirements determination and process for quantifying manpower as prescribed in AFMAN 38-102. Others maintenance personnel that are excluded from maintenance planning are discussed in AFI 38-101.

A6.11.6. System Deployability. Lead commands should consider deployability in describing top-level logistics requirements for C-E systems. Deployability considers whether or not the system can be deployed to a theater of operations within the constraints of the user-defined requirements and logistics planning factors such as:

A6.11.6.1. Manpower (operations and maintenance)

A6.11.6.2. Maintenance concept

A6.11.6.3. Interoperability

A6.11.6.4. Electromagnetic compatibility

A6.11.6.5. The deployed environment (climate and terrain)

A6.11.6.6. Safety

A6.11.6.7. Support equipment (test equipment, mobile electric power generators, tools, environmental control units)

A6.11.6.8.  Transportation and basing factors, such as the system's weight and cube, and the number and types of vehicles required to transport the system to the deployed destination

A6.11.6.9.  System/equipment set-up and tear-down times

A6.11.6.10.  Supply support

A6.11.6.11.  Software support

A6.11.6.12.  Network Support

A6.11.6.13.  Depot-level support

A6.11.7.  Deployment Footprint. The manpower, materiel and equipment required to support a deployment is often referred to as the deployment footprint. One common way to express the deployment footprint is the number of equivalent airlift pallet positions required to deploy a system. The number of personnel required to operate and maintain the deployed system should also be factored into the deployment footprint.

**Attachment 7**

**INDUSTRIAL PREPAREDNESS**

**A7.1. Defense Production Act, Title I: Defense Priorities and Allocation System (DPAS).** The purpose of DPAS is to ensure the timely availability of industrial resources to meet national defense and emergency preparedness requirements. Contracting Officers apply priority ratings to contracts or orders according to the DoD 4400.1-M, Priorities and Allocations Manual. Through DPAS, defense programs are assigned an industrial priority rating of either DX or DO. The Secretary of Defense authorizes the use of the DX rating for programs of the highest national urgency. The DX rating allows defense orders to take priority over commercial orders and other lower rated defense orders as needed to meet required delivery dates. The industrial priority rating applies to all contracts and cascades from the prime through all levels of vendors. Another feature of DPA is the Special Priorities Assistance (SPA) process. The SPA process is used on a specific order or contract basis to expedite product delivery to meet a specific date or to accelerate a delivery due to a change in military urgency. SPA can also be used to resolve delivery conflicts among various priority rated orders, interagency/joint conflicts, and to resolve DPAS violations. The BIS-999, Request for Special Priorities Assistance, is used to execute the SPA. The BIS-999 is forwarded to the local DPAS Officer for resolution or to the DPAS Officer at AFRL/RXME for assistance.

**A7.2. Defense Production Act, Title III, Expansion of Productive Capacity and Supply.** The Defense Production Act Title III authorizes the President to use various forms of financial incentives to develop and promote measures for the expansion of production capacity and of production and supply of materials and facilities necessary for national defense. The program is administered by OUSD(A&S). The AF is the Executive Agent for the program.

**A7.3. Defense Production Act Title VII, Authority to Review Certain Mergers, Acquisitions and Takeovers.** The Defense Production Act Title VII establishes the Committee on Foreign Investment in the United States (CFIUS) as the mechanism to support Presidential review and, if the President finds it necessary, to prohibit or limit foreign direct investment that threatens national security. The Secretary of the Treasury chairs the CFIUS Department. SAF/AQRX has the responsibility for consolidating and providing AF equities and inputs to CFIUS through OUSD(A&S INDPOL). Program offices or air base officials may be tasked to qualify potential vulnerabilities or consequences related to the risk of a foreign acquisition of U.S. companies or real estate. Use of the COMET case management system on SIPRNET is required to view case materials located at **https://ebiz.acqs.osd.pentagon.smil.mil/Comet**. If program offices of air base officials have concerns involving foreign acquisition of companies of concern or of real estate for proximity concerns, the AF CFIUS office can be reached at **usaf.pentagon.saf-aq.list.usaf-cfius@mail.smil.mil** (SIPRNet) or **usaf.pentagon.saf-aq.list.usaf-cfius@mail.mil** (NIPRNet)."

**A7.4. 10 U.S.C. §2521 Manufacturing Technology (ManTech) Program.** The purpose of ManTech is to pursue revolutionary manufacturing technology solutions. The AF ManTech program pursues manufacturing technologies to enable affordable manufacturing development, production, and sustainment capabilities for emerging science and technology for applications; mature and validate emerging manufacturing technologies to support implementation in industry and Air Logistics Centers; and promote efficiency and value-added processes throughout the

industrial enterprise value chain (i.e., from prime contractors to their sub-tier suppliers). The ManTech program is led and executed by AFRL/RX.

**A7.5. Industrial Base Assessments.** AFRL/RX performs Industrial Base Assessments to identify shortfalls in industrial capability and/or capacity needed to support current and future military operations during times of peace, war, crisis, or emergency. These assessments support the AF input to the DoD Annual Industrial Capabilities Assessment and identify industrial base risks requiring PM, PEO, or corporate AF attention.

**Attachment 8**

**FORMAT FOR NEW START VALIDATION**

**A8.1.  Sample New Start Validation.**  **Table A8.1** provides a sample of a new start validation.

**Table A8.1.  New Start Validation.**

| | | |
|---|---|---|
| In accordance with AFI 63-101/20-101, I have reviewed AFI 65-601 and DoD FMR Vol III Chapter 6 and confirmed the following prior to approving this action (one of the following should be answered yes and acknowledged (signed-off) by the PM and Program's Chief Financial Officer (CFO) or Program Control Chief):  If no items can be answered YES, then the Program Office should contact its respective PEM/CD at the HAF as delineated in AFI 63-101/20-101 in order to coordinate New Start Notification package. | | |
| Program is budgeted and appropriated. Effort was budgeted in the President's Budget Submission and is consistent with program direction provided by Defense Appropriations Conference language and/or marks. Fiscal year of President's Budget Submission should match fiscal year of funds being used. *(If conditions delineated above are satisfied, then this effort is not a new start and as such requires no additional Congressional notification/approval. Mark Yes in the column to the right and sign off at bottom of sheet as required).* | **YES** | **NO** |
| Program is a Congressional Add. Effort was not requested in the President's Budget Submission, but funds were appropriated by the Defense Appropriations Conference and effort is consistent with program direction provided by Defense Appropriations Conference language and/or marks. Fiscal year of marks should match fiscal year of funds being used. (*If conditions delineated above are satisfied, then this effort is not a new start and requires no additional Congressional notification/approval. Mark Yes in the column to the right and attach SAF/AQX Program Authorization (PA) and sign-off at bottom of sheet as required).* | **YES** | **NO** |
| Program is an out-of-cycle New Start. Effort is an out-of-cycle new start for which Congressional notification/approval has been accomplished as reflected on the Secretary of the Air Force funds release document. *(If conditions delineated above have been verified, mark Yes in the column to the right and attach SAF/AQX or AF/ILS Program Authorization (PA) supporting this action).* | **YES** | **NO** |
| SAF/HAF has advised this Program Office that a new start notification is not required *(Mark Yes in the column to the right and attach supporting documentation from SAF/AQX or AF/FMB).* | **YES** | **NO** |
| _____      _____ | | |

| Program Manager (Name/Grade)                Signature and Date | | |
|---|---|---|
| _____          _____<br>CFO/Program Control Chief (Name/Grade)        Signature and Date<br><br>Department of Defense Appropriations Act 2000, Public Law 106-79 Sec. 8096. None of the funds in this Act may be used to compensate a DoD employee who initiates a New Start program without notification to OSD and the Congressional Defense Committees, as required by DoD financial management regulations. | | |

**Attachment 9**

**AIR FORCE DRAWING APPROVAL, RELEASE AND NUMBERING PRACTICES**

**A9.1. Drawing Approval and Release.** The following provides recommended program verification procedures for approval and release of Air Force CAGE/generated engineering drawings and associated documentation. Manually applied signatures or electronically applied signature equivalents can signify completion of each action.

A9.1.1. Technician (mandatory):  Verifies the preparing technician developed and examined the completed work as directed and the required information is accurately delineated.

A9.1.2. Checker (mandatory):  Verifies conformance to standards and guidance cited therein, ensuring the content is correct and complete.

A9.1.3. Project Engineer (mandatory):  Verifies compliance with the applicable engineering design criteria. Certifies all coordinating signatures are included as required.

A9.1.4. Engineering Approval (optional):  Verifies cognizance and approval of the project by the design engineer's supervisor.

A9.1.5. Coordinating Signatures (optional). Verifies additional professional approval as determined by the project engineer. (Most signing engineers represent a specialized engineering discipline such as corrosion, environmental, safety, reliability, nuclear, etc.)

A9.1.6. Air Force Authentication (mandatory):  Verifies all requirements are satisfied. The engineering drawing is now under formal configuration management control and is technically ready for final release. The authentication authority is:

A9.1.6.1. The chief/lead Air Force engineer or other designated agent for Air Force engineering data generated organically, or

A9.1.6.2. A contractor preparing Air Force drawings delegated this authority tasked to deliver drawings that include their release control authority signatures.

**A9.2. Air Force Release.** The locally designated activity signs the Air Force release verifying that:

A9.2.1. Drawing activities have accomplished administrative control functions as follows: The EO contains the minimum required signatures. The Engineering Approval signature is verified against the current authorized Chief/lead Engineering Authority list supplied by SPO. The EO is verified to be the correct type for the current CAGE code (information EO and AESO for contractor CDA; Information EO Change notice (CNEO) and advanced EO (AECO) for Air Force CDA. The Distribution Statement is included and matches the drawing, the revision level matches the current indexing in JEDMICS.

A9.2.2. The complete engineering drawing (defined by the design or design change) has been released.

A9.2.3. The "X" has been removed from the engineering drawing number.

**A9.3. Air Force Engineering Drawing Numbers.**

A9.3.1. Each Air Force drawing preparation activity annually acquires blocks of official Air Force drawing numbers from HQ AFLCMC/XP.

A9.3.2.  HQ AFLCMC/XP distributes blocks of Air Force drawing numbers to authorized activities upon their request. Engineering activities will submit annual distribution requests no later than December 1st. Additional drawing numbers may be requested at any time.

A9.3.2.1.  Drawing number requests include:

A9.3.2.1.1.  Quantity of drawing numbers required

A9.3.2.1.2.  Full office postal address

A9.3.2.1.3.  Commercial and Government Entity (CAGE) Code

A9.3.2.1.4.  Point of contact name, phone number (voice and FAX), E-mail address.

A9.3.2.2.  Submit request via letter, FAX, or E-mail to office listed in **Table A9.1**

**Table A9.1.  HQ AFLCMC/XP Contact Information.**

| |
|---|
| AFLCMC/XP<br>TBD<br>Wright-Patterson AFB OH 45433-5006<br>E-mail: AFLCMC/XP Workflow (TBD)<br>FAX:  TBD |

A9.3.3.  Use the prefix "X" in the drawing number blocks until Air Force Release action. Do not prefix references to Air Force drawings with an "X." The "X" is removed only upon Air Force release action.

A9.3.4.  Air Force drawing numbers are applied as assigned without modification except for associated list identification as provided in ASME Y14.34, *Associated Lists*.

A9.3.5.  Air Force drawing numbers are assigned only during the calendar year for which they are issued. Unassigned drawing numbers will not be "carried over" to the following calendar year. (i.e., CY 2013 number assignment ceases 31 December 2013, CY 2014 number assignment commences 1 January 2014)

A9.3.6.  Designated focal points assigned blocks of Air Force drawing numbers administer those drawing numbers. Each focal point maintains permanent records of assigned Air Force drawing numbers. When Air Force drawing numbers are transferred or reassigned to a different CAGE Code identified activity, the focal point maintains a permanent record of the transfer action and reports the following transfer actions to AFLCMC/HIAM:

A9.3.6.1.  The drawing number(s) transferred. If a block of numbers is transferred, the first and last number of the block is sufficient. If the transfer involves numbers not in sequence, list each number transferred.

A9.3.6.2.  The date of transfer.

A9.3.6.3.  The full identification of the receiving activity including full postal address, focal point name, phone number (voice and FAX), and E-mail address.

A9.3.7.  Air Force Dash Numbering System.

A9.3.7.1. The standard Air Force dash numbering system for items and assemblies is based on long standing practices. While many drawing functions, both Government and non-Government, are often more complex, most of them have evolved from this base.

A9.3.7.1.1.  Detailed Item Dash Numbers. Use odd dash numbers on all defined detail items. Use even numbers for the opposite or mirror-image items. Do not use dash numbers ending in "9" or "0" see **Table A9.2**

A9.3.7.1.2. Assembly Dash Numbers. Use dash numbers beginning with an odd number and ending with "0" for all defined assemblies. Use dash numbers beginning with an even number and ending with "0" for the opposite or mirror-image assemblies see **Table A9.2**

A9.3.7.1.3. Tabulated alignment. You may use corresponding dash numbers for tabulated Air Force drawings that relate to other tabulated drawings or standards when necessary for clear cross-referencing and identification.

A9.3.7.1.4. Variations. Submit requests for variations of the Air Force dash numbering system to ESC/HGGI. Fully describe the variations you're requesting, explain why you need the variations, and assess the impact on your project if the variation is not approved. Your request will be evaluated by ESC/HGGI and submitted with disposition recommendation through HQ AFLCMC/XPfor final resolution.

**Table A9.2.  Dash Numbers.**

| Parts | | | Assemblies | |
|---|---|---|---|---|
| Shown | Opposite | | Shown | Opposite |
| -01 | -02 | | -10 | -20 |
| -03 | -04 | | -30 | -40 |
| -05 | -06 | | -50 | -60 |
| -07 | -08 | | -70 | -80 |
| *(do not use numbers ending in 9 or 0)* | | | -90 | -100 |
| -11 | -12 | | -110 | -120 |
| -13 | -14 | | -130 | -140 |
| -15 | -16 | | Etc. | |
| Etc. | | | | |

**Attachment 10**

**STANDARDS AND MANUALS FOR ENGINEERING DRAWINGS AND RELATED DOCUMENTATION**

**A10.1. Overview.Table A10.1** provides references identified as Non-Government Standards (NGS) for Engineering Drawing Preparation. When Government standards or specifications are revised, superseded, or cancelled the following codes and standards apply.

**Table A10.1.  Non-Government Standards (NGS) for Engineering Drawing Preparation.**

**ASME**—American Society of Mechanical Engineers
Three Park Avenue, New York, NY 10016-5990
Order Dept: 22 Law Drive, P.O. Box 2900, Fairfield NJ 07007-2900
http://www.asme.org/catalog/
ASME B46.1—Surface Texture (Surface, Roughness, Waviness, and Lay)
ASME Y14.1Decimal Inch Drawing Sheet Size and Format
ASME Y14.1M—Metric Drawing Sheet Size and Format
ASME Y14.2—Line Conventions and Lettering
ASME Y14.3—Multi- and Sectional-View Drawings
ASME Y14.4M—Pictorial Drawing
ASME Y14.5—Dimensioning and Tolerancing
ANSI Y14.6—Screw Thread Representation
ANSI Y14.7.1—Gear Drawing Standards – Part 1: For Spur, Helical, Double Helical, and Rack
ANSI Y14.7.2—Gear and Spline Drawing Standards – Part 2: Bevel and Hypoid Gears
ASME Y14.8—Casting and Forgings
ASME Y14.13—M    Mechanical Spring Representation
ASME Y14.24—Types and Applications of Engineering Drawings
ASME Y14.31—Undimensioned Drawings
ASME Y14.34—Associated Lists
ASME Y14.35M—Revision of Engineering Drawings and Associated Documents
ASME Y14.36M—Graphic Symbols for Heat-Power Apparatus
ASME Y14.38—Abbreviations and Acronyms
ASME Y14.41—Product Definition Data Set Practices – Digital
ASME Y14.42—Digital Approval Systems
ASME Y14.43—Dimensioning and Tolerancing for Gages and Fixtures
ASME Y14.100—Engineering Drawing Practices

**AIIM**—Association for Information and Image Management
1100 Wayne Avenue, Silver Spring, MD 20910
http://www.aiim.org/ ANSI/AIIM MS4        Flowchart Symbols and Their Use in Micrographics

**AWS**—American Welding Society
550 NW Le Jeune Road, Miami, FL 33135
http://www.aws.org/

**ANSI**—American National Standards Institute

ANSI/AWS A2.4—Standard Symbols for Welding, Brazing, and Nondestructive Examination

ANSI/AWS A3.0—Welding Terms and Definitions, Including Terms for Brazing, Soldering, Thermal Spraying, and Thermal Cutting

**ASTM**—American Society for Testing and Materials
100 Barr Harbor Drive, West Conshohocken, PA 19428
http://www.astm.org/
IEE/ASTM SI 10—American National Standard for Use of the International System of Units (SI): The Modern Metric System

**EIA**—Electronic Industries Alliance
2500 Wilson Blvd., Arlington, VA 22201
http://www.eia.org/
EIA 632—Processes for Engineering A System

**IEEE**—Institute of Electrical and Electronics Engineers
445 Hose Lane, Piscataway, NJ 08855
http://www.ieee.org/
ANSI/IEEE 91—Graphic Symbols for Logic Functions
IEEE 91a—Supplement to Graphic Symbols for Logic Functions
ANSI/IEEE 260.1—Letter Symbols for Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units)
ANSI/IEEE 260.3—Mathematical Signs and Symbols for Use in Physical Sciences and Technology
ANSI/IEEE 280—Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering (Same as ANSI Y10.5)
IEEE 315—Graphic Symbols for Electrical and Electronics Diagrams
ANSI/IEEE 315a        Supplement to Graphic Symbols for Electrical and Electronics Diagrams

**IPC**—Institute for Interconnecting and Packaging Electronic Circuits
2215 Sanders Road, Northbrook, IL 60062
http://www.ipc.org/
IPC D-325—Documentation Requirements for Printed Boards, Assemblies, and Support Drawings
ANSI/IPC D-350—Printed Board Description in Digital Form
ANSI/IPC T-50F—Terms and Definitions for Interconnecting and Packaging Electronic Circuits
IPC 2221—Generic Standard on Printing Wiring Board Design

**ISO**—International Organization for Standardization
http://www.iso.ch/iso/en/prods-services/ISOstore/store.html
American National Standards Institute (ANSI)
West 43rd Street, 4th floor, New York, NY 10036
http://webstore.ansi.org/ansidocstore/default.asp
ISO 10303—Standard for Exchange of Product model data (STEP)
*Note:* This reference is to a family of application protocols (AP).
ISO 10303-239—Application Protocol: Product Life Cycle Support

261 3 FEBRUARY 2021

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**SAE**—Society of Automotive Engineers
400 Commonwealth Drive, Warrendale, PA 15096
http://www.sae.org/
SAE AS 1290—Graphic Symbols for Aircraft Hydraulic and Pneumatic Systems

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**A10.2. Requirements Manuals.Table A10.2** is a list of commercially available drawing requirements manuals is current as of the publication of this Instruction and does not constitute endorsement nor imply required use. These manuals may be locally purchased and used directly or to supplement the standards listed above and tailored as required. ***Note:*** When there is a conflict with the DRM the respective ASME document takes preference.

**Table A10.2.  Commercially Available Drawing Requirements.**

| Drawing Requirements Manual |
| Global Engineering Documents |
| 15 Inverness Way |
| Englewood CO 80112-5704 |
| (800) 854-7179 |
| FAX (303) 397-7935 |
| http://global.ihs.com/ |

| Modern Drafting Practices and Standards Manual |
| Genium Publishing Corp. |
| 1174 Riverfront Center |
| Amsterdam NY 12010 |
| (800) 243-6486 |
| FAX (518) 842-1843 |
| http://www.dz.genium.com |

**Attachment 11**

**CONFIDENCE LEVEL CONSIDERATIONS**

**A11.1.  Documenting the Confidence Level.**  The confidence level used in establishing the cost estimate is required to be included in many documents including:

A11.1.1.  The ADM approving the APB

A11.1.2. Any cost estimates for MDAP programs prepared in association with the Independent Cost Estimates (ICEs)that are required in advance of: 1) MS A, MS B, low rate initial production (LRIP), and full rate production (FRP); 2) Any certification pursuant to sections 2366a, 2366b, or 2433a of Title 10, USC; 3) Any report pursuant to section 2445c of Title 10 U.S.C.; and 3) At any time specified by the MDA or the D,CAPE.

A11.1.3. For MDAPs, the confidence level statement should also be included in the next selected acquisition report (SAR) prepared in compliance with section 2432 of Title 10 U.S.C.

**A11.2.  Considerations.**  When recommending or selecting a Confidence Level (CL) for an estimate (MDAP or ACAT II), which will directly affect the program budget, the program team and Milestone Decision Authority (MDA) considers a program's requirements, cost and schedule, interfaces or criticality to other programs, and technical and programmatic maturity. Where these considerations are found to be exceptional with respect to acquisition programs in general, they may be used to justify a higher CL estimate for developing a program budget. These considerations are used:

A11.2.1.  By the program team in formulating a CL recommendation,

A11.2.2. At the MDA level in determining the appropriate CL for the program and in documenting the rationale for the choice of the CL in the Acquisition Decision Memorandum (ADM), and

A11.2.3.  By the Air Force Corporate Structure (AFCS) in evaluation of program funding.

**A11.3.  Examples.**  The following list gives examples of possible considerations. This list is then augmented with other exceptional aspects of the individual acquisition program that affect the choice of the program's CL.

A11.3.1.  Requirements.

A11.3.2.  Low level of detail with respect to granularity of requirements (e.g. completeness of the Capability Based Assessment (CBA), system requirements are traceable to operational requirements, degree to which requirements are finite and testable).

A11.3.3.  Incremental strategy in providing capability.

A11.3.4.  Warfighter requirements vs. business system requirements.

A11.3.5.  Air Force specific requirements (importance of joint requirements would need to be accompanied by a funding mandate).

A11.3.6.  Increment delivering multiple KPPs.

A11.3.7.  Major risk areas from Capabilities Review and Risk Assessment (CRRA).

A11.3.8.  Tier I Weapons Systems.

A11.3.9. Sufficient number of test articles and Test & Evaluation infrastructure for completing the development program.

A11.3.10.  Time critical delivery (schedule urgency).

A11.3.11.  Low confidence in quality/completeness of cost estimate.

A11.3.12.  Degree to which schedule and cost uncertainties are integrated, and time-phasing of budget.

A11.3.13.  Development Test/Production schedule phase concurrency Interfaces/Criticality to Other Programs and/or Other Program Increments.

A11.3.14.  Several other programs dependent on the program in question (type of program dependencies in a system-of-systems).

A11.3.15.  Foundational increment (e.g. platform) Programmatic/Technical.

A11.3.16. Degree to which significant functional groups (e.g. contracting, systems engineering, logistics, T &E, risk management) believe the level of acquisition strategy detail is appropriate.

A11.3.17.  Cost type strategy.

A11.3.18.  Developmental Planning (Pre Milestone A).

A11.3.19.  Between Milestone A & Milestone B (Tec1mology Development Phase).

A11.3.20.  Post Milestone B.

A11.3.21.  Technology Readiness and Manufacturing Readiness Levels are appropriate for Milestone events.

A11.3.22.  History of like/similar program execution problems due to risk realization.

A11.3.23.  Prevention of Class A type incidents (Safety Issues).

A11.3.24.  Confidence Level Considerations Schedule/Cost.

**Attachment 12**

**PROGRAM TERMINATION TEMPLATES**

**A12.1. Termination Acquisition Decision Memorandum Template.** The following is a sample of a memorandum that should be submitted for a termination acquisition decision.

MEMORANDUM FOR AF PEO _____

FROM:  SAF/AQ
1060 Air Force Pentagon
Washington, DC 22030-1060

SUBJECT: Termination Acquisition Decision Memorandum (T-ADM) for
_____

**Purpose:**  This T-ADM serves as direction to terminate
the_____ program.
The PM is _____ (XXX/XXX) and the PEO is
_____ (XXX/XXXX).

**Decisions:**
In accordance with _____, I render a Program Termination Decision for
_____.
*Or:*  As a result of the FYXX President's Budget eliminating funding for the_____ _____
program, I direct the program to stop work and end contract activity in a prudent manner and
take appropriate steps to efficiently close out all ongoing efforts in accordance with current laws
and regulations.
*NOTE:* For termination of modification programs or incrementally developed programs with
fielded systems/capability, the following specific guidance is provided:
_____.

**Tasking/Action Items:**
The PM will identify a Termination Contracting Officer (TCO) to work closely with the PM and
the Contracting Officer to facilitate the termination process.
The Contracting Officer will ensure completion of all actions required IAW law and regulation,
to include all necessary notifications.
The Program PCO/ACO, as appropriate, will obtain legal review/input.
The program should present to me within XX days the detailed termination plan and the status of
actions that have been taken.
The plan will be coordinated like an acquisition plan, to include pertinent notifications.
The termination plan should address program termination activities required by FAR Part 49 and
AFI 63-101/20-101 and include the following:
Organizational responsibilities for termination
Program documentation and records
Assumptions
Contract and legal status

Funding
Personnel
Agreements, Performance Based Arrangements, Public-Private Partnerships, and Commitments
GFP and equipment deliverables


**Points of Contact:**  _____, SAF/xxx, (_____@us.af.mil) DSN: xxx-xxxx.



John Q. Smith
Air Force Service Acquisition Executive

(or DoD MDA, as appropriate; if so, prepare on OSD letterhead)
(or PEO as MDA, if applicable; if so, prepare on PEO letterhead)


1 Attachment:
TBD

DISTRIBUTION:
OSD Offices

HAF Offices

MAJCOM CC & Offices

Product Center Offices

Related Customers/Stakeholders

**A12.2. Termination Plan.**  The following is the suggested format and content for a Termination Plan.  (*Note:* This Template is applicable to ACAT I programs where the SAE is the MDA, but it can be tailored for use on ACAT ID/IB programs where the DAE is the MDA, or for use on ACAT II & III programs where the PEO is the MDA.)

A12.2.1.  Purpose. Example: "This plan delineates responsibilities to efficiently terminate the _____Program."

A12.2.2. Program/System Description. Include function and technical description of the program/system to be terminated. Include the identification of salvageable technologies and other deliverables and any other pertinent issues that require approval. State any dependencies that exist between this program and any other program(s).

A12.2.3. Program Information. **Table A12.1** provides an example of the program information that should be provided in the termination plan.

**Table A12.1.  Program Information for Termination Plan.**

| Program Name: | | ACAT: | Phase: |
|---|---|---|---|
| Joint Program:  (Yes or no) | | Foreign Military Sales: (If yes, whom?) | |
| Implementing Command: | | | |
| Sponsoring Command: | | | |
| Participating Command(s): | | | |
| OT&E Agency: | | | |
| MDA: | | | |
| PEO: | | | |
| PM: | | | |
| PCO: | | | |
| TCO: | | | |
| PEM: | | | |

A12.2.4. Organizational Responsibilities. Identify those management responsibilities and tasks that the gaining organization (if any) will need to continue after termination. When appropriate, address any provisions required to facilitate the termination of the program/system. Areas to be addressed in this paragraph include:

A12.2.4.1.  ASAF/AQ will: Identify based on program and AFI 63-101/20/101, Example: "The following persons will perform the following...:"

A12.2.4.2.  The PM will:

A12.2.4.2.1.  Determine organization responsible for termination activities;

A12.2.4.2.2. Schedule of all termination and transition activities (e.g., like an Acquisition Plan schedule);

A12.2.4.2.3. Determine planned date of program disestablishment and facility transition or closure;

A12.2.4.2.4. Determine turnover of facilities, permanent documents, and documents of historical value;

A12.2.4.2.5. Determine disposition of related efforts (including those that should be considered for ACAT status);

A12.2.4.2.6. Determine impact to other programs and a plan to mitigate such impact;

A12.2.4.2.7. Determine known industrial base impacts;

A12.2.4.2.8. Determine disposition of technology, GFP and documentation;

A12.2.4.2.9. Identify organizations' responsibilities; and,

A12.2.4.2.10. Identify enterprise/architectural impacts.

A12.2.4.3. The PCO and/or TCO, as appropriate, will:

A12.2.4.3.1. Determine status of contracting activities and the contract;

A12.2.4.3.2. Identify location of the Termination Contracting Officer (TCO) who will handle the settlement;

A12.2.4.3.3.  Create a plan to conclude open contracts in the most advantageous way to the government;

A12.2.4.3.4.  Identify potential for claims against the government;

A12.2.4.3.5.  Coordinate with the FM community for cognizance on financial closeout activities; and,

A12.2.4.3.6.  Arrange for disposition of accumulated equipment and property.

A12.2.4.4.  The Program Lead Financial Manager will:

A12.2.4.4.1.  Identify funds necessary for termination of the program;

A12.2.4.4.2.  Determine un-liquidated obligations;

A12.2.4.4.3.  Identify all outstanding contingent liabilities; and,

A12.2.4.4.4.  Ensure financial closeout and disposition of unobligated funds.

A12.2.4.5.  Personnel Activities—With the assistance of the Personnel office, the PM will:

A12.2.4.5.1.  Create a Human Resource plan to complete termination activities;

A12.2.4.5.2.  Determine release or reassignment of Government personnel;

A12.2.4.5.3.  Determine disposition of support contractors; and,

A12.2.4.5.4.  Determine disposition of manpower spaces**.**

A12.2.4.6.  The MAJCOM/A5 will: *Identify based on program.*

A12.2.4.7.  DCMA-xxxx will: *Identify based on program.*

A12.2.4.8.  The NGB (if applicable) will: *Identify based on program.*

A12.2.5.  Item Documentation and Records.

A12.2.5.1.  Technology, property and document disposition

A12.2.5.2.  Configuration Management

A12.2.5.3.  Engineering Responsibility, Engineering Data and Technical Data Package

A12.2.5.4.  Capabilities/Requirements Realignment

A12.2.5.5.  Impact to other programs and mitigation approach

A12.2.5.6.  Logistics Support (including Facilities Disposition/Hardware Realignment)

A12.2.5.7.  Software Fielding, Replication, Distribution, and Maintenance

A12.2.5.8.  Transportation and Packaging

A12.2.5.9.  Product Assurance Responsibility

A12.2.5.10.  Safety

A12.2.5.11.  Human Systems Integration (manpower positions, personnel assignments, etc.)

A12.2.5.12.  Security Classification Guidance

A12.2.5.13.  Environmental Documentation

A12.2.5.14.  Other responsibilities as specified in the Termination Acquisition Decision Memo

A12.2.6.  Assumptions - Contract Status and Legal Issues.

A12.2.6.1. Contracts Status: Open contracts/contractor(s)/time to completion/contract amount(s)/type dollars. Also include description of contracting activities, status of contracts, and contract- related responsibilities (such as notifications and required deliveries) pertinent to the termination process. Address termination and/or modification of existing contracts to include termination costs and un-liquidated obligations.

A12.2.6.2. Legal Issues:  Identify contract-related/personnel or labor/local government, etc. issues and identify current open contract information as follows (*Remove lines that are not applicable)*:

A12.2.6.2.1.  Number:

A12.2.6.2.2.  Contractor:

A12.2.6.2.3.  Contract Type:

A12.2.6.2.4.  End Date:

A12.2.6.2.5.  Current Value (All CLINs and fees paid):

A12.2.6.2.6.  Award Fees Available:

A12.2.6.2.7.  Total Invoiced to Date:

A12.2.6.2.8.  Current Funded Amount:

A12.2.6.2.9.  Other Pertinent Data:

A12.2.6.2.10.  Outstanding Contract Change Proposals:

A12.2.6.2.11. CCP #, short name, action pending (e.g., definitize UCA, settle proposal preparation cost)

A12.2.6.3. Legal Issues: Pending legal issues (Claims, Request for Equitable Adjustment, etc.)

A12.2.7. Funding Summary. RDT&E/Procurement/O&M/Future Years Defense Plan. Include portrayal of the overall budget and funding to include funds necessary for termination of the program and any anticipated future funding needs. Identify unobligated funds. Establish a timetable for withdrawal of program funds and address the status of all funding actions that have an actual or contingent liability. **Table A12.2** is an example of how RDT&E and procurement funding should be displayed. **Note:** Termination results in adjustments to current and out year funding as noted below.

**Table A12.2.  Program Funding Information for Termination Plan.**

| RDT&E | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | *Then Year & in Thousands* | | | | | | |
| | PE | BPAC | FY1 | FY1 | FY1 | FY1 | FY1 | FY1 | FY17 |

| | | | | 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Available** | XXXX | XXX | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| **Required** | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| **Excess** | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |

| **PROCUREMENT** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | **BPAC** | **Mod #** | *Then Year & in Thousands* | | | | | |
| | **App rop** | **PE** | | | **FY10** | **FY11** | **FY12** | **FY13** | **FY14** | **FY15** | **FY16** | **FY17** |
| **Available** | 3010 | XX | XXX | N/A | XXX | XXX | XXX | XX | XXX | XXX | XXX | XXX |
| **Required** | | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXX |
| **Excess** | | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXX |
| | | | | | | | | | | | | |
| **Available** | 3020 | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXX |
| **Required** | | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| **Excess** | | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| | | | | | | | | | | | | |
| **Available** | 3080 | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| **Required** | | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |
| **Excess** | | | | | XXXXX | XXXXX | XXXXX | XXXXX | XXXXX | XXXXX | XXXXX | XXXX |
| | | | | | | | | | | | | |
| **Total Excess Procurement** | | | | | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX |

*Instructions:*
*1. Enter the funding amount released in the fiscal years with active funding (e.g. FY10 – 12) in the "Available" row for each funding line.*
*2. Enter FY13 PB amounts (or most current PB) for the FYDP (F13 – 17) in the "Available" row for each funding line.*
*3. Enter the amount required to terminate the program in the "Required" row for each appropriation.*
*4. Excess is the difference between the "Available" and "Required" funding line.*

A12.2.8. Termination Actions and Milestones. Document the termination process, including lessons learned from the program being terminated. Provide a schedule that identifies tasks and milestones for activities involved in termination, to include the planned date of program office disestablishment and facility transition. Include other pertinent milestones, such as in **Table A12.3**:

**Table A12.3. Termination Actions and Milestones Example.**

| | |
|---|---|
| Service Acquisition Executive briefed on Termination Plan | DD MMM YY |
| USD (A&S) briefed on Termination Plan | DD MMM YY |
| Congressional Notification made by SAF/LL | DD MMM YY |
| Issue Termination Notice to prime contractor | DD MMM YY |
| Contractor notified, w/request for termination settlement proposal | DD MMM YY |
| TCO conducts opening conference on termination process | DD MMM YY |
| Contractor provides estimate of termination cost | DD MMM YY |
| Receive Contractor's Termination settlement proposal | DD MMM YY |
| TCO negotiates final settlement and issues contractual modifications | DD MMM YY |

A12.2.9. Authorizations/Personnel Summary. Include proposed disposition of all manpower authorizations and personnel involved in the termination including those required for completion of close-out activities and those available for reassignment. When appropriate, include the schedule of proposed draw down of manpower authorizations by fiscal quarter or if possible by month. Provide the personnel summary in formats similar to the following:

A12.2.9.1. MILITARY: (Current Auth) (On Board) (Required After**)

A12.2.9.2. CIVILIAN: (Current Auth) (On Board Auth) (Required After**)

A12.2.9.3. See **Table A12.4** for an example of how to summarize requested personnel authorizations.

**Table A12.4. Summary of Requested Personnel Authorizations.**

| | Position Number | PAS | OSC | AFSC | OCC | GRADE | PEC | EFF DATE MM/DD/YY | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| From: | XXXX | XXX | XXX | XXX | XXX | XXX | XXX | | XXX |
| To: | | | | | | | | | |
| From: | | | | | | | | | XXX |
| To: | | | | | | | | | |

A12.2.10. Agreements and Commitments. Identify any Memoranda of Agreement/Understanding that supports the program system being terminated. Address withdrawal from any agreement/understanding including international programs.

A12.2.11. Coordination: Include: PM, PCO, TCO, DCMA, MAJCOM RQMTS DIR, PEO, CENTER/CC, CAPABILITIES DIR, MDA. Losing Organization (may also be signatory),

Gaining Organization, (may also be signatory), Automated Information Systems Functional Proponent (may also be signatory) and include signed review by SAF/AQX)

A12.2.12.  Approval: Air Force Service Acquisition Executive.

**Attachment 13**

**ACQUISITION PROGRAM BASELINE EXAMPLES**

**A13.1.  Example of an ACAT I Signature Page.**  Printed from DAMIR, with Signature block information added by program office. **Figure A13.1** shows an example of a signature page. **Figure A13.2** shows an example of Section A**, Figure A13.3** shows an example of Section B, and finally, **Figure A13.4** shows an example of Section C. If ACAT II delegated to AFPEO/AC, PEO is last signature block. If not delegated, leave Component Acquisition Executive block, and delete Defense Acquisition Executive Block.

**Figure A13.1.  Signature Page Example.**

**Figure A13.2.  Section A Example.**

REQUIREMENT:  Capability Development Document for B-X Program,
CAF 357-92 (SAC 007-92) I/II-A, Revision 2, 6 Jan 05

> The "Proposed" column is completed only for a proposed APB Update. Insert only values that change from the previous approved APB. Other objective and threshold values remain valid. The column title will change to "APB Change 1" and also adds the approval date. Add footnote in affected Section explaining reasons for the proposed APB.

Section A.  PERFORMANCE

MS B APB (Dec 05)

|  | Proposed | | |
| --- | --- | --- | --- |
| | | Objective | Threshold |
| Objective | Threshold | | |
| Interoperability | B-X joint tactical battle management and command and control computer programs (such as those providing Link 16 data processing) should conform to the Single Integrated Air Picture (SIAP) System Engineer's Integrated Architecture and Integrated Architecture Behavior Model now being developed. | B-X joint tactical battle management and command and control computer programs (such as those providing Link 16 data processing) should conform to the Single Integrated Air Picture (SIAP) System Engineer's Integrated Architecture and Integrated Architecture Behavior Model now being developed. |
| Interoperability | 100% of the top-level IERs should be satisfied. | 100% of the top-level IERs designated critical must be satisfied. |
| Net Ready | 100% of interfaces; services; policy enforcement controls; and data correctness, availability and requirements in the Joint integrated architecture. /1 | 100% of interfaces; services; policy enforcement controls; and data correctness, availability and processing requirements designated as enterprise-level or critical in the Joint integrated architecture. /1 |

> KPPs will be entered exactly as written in the requirements document. If no threshold is stated, repeat what is in objective column.

> If KPPs are not specified in the requirements document, choose performance parameters that best describe what the war needs.

**Figure A13.3.  Section B Example.**

| | | | | |
| --- | --- | --- | --- | --- |
| (U) O&S | 627.0 | N/A | | |
| (U)  Total Life Cycle Cost | 1116.0 | N/A | 1156.0 | N/A |
| Base Year $M (FY05): | | | | |
| U) RDT&E | 240.0 | 264.0 | 274.0 | 301.4 |
| (U) Procurement | 208.7 | 229.6 | | |
| (V) (U) MILCON | 0.0 | N/A | | |
| (U) Acquisition O&M | 0.0 | N/A | | |
| (U)  Total Acquisition Cost | 448.7 | N/A | 482.7 | N/A |
| (U) O&S | 484.0 | 532.4 | | |
| (U)  Total Life Cycle Cost | 932.7 | N/A | 966.7 | N/A |
| Quantities (Information only/No deviation criteria): | | | | |
| (U) Total RDT&E/1 | 2 | 2 | | |
| (V) (U) Total Procurement | 65 | 65 | | |
| Program Acquisition Unit Cost (PAUC) | 6.70 | 7.37 | 7.20 | 7.92 |
| Average Unit Procurement Cost (APUC) | 3.21 | 3.53 | | |

> These Threshold values are breachable. Default Cost Thresholds are set at 10% greater than Objective value.

> PAUC/APUC will be used for all programs and all ACAT categories (AIS programs may be exempt).
> - APUC = Total Procurement divided by Procurement Quantity (208.7/65)
> - PAUC – Total Cost divided by Quantity (448.7/67)

Footnotes:

(U)  Proposed APB Change 1
1/  Two B-XB test aircraft will be modified to support DT&E and IOT&E flight test using RDT&E funds.

> Funding Certification: APB cost must be fully funded in the President's Budget Program (cum-to-date + FYDP + beyond FYDP). Justification or a plan to obtain funding must be submitted to the MDA re any shortfall, though APB approval is not guaranteed.

**Figure A13.4.  Section C Example.**

Footnotes:

(U) 1/ RAA is used in lieu of IOC.  RAA is defined as the date assets consisting of three modified aircraft, associated O-level support equipment, O-level spares, verified O-level maintenance and flight manual technical orders, and source data to support training systems, programs, and courses are delivered to ACC.

(U) Proposed APB Change 1                                                                                          2/ Describe
what parameters have changed and the reasons for the change.  When the proposed APB change is approved, "Proposed" is deleted and the date of the approval is added following "Change 1.".

> Use footnotes to clarify information/define events as appropriate.

> Cost may not be limited to a single Program Element (PE). Include funding from any PE required to deliver approved acquisition program scope.

| SECTION C:  COST | MS B APB (Dec 05) | | | Proposed | |
| --- | --- | --- | --- | --- | --- |
| | Objective | Threshold | | Objective | Threshold |
| Then Year $M (Information Only/No deviation criteria) | | | | | |
| (U) RDT&E | 250.0 | N/A | | 290.0 | N/A |
| (U) Procurement | 239.0 | N/A | | | |
| (U) MILCON | 0.0 | N/A | | | |
| (U) Acquisition O&M | 0.0 | N/A | | | |
| (U) Total Acquisition Cost | 489.0 | N/A | | 529.0 | N/A |
| (U) O&S | 627.0 | N/A | | | |
| | | | | | |
| (U) O&S | 627.0 | N/A | | | |
| (U) Total Life Cycle Cost | 1116.0 | N/A | 1156.0 | N/A | |
| Base Year $M (FY05): | | | | | |
| U) RDT&E | 240.0 | 264.0 | 274.0 | 301.4 | |
| (U) Procurement | 208.7 | 229.6 | | | |
| (V) (U) MILCON | 0.0 | N/A | | | |
| (U) Acquisition O&M | 0.0 | N/A | | | |
| (U) Total Acquisition Cost | 448.7 | N/A | 462.7 | N/A | |
| (U) O&S | 484.0 | 532.4 | | | |
| (U) Total Life Cycle Cost | 932.7 | N/A | 966.7 | N/A | |
| Quantities (Information only/No deviation criteria): | | | | | |
| (U) Total RDT&E/1 | 2 | 2 | | | |
| (V) (U) Total Procurement | 65 | 65 | | | |
| Program Acquisition Unit Cost (PAUC) | 6.70 | 7.37 | 7.20 | 7.92 | |
| Average Unit Procurement Cost (APUC) | 3.21 | 3.53 | | | |

> Threshold values not required for Then Year dollars. Breaches are calculated using Base Year dollars only.

> These Threshold values are breachable.  Default Cost Thresholds are set at 10% greater than Objective value.

> PAUC/APUC will be used for all programs and all ACAT categories (AIS programs may be exempt).
> - APUC = Total Procurement divided by Procurement Quantity (208.7/65)
> - PAUC = Total Cost divided by Quantity (448.7/67)

Footnotes:

(U) Proposed APB Change 1
1/ Two B-XB test aircraft will be modified to support DT&E and IOT&E flight test using RDT&E funds.

> Funding Certification:  APB cost must be fully funded in the President's Budget Program (cum-to-date + FYDP + beyond FYDP).  Justification or a plan to obtain funding must be submitted to the MDA re any shortfall, though APB approval is not guaranteed.

**Attachment 14**

**ACQUISITION PROGRAM TECHNICAL CERTIFICATIONS SUMMARY**

**A14.1. Overview. Table A14.1** identifies a non-exhaustive list of program and system-level technical certifications. This table is referenced in *Defense Acquisition Guidebook* - Chapter 4. Some of the certifications listed are applicable across DoD, whereas others are Service specific. Programs are advised to use the list as a starting point for identifying applicable certification requirements. PMs and systems engineers should consult ODASD (SE), joint, and Service-specific domain experts to determine other certifications that may be required.

**Table A14.1.  DoD Acquisition Program Technical Certifications and License Summary.**

| Certification and License | Source Requirement/ Guidance | Title |
|---|---|---|
| Air Force Training System and Device Simulator Certification | AFI 36-2251 | Management of Air Force Training Systems |
| Air Transportability Certification | MIL-STD-1366E | Interface Standard for Transportability |
| | AFMAN 24-204 | Preparing Hazardous Materials For Military |
| Airworthiness Certification | MIL-HDBK-516 | Airworthiness Certification Criteria |
| | Joint Service Specification | JSSG-2000 Air System |
| | JSSG-2001 | JSSG-2001 Air Vehicle |
| | JSSG-2005 | JSSG-2005 Avionic Subsystem, Main Body |
| | JSSG-2006 | JSSG-2006 Aircraft Structures |
| | JSSG-2007 | JSSG-2007 Engines, Aircraft, Turbine |
| | JSSG-2008 | JSSG-2008 Vehicle Control and |
| | AFPD 62-6 | USAF Airworthiness |
| Assessment of Operational Test Readiness (AOTR) | DoDI 5000.02T | Operation of the Defense Acquisition System |
| Authorization to Operate (ATO) | DoDD 4630.5 | Interoperability and Supportability of Information Technology(IT) and National Security Systems (NSS) |
| | DoDI 4630.8 | Procedures for Interoperability and Supportability of Information Technology |
| Command, Control, Communications, Computers, & Intelligence (C4I) Supportability Certification | DoDI 4650.01 | Policy and Procedures for Management and Use of the Electromagnetic Spectrum |
| | DoDI 5000.02T DoDI 5000.02 | Operation of the Defense Acquisition System Operation of the Adaptive Acquisition |
| | CJCSI 6212.01F | Net Ready Key Performance Parameter (NR KPP) |

| Certification and License | Source Requirement/ Guidance | Title |
|---|---|---|
| | SECNAVINST 5000.2 | Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System |
| Clinger-Cohen Act (CCA) Compliance Certification | DoDI 5000.02T | Operation of the Defense Acquisition |
| | Section 8808 of Public Law 107- 248 | Department of Defense Appropriation Act, 2003 |
| Laser Safety Review Certification | DoDI 5000.69 | DoD Joint Services Weapon and Laser System Safety Review Processes |
| | AFI 48-139 | Laser and Optical Radiation Protection |
| Risk Management Framework for DoD IT | DoDD 8500.01 | Cybersecurity |
| | DoDI 5000.02T | Operation of the Defense Acquisition |
| | Section 3502 of | E-Government Act of 2002 |
| | NSD-42 | National Security Directive - National Policy for the Security of National Security |
| | CNSSI-1253/CNSSI-1243a | Security Categorization and Control Selection for National Security Systems |
| | CNSSI-4009 | National Information Assurance Glossary |
| | NIST-SP-800-37 | National Institute of Standards and Technology (NIST) - Guide for Applying the Risk Management Framework to Federal |
| | NIST-SP-800-39 | National Institute of Standards and Technology (NIST) - Managing Information Security Risk: Organization, Mission, and Information System View |
| | NIST-SP-800-53 | National Institute of Standards and Technology (NIST) – Security and Privacy Security Controls for Federal Information Systems and Organizations |
| Full Materiel Release Certification | DA PAM 700-142 | Instructions for Materiel Release, Fielding, and Transfer |
| Hazards of Electromagnetic Radiation to Ordnance (HERO) Certification | DoDM 6055.09-M | DoD Ammunition and Explosives Safety Standards |
| | NAVSEAINST 8020.7B | Naval Sea Command instructions (NAVSEAINST) 8020.7b |

| Certification and License | Source Requirement/ Guidance | Title |
|---|---|---|
| Identification Friend or Foe (IFF) Equipment Certification | DoD AIMS 04-900 | Interface Control Standard for Mode 4/5 Cryptographic Computer |
| | DoD AIMS 03-1000B | Technical Standard for the ATCRBS/IFF/Mark XIIA Electronic Identification and Military Implementation of Mode S and Classified Addenda |
| Independent Logistics Assessment (ILA) and Logistics Certification | SECNAVINST 4105.1B | Independent Logistics Assessment and Certification Requirements |
| Interim Approval to Operate (IATO) Certification | DoDD 4630.5 | Interoperability and Supportability of Information Technology (IT) and National |
| | DoDI 4630.8 | Procedures for Interoperability and Supportability of Information Technology |
| | CJCSI 6212.01F | Net Ready Key Performance Parameter (NR KPP) |

**A14.2. List of Military Certifications. Table A14.2** provides a list of military certifications that programs should achieve.

**Table A14.2.  List of Military Certifications.**

| Certification | Source Requirement/ Guidance | Title |
|---|---|---|
| Insensitive Munitions Certification | DoDD 5000.01 | The Defense Acquisition System |
| | CJCSI 5123.01 | Joint Capabilities Integration and |
| Joint Interoperability Test Certification | CJCSI 6212.01F | Net Ready Key Performance Parameter (NR KPP) |
| | AFI 17-140 | Architecting |
| Joint Military Intelligence | CJCSI 3312.01B | Joint Military Intelligence Requirements Certification |
| Modeling and Simulation Verification, Validation, and Accreditation | DoDI 5000.61 | DoD Modeling and Simulation (M&S) Verification, Validation, and Accreditation |
| | Mil-STD 3022 | Department of Defense Standard Practice: Document of Verification, Validation and Accreditation (VV&A) for Models and Simulations |

| Certification | Source Requirement/ Guidance | Title |
|---|---|---|
| Nonnuclear Munitions Safety Board (NNMSB) Certification | AFI 91-205 | Nonnuclear Munitions Safety  Board |
| Nuclear Certification | AFI 63-125 | Nuclear Certification Program |
| Operational Test & Evaluation (OT&E) Readiness Certification | DoDI 5000.02T | Operation of the Defense Acquisition |
| | DOT&E TEMP Guidebook | Director, Operational Test & Evaluation TEMP Guidebook |
| | Section 139 of title 10, United States Code | Director of Operational Test and Evaluation |
| | Section 2399 of title 10, United States Code | Operational test and evaluation of defense acquisition programs |
| | AFI 99-103 | Capabilities-Based Test And Evaluation |
| | AFMAN 63-119 | Certification Of System Readiness For Dedicated Operational Testing |
| Radioactive Material (RAM) License/Permit | AFI 40-201 | Radio Active Material (RAM) Management |
| | AFJI 23-504 | Radioactive Commodities in the DoD Supply System |
| | Title 10, Code of Federal Regulation, Part 30 | Rules of General Applicability to Domestic Licensing of Byproduct Material |
| Radio Frequency Radiation (RFR) Hazards (RADHAZ) Certification | DoDI 6055.11 | Protecting Personnel from Electromagnetic Fields |
| Spectrum Certification Compliance | DoDD 4650.01 | Policy and Procedures for Management and Use of the Electromagnetic Spectrum |
| | Section 305 of title 47, United States Code | United States Code  - Government owned stations |
| | Section 102 – 538 of Public Law | Public Law 102- 538, 104 |

| Certification | Source Requirement/ Guidance | Title |
|---|---|---|
| | Section 901 - 904 of title 47, United States Code | Definitions, findings, policy (901); Establishment; assigned functions (902); Spectrum management activities (903); General administrative provisions (904) |
| | OMB CIRCULAR NO. A- 11, Part 2 | Office of Management & Budget Circular A-11:Preparation & Submission of Budget Estimates |
| Training Device Certification | AFI 36-2251 | Management of Air Force Training Systems |
| Ultrahigh Frequency (UHF) Satellite Communication (SATCOM) Demand Assigned Multiple Access (DAMA) Certification | CJCSI 6251.01D | Narrowband Satellite Communications Requirements |

**Attachment 15**

**MEMORANDUM OF AGREEMENT**

**A15.1. Memorandum of Agreement.** A Memorandum of Agreement (MOA) is a written document describing a cooperative relationship between two parties wishing to work together on a project or to meet an agreed upon objective. An MOA serves as a legal document and describes the terms and details of the partnership agreement. An MOA is more formal than a verbal agreement, but less formal than a contract. Organizations can use an MOA to establish and outline collaborative agreements, including service partnerships or agreements to provide technical assistance and training. An MOA may be used regardless of whether or not money is to be exchanged as part of the agreement.

**A15.2. DoDI 4000.19.** See DoDI 4000.19, *Support Agreements, Enclosure 3* for a sample template of an MOA. AFI 25-201, *Intra-Service, Intra-Agency, and Interagency Support Agreement Procedures, also* provides additional guidance on MOAs. The typical format of an MOA includes:

A15.2.1.  Background

A15.2.2.  Authorities

A15.2.3.  Responsibilities of the Parties

A15.2.3.1.  Purpose of the Agreement

A15.2.3.2.  Brief description of the scope of work

A15.2.3.2.1.  Financial obligations of each party, if applicable

A15.2.3.2.2.  Dates agreement is in effect

A15.2.3.3.  Personnel

A15.2.3.3.1.  Name of parties involved

A15.2.3.3.2.  Key contacts for each party involved

A15.2.3.4.  General Provisions

A15.2.3.5.  Detailed Description of Roles and Responsibilities

A15.2.3.6.  Payment Schedule if Applicable

A15.2.3.7.  Duration of the Agreement

A15.2.3.8.  Annual reviews of the MOA terms and conditions

A15.2.3.9.  Modification of Termination

A15.2.3.10.  Signatures of Parties' Principals

**A15.3.  Tips for Writing a Memorandum of Agreement (MOA).**

A15.3.1. Only use one Memorandum of Agreement form when writing the terms of an agreement.

A15.3.2. Keep it simple. Make sure that the wording is clear and concise. Whenever possible, use the wording of the parties when drafting the mediation agreement.

A15.3.3. Agreements should strive for balance – a "sandwich" model can be useful. Start with "both parties agree" then state what each individually agrees to then close with "both parties agree." Balance is not that each party has the same number of bullet points but that what is expected of each in the future has a sense of balance for them.

A15.3.4. Agreements should be written in positive language. For example, state what someone will do, not what they will not do.

A15.3.5. Agreements should be specific. As much as possible address: who, what, when and how questions.

A15.3.6. Careful reality checks should be done with the parties to ensure that the terms of the agreement are realistic and within their scope of authority.

A15.3.7. Carefully review each item in the terms of agreement with both parties to ensure that each item is correct and appropriately captures each party's intent. You should read each item out loud and ask each party if the wording is accurate. Each party should be able to understand their responsibilities in the terms of agreement.

A15.3.8. Keep in mind that the Memorandum of Agreement is a Settlement Agreement; therefore, appropriate personnel will need to clearly understand the terms of the agreement in order to support and execute the contents of the agreement.

A15.3.9. Be absolutely sure that all parties sign the agreement.

A15.3.10. All parties should receive a written copy of their agreement.

A15.3.11. If one party can no longer agree with the terms of the MOA before the stated duration date because one principal party is implementing a new management philosophy, both parties should agree on a new termination date.

A15.3.12. In accordance with AFMAN 63-119, MOUs and MOAs should establish the availability of test and support resources needed for the OT&E plan and schedule if OT&E is part of the MOU or MOA.