BY ORDER OF THE COMMANDER
AIR FORCE MATERIEL COMMAND

AIR FORCE MATERIEL COMMAND
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Acquisition

INTEGRATED LIFE CYCLE SYSTEMS ENGINEERING AND TECHNICAL MANAGEMENT

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This Air Force Materiel Command Instruction (AFMCI) implements guidance contained in Department of Defense Instruction (DoDI) 5000.88, *Engineering of Defense Systems*, Air Force Instruction (AFI) 63-101/20-101, *Integrated Life Cycle Management*, and other relevant publications. It assigns Air Force Materiel Command (AFMC) responsibilities, prescribes policy and procedures, and provides direction for standardizing, verifying, and maintaining the accomplishment of required missions and end states in accordance with (IAW) Department of Defense (DoD), United States Air Force (USAF), and AFMC policy. It applies to regular Air Force, civilians, and contractors. This publication does not apply to United States Space Force, Air Force Reserve Command, or Air National Guard units. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW AFI 33-322, *Records Management and Information Governance Program*, and disposed of IAW Air Force Records Information Management System Records Disposition Schedule. Refer recommended changes and questions about this publication to the office of primary responsibility (OPR) using the Department of Air Force (DAF) Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. This publication may be supplemented at any level, but all supplements must be routed to the OPR of this publication for coordination prior to certification and approval. The authorities to waive wing/unit level requirements in this publication are identified with a tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See Department of the Air Force Manual (DAFMAN) 90-161, *Publishing Processes and Procedures*, for a description of the authorities associated with the tier numbers. Submit requests for waivers through the chain of command to the appropriate tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items using a completed Department of the Air Force (DAF) Form 679, *Department of the Air Force Publication Compliance Item Waiver Request/Approval* (or equivalent information). The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This document has been substantially revised and needs to be completely reviewed. Major changes have been made in order to streamline the life cycle systems engineering and technical management process and its supporting activities.

Chapter 1

ROLES AND RESPONSIBILITIES

1.1. AFMC Engineering and Technical Management Directorate. AFMC Engineering and Technical Management Directorate (AFMC/EN) is the AFMC chief engineer and technical authority per Air Force Materiel Command Mission Directive 401, *Headquarters Air Force Materiel Command (HQ AFMC)*. The chief engineer and technical authority:

1.1.1. Provides the AFMC Commander (AFMC/CC), unbiased technical advice for pre-acquisition investment decisions and throughout the acquisition life cycle.

1.1.2. Engages implementing commands and center-level engineering offices to provide technical support to program executive officers (PEO) and program managers (PM).

1.1.3. Oversees AFMC engineering enterprise policy and guidance and directs external technical assessments of programs, as needed.

1.2. AFMC Center-Level Engineering Director or Equivalent.

1.2.1. Advocates for resources necessary to conduct and sustain effective systems engineering (SE), life cycle systems engineering (LCSE) and operational safety, suitability, and effectiveness (OSS&E) related processes and procedures. **(T-2)**

1.2.2. Ensures implementation of standard SE, LCSE, and OSS&E-related procedures across center programs and projects, with tailoring/waivers as authorized and appropriate. **(T-3)**

1.2.3. Ensures AFMC center organizations implement center and organizational (i.e., Directorate, Group or equivalent) SE operating instruction (OI), directive policy supplements, and other applicable SE standards, with tailoring/waivers as authorized by the assigned or delegated Authority. **(T-3)**

1.2.3.1. Centers with diverse sub-organizations may issue SE OIs at sub-organizational levels, with authorization by the center-level engineering director or equivalent.

1.2.3.2. Each SE OI identifies the organizations to which it applies.

1.2.3.3. The SE processes covered in an approved Systems Engineering Plan (SEP) will be consistent with applicable SE OIs.

1.2.4. Ensures their center's SE-related OIs, supplements and other applicable SE standards are reviewed by their OPRs no less often than biennially and updated as needed. **(T-3)**

1.2.5. Develops and implement center SE, LCSE, and OSS&E policy consistent with AFMC policies. **(T-3)**

1.2.5.1. Provides opportunities for the center-wide workforce to keep current with evolving policies and guidance spanning the processes in this instruction.

1.2.5.2. Provides associated best practice examples appropriate to the nature of center programs and implementation of specific processes, with recommendations on how to effectively implement the best practice(s) within the center.

1.2.5.3. Provides associated examples of deficient/problematic processes, with recommendations on how to prevent recurrence of such practices within the center. Some examples may be available via the AFMC Acquisition Incident Review process-- reference AFMCMAN 63-101/20-101, *Acquisition Incident Review (AIR) Process*, for more information.

1.2.6. Serves as the center's Standardization Management Executive, or delegate the responsibility as appropriate, IAW AFI 60-101 AFMCSUP, *Materiel Standardization*.

1.3. Director of Engineering or Equivalent.

1.3.1. Program Executive Officer Director of Engineering or Equivalent. Identified by the PEO, is accountable to the PEO for oversight of the portfolio's engineering functional support. **(T-3)**

1.3.2. Air Force Research Laboratory Director of Engineering or Equivalent

1.3.2.1. Documents standard SE processes appropriate to the maturity of the technology under development IAW Air Force Research Laboratory (AFRL) SE OIs and supplements and implements standard SE processes in science and technology (S&T) programs. **(T-3)**

1.3.2.1.1. The AFRL SE OI or Supplement identifies all organizations to which it applies. The AFRL SE OI is not required to identify all programs to which it applies.

1.3.2.1.2. AFRL SE OIs are reviewed no less often than biennially and updated as required by the appropriate OI OPR.

1.3.2.1.3. AFRL S&T research and development efforts, including AFRL-led basic research, applied research, and advanced research, follow this guidance.

1.3.2.1.4. AFRL documents and archives trade study results for use in future technology demonstration or acquisition programs.

1.3.2.2. Supports technology transition planning in collaboration with a transition and/or acquisition agent IAW AFI 61-101, *Management of Science and Technology*. **(T-3)**

1.3.2.3. Coordinates with PM(s) on S&T programs intended to modify existing systems, subsystems, or end items.

1.3.2.4. Ensures that S&T program managers coordinate with the system PM or acquisition agent to integrate OSS&E baseline definition and certification requirements into a developer's design and development activity. An S&T program intended to transition to operational use, either as a modification to an existing system, subsystem, end item, or as a new system, subsystem, or end item ensures that the OSS&E baseline definition and certification requirements are coordinated with the system's (or enterprise) technical architecture. **(T-3)**

1.3.2.5. Recognizes the system, subsystem, or end item S&T PM as the designated individual with responsibility and oversight over an S&T program targeted for integration onto an existing system, subsystem, or end item. The PM retains overall SE responsibility for a supported system, subsystem, or end item. **(T-3)**

1.3.2.6. Ensures S&T program is not connected (physically or through information networks) to any fielded system, subsystem, or end item without (1) approval by the Configuration Control Board (CCB) for the affected system, subsystem, or end item and

(2) implementation of OSS&E requirements or use of major command /A3 (or CC/CV) waiver. **(T-3)**

1.3.2.7. Conducts (or ensure the appropriate Technology Directorate Director conducts) structured technical reviews (program management review, program baseline review, or equivalent). **(T-3)**

1.3.2.8. As the AFRL Director of Engineering (DoE) determines to be appropriate, ensure S&T programs prepare S&T Program Protection Plan (PPP) and implement required countermeasures IAW DoDI 5000.83. Reference DoDI 5000.83 DAFI 63-113 for more information. IAW the above referenced guidance, ensures identification of Critical Program Information (CPI) and protection of Designated Science and Technology Information. **(T-3)**

1.4. Lead Systems Engineer/Chief Engineer. IAW AFI 63-101/20-101, *Integrated Life Cycle Management*, Paragraph 2.8, Chief Engineer. **Note:** In this instruction, the terms lead systems engineer (LSE) and chief engineer (CE) are synonymous, referring to the senior (having precedence in making decisions) responsible engineer in a program office.

1.5. Engineering Senior Professional (Senior Level/Scientific and Professional).

1.5.1. Engineering Senior Level (SL) will primarily guide the Department of the Air Force (DAF) strategy, vision, and goals in their technical area(s) in direct support of, and consistent with, broad national, DoD, DAF, and AFMC policy and strategic guidance.

1.5.2. Scientific and Professional (ST) will perform high-level research and development in the physical, biological, medical, or engineering sciences, or a closely related field, typically in a laboratory setting. STs serve as principal scientific/technical advisors, independent researchers, and recognized national/international experts in a major technology focus area.

1.6. Supply Chain Engineer.

1.6.1. Receive and manage sustaining engineering funding for sustainment of fielded assets and for re-engineering of obsolete or unsustainable items.

1.6.2. Document and deliver products that meet OSS&E requirements defined by a PM for an assigned system, subsystem, or end item. With support from the appropriate LSE/CEs, ensures that any changes to a product, component, or end item include an evaluation for any required changes to associated automated test equipment including test program set (TPS) and support equipment.

1.6.3. Communicate/coordinate product changes with the PM as required to maintain system-level OSS&E end states.

1.6.4. Execute duties, responsibilities, and authorities delegated by the PM and/or LSE/CE and help to ensure appropriate documentation of the delegation IAW **Chapter 3**. To ensure the critical mission of the supply chain organization continues while the delegation of authority/responsibility is being documented, in the absence of delegation documentation from the PM or LSE/CE the respective Supply Chain Manager (SCM) Group Director of Engineering has, by default, the following authority. These apply to those cases where consignment transfer has been accomplished for spares, repairs, and technical orders (TO) that are owned by AF SCM; is not a transfer of workload or configuration control inherent to the assigned program office.

1.6.4.1. Executes Class II change authority for engineering change proposal (ECP) and engineering change order action items within the SCM portfolio which preserve form, fit, function and interface at the next higher assembly level of the weapon system(s). Note: For more information on ECP classes, reference MIL-HDBK-61B.

1.6.4.2. Responds to Engineering Technical Assistance Requests to include AFMC Form 202, *Engineer Technical Assistance Request*, Defense Logistics Agency (DLA) Form 339, *Request for Engineering Support*; DLA Form 1912, *Defense Logistics Agency Local Purchase – Technical Support Request*; requests IAW TO 00-25-107, *Maintenance Assistance*; Material Review Board deviation dispositions; screening actions for contract purchases and repairs; Source Approval Requests; First Article Test dispositions; Depot Level TO Validation, Verification, Update and Correction; and Deficiency Report/Material Improvement Project investigations (per TO 00-35D-54) where the National Stock Number roles and responsibilities are currently assigned to the SCM for Classes of Supply II (General Support Items), VII (Major End Items) and IX (Repair Parts, Less Medical Special Repair Parts). Note: For more information on classes of supply, reference Joint Publication (JP) 4-09, *Distribution Operations*.

1.6.4.3. Accomplishes and implements the Consolidated Sustainment Activity Group-Supply, General Support Division, and TPS sustainment Engineering projects to include the following:

1.6.4.3.1. Eliminate deficiencies of consigned items within the SCM portfolio to diminishing manufacturing sources and material shortages, shortfalls in reliability and maintainability, and safety defects.

1.6.4.3.2. Perform necessary sustainment to consigned TPS, to include:

1.6.4.3.2.1. Adaptive maintenance that modifies software or hardware to properly interface with a changing environment.

1.6.4.3.2.2. Perfective maintenance for adding new capabilities, modifying existing functions, and making general enhancements.

Chapter 2

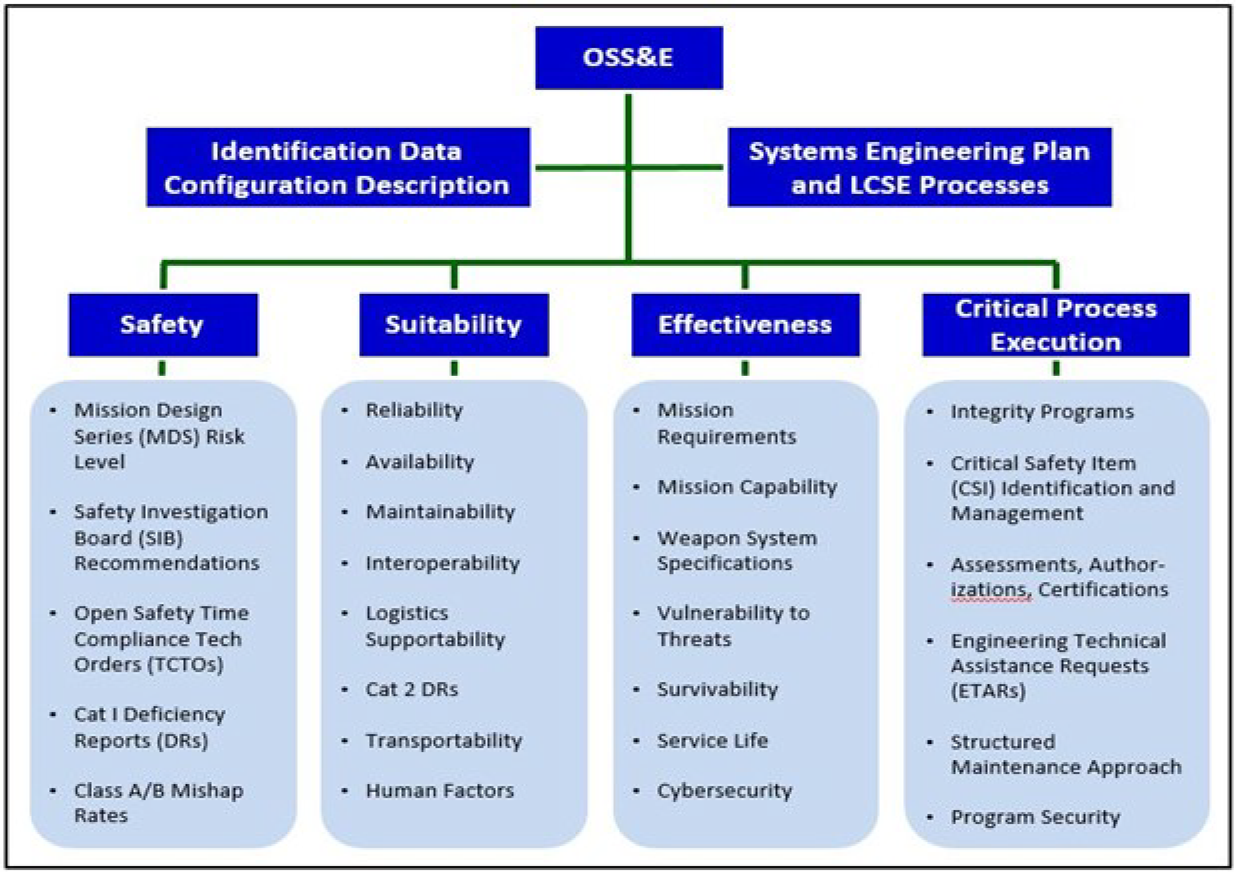
INTEGRATED LIFE CYCLE SYSTEMS ENGINEERING AND TECHNICAL MANAGEMENT

2.1. Life Cycle Systems Engineering. Systems engineering is a collaborative, interdisciplinary execution approach, which provides technical and managerial processes to unify, integrate and focus the efforts of all stakeholders - researchers, acquirers, developers, users, testers, trainers, maintainers, and sustainers - throughout the life cycle of a product or system. Systems engineering provides the integrating technical processes and design leadership to define and balance system performance, cost, schedule, risk, and system security within and across individual systems and programs. Tailored application of Systems engineering processes begins at concept inception and continues throughout the life cycle phases (user needs identification through disposal). Systems engineering decisions can be made at any life cycle phase and can affect the cost, schedule, and performance of an item, system, and Family/System of Systems. Life cycle systems engineering emphasizes disciplined technical planning, organization, and execution of integrated systems engineering efforts across all stakeholder organizations to balance research, development, acquisition, test and evaluation, and sustainment needs (including regeneration and disposal), thereby ensuring that delivered products and capabilities meet user requirements. It develops a relevant engineering and technical knowledge base that is matured, maintained, and utilized in a disciplined manner over the life cycle of the capability. See **Attachment 2.**

2.1.1. Systems Engineering Areas. This document focuses on nine areas within systems engineering. These include (1) OSS&E, (2) Digital Engineering, (3) Government Reference Architecture Governance Structure, (4) Agile Software and Intellectual Property, (5) Mission Engineering, (6) Test and Evaluation, (7) System Safety, (8) Human Systems Integration, and (9) Technology Assessment Process. These areas are considered key in AFMC's systems engineering process.

2.1.1.1. Operational Safety, Suitability, and Effectiveness. Robust products and systems that exhibit required attributes of system security, mission assurance, and OSS&E assurance are the principal outcomes of properly planned and applied SE. However, while OSS&E is an outcome of properly applied SE principles, processes, and practices, it is important to recognize that system OSS&E characteristics are dynamic over the entire system life cycle, particularly in the Operations and Sustainment (O&S) phase. Various program management, engineering, and technical practices are needed to ensure that systems and end items remain operationally safe, suitable, and effective across the life cycle. As an example, **Figure 2.1** shows a notional taxonomy of factors and processes that help to ensure a system's OSS&E. While LCSE describes the processes needed to achieve and maintain required system capabilities, the processes related to the OSS&E outcomes help to establish, document and track system/item configurations, characteristics, and behaviors throughout their life cycles. See **Attachment 3.**

Figure 2.1. OSS&E Taxonomy (Notional, Tailorable).



2.1.1.1.1. In simplest terms, OSS&E assurance consists of two parts: (1) defining and establishing the OSS&E baseline and (2) tracking and sustaining the OSS&E baseline throughout the life cycle of a system. As an overarching concept, OSS&E assurance can best be viewed as an approach that pulls together requirements, technical baseline data, and life cycle processes for the sustainment of systems, subsystems, and end items. Characteristics of an effective OSS&E assurance approach are:

2.1.1.1.1.1. Development and documentation of an initial OSS&E baseline, including identification/definition of the key characteristics necessary to assure OSS&E.

2.1.1.1.1.2. Delivery of systems, subsystems, end items, and information in accordance with the established OSS&E baseline.

2.1.1.1.1.3. Preservation and tracking of OSS&E baseline characteristics of systems, subsystems, and end items over their operational lives to ensure that systems, items, and supporting critical processes continue to meet OSS&E requirements.

2.1.1.1.1.4. Updating of OSS&E baselines when making modifications or changes to systems, subsystems, or end items.

2.1.1.1.2. The OSS&E baseline consists of key features and aspects that describe the system, subsystem, or end item capabilities, require continuous tracking, and merit the attention of the PM (with support from the LSE/CE) and user(s) in terms of OSS&E. It comprises the system/item characteristics and limitations that must be understood, acknowledged, and maintained during operational use, deployment, experimentation, exercises, training, and maintenance. It is also supported by measurable, useful, affordable metrics. The OSS&E baseline is established in development and is updated as significant changes (threat, operational usage, aging, etc.) occur or are made to the system/item over the life cycle.

2.1.1.1.3. The PM and LSE/CE apply LCSE processes and practices to monitor systems and ensure preservation of the technical baseline, which provides system descriptions of functions, performance, and interfaces, and enables the underlying design to progress using a common reference-- see **paragraph A2.8** for more information. The PM (with support from the LSE/CE) describes how the LCSE and technical baseline requirements are being met in the appropriate program documents. For the OSS&E baseline, the program and operational stakeholders utilize technical baseline data and SE processes to identify the key OSS&E performance characteristics for the system and establish the means to track and maintain those characteristics over the life cycle.

2.1.1.1.4. The program SEP should identify technical data, including specifications and standards, for achieving and assuring preservation of baseline OSS&E characteristics. See **Attachment 4** for SEP recommendations and requirements related to LCSE and OSS&E. In addition, Human Systems Integration (HSI) planning content can be included in the SEP as discussed in **Attachment 5.**

2.1.1.1.5. OSS&E Relationships. The PM (with support from the LSE/CE) is responsible for assuring the OSS&E of systems, subsystems, and end items. The LSE/CE is the primary program Engineering/Technical Authority responsible for establishing, implementing, managing, and controlling LCSE activities necessary to develop and field robust products and systems that exhibit attributes of systems security, OSS&E, and mission assurance. PMs and LSE/CEs collaborate to continue rigorous application of SE principles and processes. All relevant aspects of SE performance are periodically assessed by these stakeholders with a focus on ensuring OSS&E over the life cycle.

2.1.1.1.5.1. The PM's (with support from the LSE/CE) responsibilities include ensuring OSS&E for the Peculiar Support Equipment (PSE) required to sustain a system, subsystem, or end item; subsystems and components that compose a system or PSE; and integration of any government furnished equipment (GFE), payload, cargo or other item that physically or electronically connects to a system, subsystem, or end item.

2.1.1.1.5.2. The LSE/CE is the overall Engineering/Technical Authority for the program and system. The LSE/CE typically leads implementation of program LCSE processes and ensures the integrity of those processes, including technical risk assessments focused on ensuring OSS&E of an assigned system. The LSE/CE is a system's final Engineering/Technical Authority for all PSE, GFE, subsystems and components, and integration of any payload, cargo or other item that physically or electronically connects to the system. As required, the LSE/CE provides a technical assessment to the PM for commercial- or government-managed subsystems and end items, intended to be either temporarily or permanently installed on a system, physically/electronically connected to a system, or used to manufacture or maintain a system.

2.1.1.1.5.3. The PM (with support from the LSE/CE) includes representatives of the operational, logistics, maintenance/sustainment, safety, and test and evaluation (T&E) communities in the program efforts to define, achieve, track, and maintain the OSS&E baseline.

2.1.1.1.5.4. The PM and LSE/CE ensure that designation/delegation of program, engineering and technical authorities related to OSS&E are clearly documented and consistent with the roles and responsibilities in this instruction. This includes documenting specific delegation of program management-related OSS&E authority given to the Product Support Manager(s) (PSM), Product Group Manager(s) (PGM) and SCM(s). Specific program management-related OSS&E authorities and responsibilities are documented and approved by the appropriate OPR, as well as the designated/delegated organization. Reference DAFPAM 63-128 for additional recommended procedures. Also, see **Attachment 6** for recommended templates related to delegation of engineering authorities for the AFMC Form 202.

2.1.1.1.5.5. Any delegation of OSS&E responsibilities/authorities documented in a center level agreement (CLA) or other Memorandum of Agreement (MOA) should be made available by the PM (with support from the LSE/CE) to program OSS&E stakeholders.

2.1.1.1.5.6. For assets stored at the 309 Aerospace Maintenance and Regeneration Group (AMARG): If the asset program office no longer exists, and if no PM or program LSE/CE is assigned to provide programmatic or engineering authority/disposition for the stored assets at the 309 AMARG, the 309 AMARG Engineering Group assumes engineering/disposition authority IAW this instruction.

2.1.1.1.5.6.1. A PM or LSE/CE assigned to provide programmatic, or engineering authority/disposition should consider delegation of engineering authority/disposition to the 309 AMARG Engineering Group for assets assigned to 309 AMARG 2000 or 4000 type storage. Reference Air Force TO 1-1-686, Desert Storage Preservation, and Process Manual for Aircraft, Aircraft Engines, and Aircraft Auxiliary Power Unit Engines, for more information. For such delegation the 309 AMARG Engineering Group and the PM or LSE/CE with primary authority should document any periodic reporting requirements between stakeholders as part of the authority delegation memo.

2.1.1.1.5.7. Non-Air Force-Managed U.S. Military Systems and End Items. AFPD 63-1/20-1, *Integrated Life Cycle Management*, indicates that OSS&E assurance applies to systems and end items managed by the Air Force. However, the PM (with support from the LSE/CE) should consider control of certain aspects of OSS&E for

U.S. military systems, components and end items that are not managed by the Air Force -- OSS&E assurance may still have some limited applicability. For example, if the Air Force does not own or maintain a training simulator system, training effectiveness may be the only applicable portion of OSS&E. However, ineffective training resulting from poor configuration control could cause unsafe actions in the aircraft and lead to suitability issues. Contracts for a pilot or maintainer, leased aircraft and/or contractor logistics support (CLS) can further complicate the application of the program's OSS&E approach. The PM and LSE/CE should evaluate and tailor the application of the OSS&E requirements to meet the unique program needs and constraints.

2.1.1.1.5.8. Foreign Military Sales (FMS) Efforts. Export sales and transfers of U.S. defense articles and associated services are complex transactions involving three primary stakeholders or parties: the United States Government (USG), international partners (allied and friendly governments/organizations), and defense contractors and suppliers (U.S. and international). IAW Air Force Manual (AFMAN) 16-101, *Security Cooperation (SC) And Security Assistance (SA) Management*, the system PM, Security Assistance Program Manager, Air Force Security Assistance Cooperation (AFSAC) Directorate Command Country Manager or Case Manager, and other FMS stakeholders work to ensure the delivery of the required system, items, spares, support equipment and/or services in a timely manner. For FMS programs, the following OSS&E guidance applies:

2.1.1.1.5.8.1. IAW AFI 63-101/20-101, program office technical and management processes (e.g., systems engineering, system and component qualification, configuration management, etc.) are followed as is normally done in the execution of programs during acquisition and modifications. This may include certifications, coordination, and approvals (e.g., aerial refueling, spectrum management, etc.) required to be accomplished in support of acquisition and modification program activities while the systems being supplied are under USAF cognizance (i.e., development, flight test, and ferry). However, compliance with this AFMCI for OSS&E baselines, metrics, and other requirements intended for application over the life cycle of a system/item are not required unless they are needed to comply with higher level DoD/Joint/AF directive policies, the terms of the Letter of Offer and Acceptance, or other applicable agreement mechanism(s) with the international partner(s).

2.1.1.1.5.8.2. FMS programs should ensure that each weapon system delivered to a partner nation has met its OSS&E and applicable certification/coordination/approval requirements. Unless otherwise stipulated in the Letter of Offer and Acceptance or other agreement, final responsibility and accountability for these items remain with the PM (with support from the LSE/CE) until officially transferred to the gaining country. Transfer of OSS&E and other responsibilities should be considered as the Letter of Offer and Acceptance is drafted for each system and country.

2.1.1.1.6. Summary. Through effective LCSE and OSS&E approaches, the program office and the supporting stakeholders should have the means to determine the adequacy of the products that they deliver to their customers. In turn, the customers should have assurance that the criteria used for system acceptance are based on sound SE practices and are traceable to the system's performance requirements.

2.1.1.2. Digital Engineering. The LSE/CE, in support of the PM, has execution responsibility for the program's digital engineering and should adhere to the governance structure. In addition, the LSE/CE shall develop and implement digital engineering utilizing the Air Force Digital Guide and plan for digital engineering strategy as part of SEP. Information on digital enterprise can be found at the Air Force Digital Guide website, which is located at **https://usaf.dps.mil/teams/afmcde/SitePages/Home.aspx**.

2.1.1.3. Government Reference Architecture Governance Structure. The LSE/CE shall use either the term "System Architecture" or "Solution Architecture" for architectural design work specific to one weapon system and should avoid using the term "Reference Architecture" for any work that is not guiding design principles of multiple architectures and solutions.

2.1.1.4. Agile Software and Intellectual Property.

2.1.1.4.1. The LSE/CE shall assist the PM in determining and executing the appropriate program development technical acquisition processes.

2.1.1.4.1.1. Software Development Methodologies and Techniques. The LSE/CE ensures incremental software development methodologies and techniques are considered as the preferred approach to the technical implementation of systems. The LSE/CE and Integrated Test Team in conjunction with the PM shall consider agile implementation in support of rapid delivery of capability status to program office personnel, key stakeholders, and timely delivery of capabilities to end user communities at sufficient intervals. Since the functionality of avionics components are likely developed in the form of software, the LSE/CE should consider creation of a software capability team composed of cross domain avionics subject matter experts (SMEs) and software SMEs charged with the responsibility to conduct highly collaborative/transparent technical oversight of software development. See chapter on Agile Dev-Sec-Ops at **https://www.milsuite.mil/book/community/spaces/air-force-engineers**.

2.1.1.4.1.2. Data Rights Identification & Sustainment. The scope of the sustainment strategy is limited only to those elements that are candidates for update during the sustainment period of a component or system. The LSE/CE assures the program office personnel identify only that set of data rights that support the sustainment strategy in order to facilitate a manageable system data rights profile. The LSE/CE should consider creating a program data rights council (PDRC) consisting of SMEs across all technical domains charged with ensuring the program data rights profile remains consistent with the sustainment strategy and that the needed data rights for sustainment persist throughout the system's life cycle. The PDRC shall determine the initial set data rights that the program shall pursue for system sustainment. For the remaining life cycle of the system, the PDRC should conduct analysis at strategic points to assure the system data rights remain aligned with the sustainment strategy. For guidance, see Intellectual Property Strategy section in AFI 63-101/20-101 and the Air Force Data Rights Guidebook at https://www.dau.edu/pdfviewer?Guidebooks/Air-Force-Data-Rights-Guidebook.pdf.

2.1.1.5. Mission Engineering. IAW the National Defense Authorization Act (NDAA) for Fiscal Year 2017, Section 855, the LSE/CE, in support of the PM, shall establish Mission Integration Management (MIM) as a core activity within the acquisition, engineering, and operational communities. Mission engineering is the technical sub-element of MIM as a means to provide engineered mission-based outputs to the requirements process, guide prototypes, provide design options, and inform investment decisions. For implementation, LSE/CE should consult Office of the Undersecretary of Defense for Research and Engineering Mission Engineering Guide available at https://ac.cto.mil/mission-engineering when conducting Mission Engineering and MIM.

2.1.1.6. Test and Evaluation. IAW DoDI 5000.88, the PM (with support from the LSE/CE) shall ensure test and evaluation planning and program activities are conducted in accordance with DoDI 5000.89 DAFI 99-103. To the greatest extent possible, test and evaluation planning and resultant activities (e.g., strategy, test plans, test resources, requirements traceability, test data, test analyses, and other related activities) shall use and contribute to the information contained in the evolving digital system representation. The fundamental purpose of T&E is to provide essential information to decision makers, verify and validate performance capabilities documented as requirements, assess attainment of technical performance parameters, and determine whether systems are operationally effective, suitable, survivable, and safe for intended use.

2.1.1.6.1. T&E shall be a continuum of integrated test (Contractor Test, Developmental Test, Certification Test, and Operational Test, at a minimum) throughout the defense acquisition process to provide program offices with system maturity and readiness assessments to advance to the next phase of development or fielding including OSS&E.

2.1.1.6.1.1. Test results shall provide feedback to analyze the design progress toward performance goals.

2.1.1.6.1.2. The continuum of test activities shall support technical reviews and provide feedback to the systems engineering process.

2.1.1.6.1.3. The PM (with support from the LSE/CE and Chief Developmental Tester/Test Manager) shall utilize test activities and test documentation to inform and support acquisition decisions.

2.1.1.6.2. The SEP, Test and Evaluation Master Plan (TEMP) and other T&E related digital or legacy documents shall be aligned to ensure that they are mutually supportive and traceable to each other.

2.1.1.6.2.1. Testing activities derived from the TEMP or the Test and Evaluation Strategy (TES) shall be structured to provide the required evaluation data for all design decision points, audits, and reviews that are part of the systems engineering process.

2.1.1.6.2.2. Technical thresholds and objectives including specific performance requirements shall be included in developmental test objectives.

2.1.1.7. System Safety.

2.1.1.7.1. System safety is the application of engineering and management principles, criteria, and techniques to achieve acceptable mishap risk within the constraints of operational effectiveness, suitability, time, and cost, throughout all phases of the system life cycle. System Safety objectives include:

2.1.1.7.1.1. The identification of Environment, Safety, and Occupational Health (ESOH) hazards, assess hazard risk in terms of severity and probability, reduce the risks by the safety design order of precedence, (a) eliminate the hazard through design selection, (b) reduce risk through design alteration, (c) incorporate engineered features or devices, (d) provide warning devices, and (e) incorporate signage, procedures, training, and personal protective equipment.

2.1.1.7.1.2. Accept residual risks (interim and final). Chapter 11 of AFI 91-202, *The US Air Force Mishap Prevention Program*, outlines system safety program requirements and responsibilities for PMs and using commands as well as defining the process for safety hazard risk acceptance. The greater the risk, the higher the acceptance authority.

2.1.1.7.2. The PM (with support from the LSE/CE) is to establish and maintain a tailored system safety program using MIL-STD-882E, *System Safety*, as a guide to manage ESOH. Where variation or innovation in tasking or methodology is allowed, proof is required to demonstrate that the approach accomplishes the required objectives and tasking contained in the Air Force policies. Some basic tenets of a system safety program include the establishment of hazard risk-resolution criteria, properly scoped hazard analyses, hazard tracking, resolution, documentation, and forums for hazard deliberations and resolution.

2.1.1.7.3. AFI 91-202 requires that System Safety Groups (SSG) be established for all Acquisition Category I (ACAT I) programs and for all aircraft programs unless waived by the major command (MAJCOM). The purpose of the SSG is to oversee the system safety program throughout the life cycle of the system and to document the mishap risk review process with the specifics identified in the SSG charter. The PM or deputy chairs (with support from the LSE/CE) the SSG, and membership includes user command maintenance and operations representatives. If residual risk remains after being addressed by the SSG, AFI 91-202 and MIL-STD-882E define the appropriate levels of risk approval authority (Low/Medium is the PM, Serious is the PEO, and High is the component acquisition executive) for acceptance of residual mishap risk. In the sustainment phase, SSGs are primarily concerned with engineering change proposals, mishap trends and recommendations, time-compliant technical orders (TCTO), and deficiency report (DR) tracking.

2.1.1.8. Human Systems Integration. The LSE/CE shall establish HSI planning and implementation that addresses the systematic integration of interrelated domains. This shall enable the systems engineering process and program management effort. It allows integrated and comprehensive analysis, design, and assessment of requirements, concepts, and resources. See **Attachment 5.**

2.1.1.9. Technology Assessment Process. The LSE/CE shall use and employ novel or substitute materials, processes, and product form(s) for enterprise technologies IAW **https://usaf.dps.mil/teams/21080/TechAssessProc/SitePages/Home.aspx**. Novel or substitute materials, processes, and product forms are those that are not adequately defined by approved material and/or process specifications to enable application across the enterprise.

2.2. Technical Management. Technical management and its processes are used to manage the development of a system. Technical processes are used to design, develop, and analyze the system. These processes are foundational and are used consistently to provide insight and control over the technical development of a system throughout its life cycle.

2.2.1. Technical Reviews and Assessments.

2.2.1.1. Independent Technical Risk Assessment.

2.2.1.1.1. The LSE/CE shall conduct Independent Technical Risk Assessments (ITRA) per DoDI 5000.88, Engineering of Defense Systems. ITRAs are conducted on all Major Defense Acquisition Programs (MDAP) before approval of Milestone A, Milestone B, and any decision to enter into low-rate initial production or full-rate production. The Under Secretary of Defense for Research and Engineering establishes policy and guidance for the conduct of ITRAs, consistent with Section 4272 of Title 10, United States Code (U.S.C.). The 25 Jun 2020 SAF/AQ Memo, ITRA Roles and Responsibilities, designates SAF/AQR as the primary office responsible for all AF ITRA activities, and the 12 Feb 2021 SAF/AQR Memo, ITRA Execution Roles and Responsibilities, establishes roles of SAF/AQR, AFMC/EN, and the PM.

2.2.1.1.2. AFMC/EN's shall identify SMEs to serve on AF ITRAs and to provide risk management team training. The OSD 2017 Risk, Issue, and Opportunity Management Guide is located at **https://acqnotes.com/wp-content/uploads/2017/07/DoD-Risk-Issue-and-Opportunity-Management-Guide-Jan-2017.pdf**.

2.2.1.1.3. Preliminary Design Review and Critical Design Review. To fulfill this requirement, SAF/AQR memorandum, Delegation Authority – Conduct of Post-Preliminary Design /Critical Design Review Assessments, dated 8 Dec 2021, designates center level engineering functional offices to fill the role of the independent review team. Specifically, SAF/AQR designates SSC/ZAE, AFLCMC/EN, and AFNWC/EN to conduct post-PDR/CDR assessments for their respective MDAPs.

2.2.1.2. Air Force Systems Engineering Assessment Model Tool.

2.2.1.2.1. Air Force Systems Engineering Assessment Model. The LSE/CE may use the Air Force Systems Engineering Assessment Model (AF SEAM) Management Guide and Self-Assessment Tool for conducting assessments relative to life cycle management. The primary purpose of the AF SEAM is to promote the application and use of standard systems engineering processes across the AF and to improve the performance of those processes through continuous process improvement.

2.2.1.2.2. Approach. This is achieved by providing both standard process definitions and an associated set of SE best practices tailored for use by United States Air Force programs and projects. These practices include the activities performed by technical professionals across the AF charged with the responsibilities of identifying, acquiring, testing, and sustaining military weapon systems. Combined, these practices form the foundation for SE process discipline that leads to repeatable excellence in product life-cycle management and higher levels of customer satisfaction. The processes and associated practices address acquirer activities as well as activities conducted by the integrator or supplier and other organizations throughout the supply-chain. It is the acquirer's role to over-see the adequacy of the SE processes and ensure effective implementation of systems engineering. This includes those government processes that have been flowed down and are then delegated to the supplier. The final responsibility for the performance of the processes remains with the acquirer.

2.2.1.2.3. Tailor-ability and Limitations. While designed to assess the existence of SE process work products (i.e., CONOPS, plans, technical documents, etc.) it does not assess the outcomes delivered to the customer. The model concentrates on "what" SE processes must be in place which, when properly executed, increase the likelihood customer needs shall be satisfied. Therefore, AF SEAM must be used in conjunction with other more traditional tools to gain a full understanding of project/program status. Also, the model was designed to be flexible and simultaneously take full advantage of creative solutions and CPI by not bounding the user to prescribed implementation approaches "how to" for achieving systems engineering best practices.

2.2.1.2.4. Assessment Models and Checklists. Developed models and checklists are available within these 11 focus areas: General Practices; Configuration Management; Decision Analysis; Design; Manufacturing; Project Planning; Requirements; Risk Management; Transition; Fielding and Sustainment; Technical Management and Control; and Verification and Validation.

2.2.1.2.5. Additional content and user training related to the AF SEAM can be found at **https://www.milsuite.mil/wiki/AF_SEAM_(AF_ERC**).

Chapter 3

DELEGATION OF RESPONSIBILITIES/AUTHORITIES

3.1. Processes/Activities. For the scope of processes/activities covered by this instruction, delegation of engineering/technical responsibilities and authorities to a qualified individual is specific in nature, documented by official memo, and regularly reviewed/updated over time. See AFMCMAN 63-1202 for additional details. Responsibility/authority will be delegated to a qualified individual, not to an organization, team, or office.

3.2. Responsibility/Authority Delegation. For responsibility/authority to be delegated, the individual should be assessed by both the individual's functional office and the delegating OPR/authority as having the qualifications and needed levels of competence to carry out the tasks covered by that responsibility/authority. The person delegating responsibility/authority is responsible for ensuring that the delegation does not conflict with other responsibility/authority assignments or delegations.

3.3. Delegated Responsibility/Authority Holders. Delegated responsibility/authority holders should:

3.3.1. Exercise their responsibility/authority only within the limits of their assignment and only for the intended purposes.

3.3.2. Apply accepted standards and procedures (with tailoring, if authorized/appropriate), and promptly advise appropriate offices when they cannot or should not be applied.

3.3.3. Keep up to date with advances and changes in their area(s) of expertise.

3.3.4. Use established processes when exercising any further delegation of responsibility/authority.

3.4. Delegation of Specific Responsibility/Authority. Delegation of specific responsibility/authority is made IAW the policy and/or direction that applies to the unique delegation. It is made via official memo to the assigned individual and made available to the PM and LSE/CE, affected program teams and other related stakeholder organizations. Delegating responsibility and authority does not delegate the statutory/regulatory accountability of the individual assigned by law or policy. Note: Reference **Attachment 1** Glossary to distinguish the terms "responsibility", "authority", and "accountability".

3.4.1. A delegation memo is provided by the delegating Authority. Memos will be provided within 30 calendar days of the assignment. For delegations within the scope of processes/activities covered by this AFMCI that were made prior to this instruction's publication, memos will be provided within 270 calendar days of this instruction's publication date.

3.4.2. The delegated authority, responsibility, and reporting relationships should be clearly defined, along with the period of assignment. The authority exists only for the duration of the period of assignment.

3.4.3. Delegation memos are reviewed no less often than once every two years by the delegating and delegated Authorities and are updated as needed to account for changes in applicable policies, programmatic relationships, and supporting organizational structures.

3.4.4. The delegating Authority documents the termination of a delegation IAW the guidance in this chapter. Memos will be provided within 30 calendar days of the termination.

3.4.5. IAW applicable policy and local instructions, individuals with delegated authority may temporarily (no longer than 180 calendar days) sub-delegate one level down to a qualified person; however, responsibility for sub-delegated actions remains with the delegated authority. Sub-delegations will be documented IAW the above guidance.

ROBERT B. FOOKES, JR., SES, AFMC/EN
Director, Engineering and Technical Management

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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Abbreviations and Acronyms

ACAT—Acquisition Category

ADDM—Acquisition Document Development and Management (System)

AF—Air Force

AFI—Air Force Instruction

AFIT—Air Force Institute of Technology

AFLCMC—Air Force Life Cycle Management Center

AFMAN—Air Force Manual

AFMC—Air Force Materiel Command

AFMCI—Air Force Materiel Command Instruction

AFMCSUP—Air Force Materiel Command Supplement

AFMCMAN—Air Force Materiel Command Manual

AFNWC—Air Force Nuclear Weapons Center

AFOTEC—Air Force Operational Test and Evaluation Center

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFRL—Air Force Research Laboratory

AFSAC—Air Force Security Assistance Cooperation (Directorate)

AFSC—Air Force Sustainment Center

AIR—Acquisition Incident Review

AMARG—Aerospace Maintenance and Regeneration Group

AoA—Analysis of Alternatives

AS—Acquisition Strategy

ASD—Assistant Secretary of Defense

ASDP—Acquisition and Sustainment Data Package

ASSIST—Acquisition Streamlining and Standardization Information System

ATD—Advanced Technology Demonstration

CBA—Capabilities-Based Assessment

CBM+—Condition Based Maintenance Plus

CCB—Configuration Control Board

CDD—Capability Development Document

CDR—Critical Design Review

CDRL—Contract Data Requirements List

CE—Chief Engineer

CEP—Circular Error Probable

CI—Configuration Item

CJCSI—Chairman Joint Chiefs of Staff Instruction

CLA—Center Level Agreement

CLS—Contractor Logistics Support

CM—Configuration Management

CMP—Configuration Management Plan

COTS—Commercial Off-the-Shelf

CPD—Capability Production Document

CPI—Critical Program Information

CSI—Critical Safety Item

CUI—Controlled Unclassified Information

DAG—Defense Acquisition Guidebook

DASD—Deputy Assistant Secretary of Defense

DASD(SE)—Deputy Assistant Secretary of Defense, Systems Engineering

DAF—Department of the Air Force

DAU—Defense Acquisition University

DID—Data Item Description

DLA—Defense Logistics Agency

DMSMS—Diminishing Manufacturing Sources and Materiel Shortages

DoD—Department of Defense

DoDAF—DoD Architecture Framework

DoDD—Department of Defense Directive

DoDI—Department of Defense Instruction

DoDM—Department of Defense Manual

DoE—Director of Engineering

DOT&E—Director, Operational Test and Evaluation

DR—Deficiency Report

DSPO—Defense Standardization Program Office

DT&E—Developmental Test and Evaluation

ECP—Engineering Change Proposal

EIA—Electronic Industries Alliance

EMA—Expectations Management Agreement

EMD—Engineering and Manufacturing Development

ESOH—Environment, Safety, and Occupational Health

ETAR—Engineering Technical Assistance Request

FCA—Functional Configuration Audit

FMECA—Failure Modes, Effects, and Criticality Analysis

FMS—Foreign Military Sales

FoS—Family of Systems

F3I—Form, Fit, Function, and Interface

FYDP—Future Years Defense Program

GEIA—Government Electronics Information-technology Association

GFE—Government Furnished Equipment

GIDEP—Government - Industry Data Exchange Program

GOTS—Government Off-the-Shelf

HSI—Human Systems Integration

IAW—In Accordance With

ICD—Initial Capabilities Document

IEC—International Electrotechnical Commission

IEEE—Institute of Electrical and Electronics Engineers

IER—Information Exchange Requirement

IHA—Intelligence Health Assessment

IMD—Intelligence Mission Data

IOT&E—Initial Operational Test and Evaluation

IPT—Integrated Product Team

ISA—Intelligence Supportability Analysis

ISO—International Organization for Standardization

IT—Information Technology

ITT—Integrated Test Team

ITRA—Independent Technical Risk Assessment

IUID—Item Unique Identification

JCIDS—Joint Capabilities Integration and Development System

JCTD—Joint Capability Technology Demonstration

JP—Joint Publication

KPP—Key Performance Parameter

KSA—Key System Attribute

LCSE—Life Cycle Systems Engineering

LCSP—Life Cycle Sustainment Plan

LHA—Logistics Health Assessment

LIMS-EV—Logistics, Installations, and Mission Support - Enterprise View

LSE—Lead Systems Engineer

MAJCOM—Major Command

MDA—Milestone Decision Authority

MDAP—Major Defense Acquisition Program

MEDALS—Military Engineering Data Asset Locator System

MIE—Materiel Intelligence Enterprise

MIM—Mission Integration Management

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

MTBCF—Mean Time Between Critical Failure

M&S—Modeling and Simulation

M&SCO—Modeling and Simulation Coordination Office

NDAA—National Defense Authorization Act

NDI—Non-Destructive Inspection

NSI—Nuclear Surety Inspection

OAS—Office of Aerospace Studies

OI—Operating Instruction

OPR—Office of Primary Responsibility

ORI—Operational Readiness Inspection

OSD—Office of the Secretary of Defense

OSS&E—Operational Safety, Suitability, and Effectiveness

O&M—Operations and Maintenance

O&S—Operations and Sustainment

PCA—Physical Configuration Audit

PDR—Preliminary Design Review

PDRC—Program Data Rights Council

PEO—Program Executive Officer

PGM—Product Group Manager

PHS&T—Packaging, Handling, Storage, and Transport

PLM—Product Lifecycle Management

PM—Program Manager

PMO—Program Management Office

POC—Point of Contact

PPP—Program Protection Plan

PSE—Peculiar Support Equipment

PSM—Product Support Manager

PSTK—Product Support Tool Kit

PWS—Performance Work Statement

QAP—Quality Assurance Program

RCM—Reliability Centered Maintenance

RFP—Request for Proposal

RMP—Risk Management Plan

RPG—Recommended Practices Guide

SAE—Society of Automotive Engineers

SSC—Space Systems Command

SCM—Supply Chain Manager

SE—Systems Engineering

SEP—Systems Engineering Plan

SFR—System Functional Review

SLA—Service Level Agreement

SMA—Services Management Agreement

SME—Subject Matter Expert

SOO—Statement of Objectives

SoS—System-of-systems

SOW—Statement of Work

SPO—System Program Office (a.k.a. Program Management Office (PMO))

SRD—System Requirements Document

SSE—Systems Security Engineering

SSG—System Safety Groups

STAR—System Threat Assessment Report

STINFO—Scientific and Technical Information

SVR—System Verification Review

S&T—Science and Technology

TCTO—Time Compliance Technical Order

TDP—Technical Data Package

TEMP—Test and Evaluation Master Plan

TFS—Transition, Fielding, and Sustainment

TMRR—Technology Maturation and Risk Reduction

TNMCM—Total Not Mission Capable for Maintenance

TNMCS—Total Not Mission Capable for Supply

TO—Technical Order

TPM—Technical Performance Measure

TPS—Test Program Set

TSN—Trusted Systems and Networks

T&E—Test and Evaluation

UCI—Unit Compliance Inspection

URL—Uniform Resource Locator

USAF—United States Air Force

U.S.C—United States Code

USG—United States Government

VV&A—Verification, Validation, and Accreditation

WBS—Work Breakdown Structure

WG—Working Group

WIPT—Working-level Integrated Product Team

Office Symbols

AFLCMC/EN—AFLCMC Engineering Directorate

AFMC/EN—AFMC Engineering Directorate

AFLCMC/LG—AFLCMC Logistics Directorate

AFMC/ENS—AFMC Systems Engineering Division

AFNWC/EN—AFNWC Engineering Directorate

SAF/AQR—SAF Science, Technology, and Engineering

SSC/ZAE—SSC Portfolio Architect Engineering

Terms

Accountability—The continuous obligation of an individual to answer for assigned activities and resources, to accept responsibility for them, and to disclose status and results in a transparent manner. It is also the reckoning, when an individual must answer for decisions and actions and accept the consequences, good or bad.

Allocated Baseline—The system's or configuration item's (CI) documented, validated, and approved "design-to" requirements, and all changes thereto approved IAW the contract. The allocated baseline includes (a) the physical hierarchy, (b) the design-to requirements for each product in the hierarchy, and (c) separable documentation identifying all design-to requirements for each component and integrated grouping of components.

Authority—The legitimate right or power of an individual to make determinations or direct actions within the scope of the position to achieve specific objectives. Assigned persons are responsible to exercise their authority to accomplish the assigned task(s).

(Aviation) Critical Safety Item—A part, assembly, installation equipment, launch equipment, recovery equipment, or support equipment for an aircraft or aviation weapons system that contains a characteristic for which any failure, malfunction, or absence could cause a catastrophic or critical failure resulting in the loss or serious damage to the aircraft or weapons system; an unacceptable risk of personal injury or loss of life; or an un-commanded engine shutdown that jeopardizes safety.

Damage is considered serious or substantial when it would be sufficient to cause a "Class A" accident or a mishap of severity category I.

Configuration Items—Aggregations of work products that are designated for configuration management and are treated as single entities within the configuration management process.

Data Management—The practice of putting into place policies, procedures, and best practices to ensure that data is understandable, trusted, visible, accessible, and interoperable. Data Management functions include processes and procedures that cover planning, data acquisition, data rights assertions, modeling, security, cybersecurity, access control, and quality. Outcomes of Data Management include the improvement of data quality and assurance, enablement of information sharing, and the fostering of data reuse by minimizing data redundancy.

DULL SWORD—A reporting term identifying a nuclear weapon safety deficiency.

End Item—Equipment that can be used by itself to perform a military function. The final production product, assembled or completed, and ready for issue/deployment.

Engineering—The profession concerned with the application of mathematic and scientific principles to design, build, and use actual and/or virtual architectures, mechanisms, and structures.

Engineering Change Proposal—The documentation by which a proposed engineering change is described, justified, and submitted to (1) the current document change authority for approval/disapproval or deferral of the design change in the documentation, and (2) to the procuring activity for approval/disapproval or deferral of implementing the design change in units to be delivered or retrofit into assets already delivered.

Expectation Management Agreement—A jointly developed and formally documented agreement between the PM and the functional sponsor to proactively resolve or de-conflict potential issues to include cost, schedules, and performance expectations of the program. Note: the term "EMA" has been replaced by Services Management Agreement (SMA) in AFI 63-138, *Acquisition of Services*.

Family of Systems—A set of systems that provide similar capabilities through different approaches to achieve similar or complementary effects.

Functional Baseline (a.k.a., Requirements Baseline)—The documented, validated, and approved system-level or CI (top level) functional and performance requirements and design constraints, their allocation or assignment to the next level, and all changes thereto approved IAW the contract. Typically, this baseline is initially approved at the System Functional Review or similar event.

Integrated Digital Environment—A compilation of data, models, and tools for collaboration, analysis, and visualization across all functional domains. IDE includes the methodology and specification for data, models, and tools arrangement with processes and procedures to exploit informational results.

Item Performance Specification—A program-unique specification, usually approved as part of the allocated baseline (formerly called a “B Specification” or “Development Specification”). States all necessary design requirements of a CI in terms of performance. Essential physical constraints are included. Item performance specifications state requirements for the development of items below the system level. They specify all of the required item functional characteristics and the tests required to demonstrate achievement of those characteristics.

Operational Effectiveness—The overall degree of mission accomplishment of a system or end item used by representative personnel in the environment planned or expected (e.g., natural, electronic, threat) for operational employment, considering organization, doctrine, tactics, cybersecurity, force protection, survivability, vulnerability, and threat (including countermeasures; initial nuclear weapons effects; and nuclear, biological, and chemical contamination threats). The PM maintains the operational effectiveness of the system by ensuring that it continues to satisfy the documented user capability requirements.

Operational Safety—The level of safety risk to the system, the environment, and the occupational health caused by a system or end item when employed in an operational environment. The PM shall utilize the established system safety process to assure operational safety.

Operational Suitability—The degree to which a system or end item can be placed satisfactorily in field use, with consideration given to availability, compatibility, transportability, interoperability, reliability, maintainability, wartime use rates, full-dimension protection, operational safety, human factors, architectural and infrastructure compliance, manpower supportability, logistics supportability, natural environmental effects and impacts, and documentation and training requirements.

Product Baseline—The "build-to" requirements for each physical element to be manufactured; the software code for each software element that has been separately designed or tested; and the "buy-to" requirements for any other physical element, part, or material to be procured from a subcontractor or vendor.

Product Group—A set of products that use similar or same production processes, have similar physical characteristics, or share customer segments, distribution channels, pricing methods, etc.

Product Group Manager—The manager of a product group (e.g., Life Support, Avionics, Automatic Test Equipment) responsible for all cost, schedule, and performance aspects of a product group and related sustainment activities. Product Groups and Product Group Managers are typically appointed when enterprise management of materiel used to support multiple weapon systems is desired to improve interoperability and decrease costs through commonality.

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.

Program—A directed, funded effort that provides a new, improved, or continuing materiel, weapon, or information system or service capability in response to an approved need. Acquisition programs are divided into acquisition categories that are established to facilitate decentralized decision making, execution, and compliance with statutory requirements.

Program Management Office—The integrated organization responsible for cradle-to-grave military system management. Formerly known as the System Program Office (SPO).

Quality—The composite of material attributes, performance features and characteristics of a product to satisfy a given need.

Quality Assurance—A planned and systematic pattern of actions necessary to provide confidence that adequate technical requirements are established; products conform to established technical requirements; and satisfactory performance is achieved.

Responsibility—The obligation to act or to do a task that one must answer for either to team members, assessors, auditors, inspectors, or supervisors. When an individual has responsibility for a task, the individual requires the authority necessary to carry it out.

Services Designated Official—The individual designated in accordance with Title 10 U.S.C. Section 4502 to exercise responsibility for the management of the acquisition of services. These responsibilities include certifying that service acquisitions are performance-based during acquisition strategy formulation; and approving, in advance, any acquisition that is not performance-based.

Services Management Agreement—An agreement executed between responsible Services Designated Officials, organizational leadership, and/or executing organizations delineating the expectations, responsibilities, and delegations within the relationship. Note: term replaces Expectation Management Agreement (EMA) in AFI 63-138, *Acquisition of Services*.

Subsystem—A functional grouping of components that combine to perform a major function within an element such as electrical power, attitude control, and propulsion.

Supply Chain Manager—Designated individual responsible for managing a line of National Stock Number-coded items. SCM functions include requirements determination; engineering responsibility for items delegated from the Program Offices; cataloging, standardization, and engineering data management; stock control and distribution; technical management functions; and pricing for their assigned items.

System—A specific grouping of subsystems, commodities, and/or components designed and integrated to perform a military function.

System of Systems—A set or arrangement of systems that results when independent and useful systems are integrated into a larger system that delivers unique capabilities.

Systems Engineering—Comprises the scientific, technical, and managerial efforts needed to define/refine requirements, develop, test, verify, deploy, support, sustain and dispose of a product, platform, system, or integrated System-of-Systems/Family-of-Systems (SoS/FoS) capability to meet user needs. SE may be referred to as a discipline, a methodology, an approach, a practice, a process, a set of processes and sub-processes, or various other terms; however, its fundamental elements – systematic technical and managerial processes and measurements – remain the same regardless of the collective nomenclature.

Systems Security Engineering—An element of systems engineering that applies scientific and engineering principles to identify security vulnerabilities and minimize or contain risks associated with these vulnerabilities.

Technical—Relating to special and/or practical knowledge of an engineering or scientific nature, having special knowledge of how a particular kind of work (involving but not necessarily limited to science and engineering) is done.

Technical Data Package—The authoritative technical description of an item. This technical description supports the acquisition, production, inspection, engineering, and logistics support of the item. The description defines the required design configuration and/or performance requirements, and procedures required to ensure adequacy of item performance. It consists of applicable technical data such as models, engineering design data, associated lists, specifications, standards, performance requirements, quality assurance provisions, software documentation and packaging details. (NOTE: The Product Level TDP, per MIL-STD-31000B, is NOT sufficient to produce, maintain, sustain, operate, and modify weapon systems (e.g., software). The Acquisition & Sustainment Data Package (ASDP) was developed within that defines the data need to produce, maintain, sustain, operate, and modify weapon systems and is located on the Digital Guide)

Technical Baseline—Includes a functional baseline, an allocated baseline, and a product baseline. Each is a reference from which to measure progress of the System's or CI's development. They enable the underlying "design-to" process using a common reference. Once a baseline is established, change becomes a formalized process, which provides stability during design. Management of the technical baselines is generally referred to as Configuration Management (CM).

Technical Performance Measure—A subset of metrics and measures that evaluates technical progress (i.e., product maturity). TPMs support evidence-based decisions at key points such as technical reviews, audits, and milestone decisions. TPMs compare the actual versus planned technical development and design; they report progress and the degree to which system performance requirements are met. Systems engineering uses TPMs to balance cost, schedule, and performance throughout the life cycle and can be integrated with other management methods. TPMs from the lower-level products are used to continuously measure growth toward meeting the required KPP goal at the end of development. **NOTE**: For additional terms and definitions not provided here see JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, and Air Force Doctrine Document 1-2, *Air Force Glossary*, which contain standardized terms and definitions for DoD and Air Force use.

Attachment 2

LIFE CYCLE SYSTEMS ENGINEERING PROCESSES

A2.1. Description. This attachment provides a description of the life cycle processes used to implement successful systems engineering for AFMC programs.

A2.2. Need for Systems Engineering. The continuous need for systems engineering is driven by the increasing technical complexity and development costs of defense acquisition programs. Congressional and DoD guidance emphasizes the need for sustained, disciplined processes and process improvement, including the assessment of SE process performance.

A2.3. Project Planning.

A2.3.1. Project (program) planning is a multi-disciplined process used to establish and maintain plans that define program activities. In the context of LCSE, project planning starts by aligning engineering/technical activities with the Acquisition Strategy (AS) and is followed by planning engineering/technical activities in increasing levels of detail. The resulting plans should be periodically reviewed for consistency with the overall acquisition plan. The acquirer's and suppliers' program planning processes are continuous, and the plans evolve to meet program and operational needs.

A2.3.2. Project planning relates technical objectives, constraints, availability of assets and technologies, accommodation of user considerations, consideration of risk, and technical support for the program over the life cycle. It defines the scope of the technical effort required to develop, field, and sustain the system; provides the program's plan for technical reviews and audits; and provides critical quantitative inputs to program planning and life-cycle cost estimates. It establishes a framework for the PM and LSE/CE to accomplish the technical activities that collectively increase product maturity and knowledge while reducing technical risks. It should also account for resources (skilled workforce, support equipment/tools, facilities, etc.) necessary to develop, test, produce, deploy, and sustain the system. Technical project planning is captured primarily in the SEP.

A2.3.3. Recommended Minimum Actions:

A2.3.3.1. Define project life cycle phases, milestones, and key decision points.

A2.3.3.2. Identify and plan for the involvement of project stakeholders.

A2.3.3.3. Define the attributes (e.g., weight, size, reliability, security and resource requirements, detection range) based on requirements document (e.g., 1067, ICD, and CDD) that scope each product-component and task that are of concern to the project.

A2.3.3.4. Develop a plan for the management of project technical data required to manage and support a system throughout its lifecycle. Programs should consider making this data management plan separate from the configuration management plan, especially if using a digital acquisition approach. The data management plan should address the following for project technical data in line with the intellectual property strategy and lifecycle mission data plan (for intelligence mission data dependent programs) and IAW the Air Force Digital Guide, DoDI 5010.44, DoD 5010.12-M, and AFI 63-101/20-101:

A2.3.3.4.1. Data identification and justification, including data formats

A2.3.3.4.2. Data acquisition

A2.3.3.4.3. Data deliverables and timeline, including identifying stakeholders who need to use the data

A2.3.3.4.4. Data protection (e.g., ensure compliance with DoD cybersecurity requirements for the purpose of interoperating in an integrated digital environment)

A2.3.3.4.5. Intelligence Mission Data production shortfalls and associated risks

A2.3.3.4.6. Determination of, and necessary adjustments throughout the life cycle to, Controlled Unclassified Information (CUI) and Scientific and Technical Information (STINFO) distribution control markings (i.e., appropriate distribution statement authorized audience, up-to-date controlling office information, export control determination and marking, destruction notice and any other applicable control markings) IAW DAFI 61-201, DoDI 5200.48, DoDI 5230.24 and DoDD 5230.25.

A2.3.3.4.7. Data verification (e.g., review to ensure meets contract requirements and for technical accuracy; data and metadata conform to a common data architecture and are easily searchable, revised, and controlled; etc.).

A2.3.3.4.8. Data storage, including organization of the data. Storage of data may be accomplished through the usage of a digital environment integrated with Siemens' Teamcenter for the PLM data management platform per the Jan 2021 PLM Enterprise Systems memo from SAF/AQ. In that case, the plan should address change control within the integrated digital environment.

A2.3.3.4.9. Data maintenance (e.g., long term archival and retrieval, version control)

A2.3.3.4.10. Program Office shall use either the term "System Architecture" or "Solution Architecture" for architectural design work specific to one weapon system and should avoid using the term "Reference Architecture" for any work that is not guiding design principles of multiple architectures and solutions.

A2.3.3.4.11. Identify available weapon system Government Reference Architectures that satisfy the Mission and Capability Reference Architectures to be used to guide and constrain a weapon system solution architecture (A list of available Government Reference Architectures can be found on the Digital Guide at **https://usaf.dps.mil/teams/afmcde/SitePages/Government-Reference-Architecture.aspx**.

A2.3.3.4.12. Program Offices should follow the Modular Open Systems Approach (MOSA) guidelines spelled out in the AFMC MOSA Implementation Plan.

A2.3.4. Artifacts:

A2.3.4.1. Integrated Master Plan and Integrated Master Schedule

A2.3.4.2. Systems Engineering Plan; Life Cycle Sustainment Plan

A2.3.4.3. Program Protection Plan, with appendices including the Cybersecurity Strategy

A2.3.4.4. Work Breakdown Structure (WBS)

A2.3.4.5. Data Management Plan, with Security Classification Guide (if applicable)

A2.3.4.6. Project stakeholder MOAs, MOUs, Expectation Management Agreements (EMA), and/or Service Level Agreements (SLA) as applicable

A2.3.5. DoDI 5000.02 and AFI 63-101/20-101 provide the primary regulatory guidance for project planning. For additional information, see the following sources:

A2.3.5.1. SAF/AQ, *USAF Acquisition Process Model*

A2.3.5.2. IEEE 15288.2, *Technical Reviews and Audits on Defense Programs*

A2.3.5.3. MIL-STD-881, *Work Breakdown Structures for Defense Materiel Items*

A2.3.5.4. DASD(SE), *Systems Engineering Plan (SEP) Outline*

A2.4. Decision Analysis.

A2.4.1. The decision analysis process is used to consider possible decisions, using a formal process, that evaluates identified alternatives against established criteria. It is often a multi-disciplined activity requiring considerations of costs, schedules, risks, sustainment impacts and other factors. A repeatable, criteria-based decision-making process is especially important, both while making the critical decisions that define and guide the acquisition process itself and later when critical decisions are made with the selected suppliers. The establishment of a formal process for decision making provides the program with documentation of the decision rationale. Such documentation allows the criteria for critical decisions to be revisited when changes that impact program requirements or other critical program parameters change.

A2.4.2. Decision analysis and associated trade studies should be integrated with, and mutually supportive of, aspects of several SE processes in the early stages of the program, particularly technical planning and assessments, stakeholder requirements definition and analysis, and architecture design.

A2.4.3. Recommended Minimum Actions:

A2.4.3.1. Establish and maintain guidelines to determine which issues are subject to a formal evaluation process.

A2.4.3.2. Determine technical review requirements and associated entry/exit criteria.

A2.4.3.3. Identify, document, and evaluate alternative solutions to program requirements.

A2.4.4. Artifacts:

A2.4.4.1. Decision guidelines, including evaluation criteria and methods

A2.4.4.2. Technical review entry/exit criteria and meeting minutes

A2.4.4.3. Analysis of Alternatives; trade studies / tradeoff analyses

A2.4.4.4. Decision briefings (as applicable)

A2.4.5. For additional information on decision analysis see the following sources:

A2.4.5.1. AFI 63-101/20-101

A2.4.5.2. MIL-HDBK-502A, *Product Support Analysis*

A2.4.5.3. MIL-HDBK-520A, *Systems Requirements Document Guidance*

A2.4.5.4. Office of Aerospace Studies (OAS), *Analysis of Alternatives (AoA) Handbook*

A2.5. Technical Management and Control.

A2.5.1. The technical management and control process enables the PM and LSE/CE to compare achieved results against defined criteria to provide a fact-based understanding of the current level of product knowledge, technical maturity, program status and technical risk. This assessment results in a better understanding of the health and maturity of the program, giving the PM a sound technical basis upon which to make program decisions. It is also utilized to provide an understanding of the program's technical progress so that corrective actions can be taken when the program's performance deviates significantly from the plan. A deviation is significant if, when left unresolved, it precludes the program from meeting its objectives. Corrective actions may require revising the original plan, establishing new agreements, and/or including additional risk/issue handling activities in the current plan. If a corrective action is required to resolve variances from program plans, these actions should be defined and tracked to closure.

A2.5.2. A program's documented engineering/technical plans (e.g., SEP, Life Cycle Sustainment Plan (LCSP), T&E Master Plan (TEMP)) are the basis for monitoring activities, communicating status and taking corrective actions. Progress is primarily determined by comparing actual work product and task attributes, effort, cost, and schedule to the plan at prescribed milestones or control levels in the program schedule and/or WBS. The PM and LSE/CE typically evaluate technical maturity in support of program decisions at the key event-driven technical reviews and audits that occur throughout the acquisition life cycle. The program uses various measures and metrics, including Technical Performance Measures (TPM) and leading indicators, to gauge technical progress against planned goals, objectives, and requirements.

A2.5.3. Monitoring and control functions are typically established early in the program as the program's planning is performed and the acquisition strategy is defined. As the acquisition of technology solutions unfolds, monitoring and control activities are essential to ensure that appropriate resources are being applied and that program activities are progressing according to plan.

A2.5.4. Recommended Minimum Actions:

A2.5.4.1. Define and implement technical standard work and process guidelines.

A2.5.4.2. Establish and maintain engineering/technical integrated product teams (IPT).

A2.5.4.3. Plan and conduct technical reviews and audits IAW process guidelines and technical review entry/exit criteria.

A2.5.4.4. Establish and maintain a program measurement approach to track technical work products and program data.

A2.5.4.5. Monitor and manage corrective actions to closure (use a deficiency reporting system as appropriate).

A2.5.5. Artifacts:

A2.5.5.1. Standard operating procedures (OIs, guides, standard processes, etc.)

A2.5.5.2. Technical planning documents (e.g., SEP, LCSP, TEMP)

A2.5.5.3. Technical IPT (e.g., Configuration Control Board, Deficiency Review Board) charters and minutes

A2.5.5.4. Program/system/item technical metrics.

A2.5.5.5. Technical status and deficiency reports

A2.5.5.6. Technical review meeting minutes and audit reports

A2.5.5.7. Corrective action plans and reports

A2.5.6. For additional information on technical management and control see the following sources:

A2.5.6.1. DASD(SE), *Systems Engineering Working-Level Integrated Product Team (WIPT) Generic Charter Template*

A2.5.6.2. MIL-HDBK-61B, *Configuration Management Guidance*

A2.5.6.3. EIA-649C, *Configuration Management Standard*

A2.5.6.4. EIA-649-1A, *Configuration Management Requirements for Defense Contracts*

A2.5.6.5. GEIA-HB-649A, *Configuration Management Standard Implementation Guide*

A2.5.6.6. MIL-HDBK-189, *Reliability Growth Management*

A2.5.6.7. EIA-748, *Earned Value Management Systems*

A2.5.6.8. ISO/IEEE 15288.2, *Technical Reviews and Audits on Defense Programs*

A2.5.6.9. TO 00-35D-54, *USAF Deficiency Reporting, Investigation and Resolution*

A2.5.6.10. *AFOTEC Operational Test and Evaluation Guide, 11th Edition*, 24 Aug 2020

A2.5.6.11. Assistant Secretary of Defense for Research and Engineering, *DoD Technology Readiness Assessment Guidance*

A2.6. Requirements.

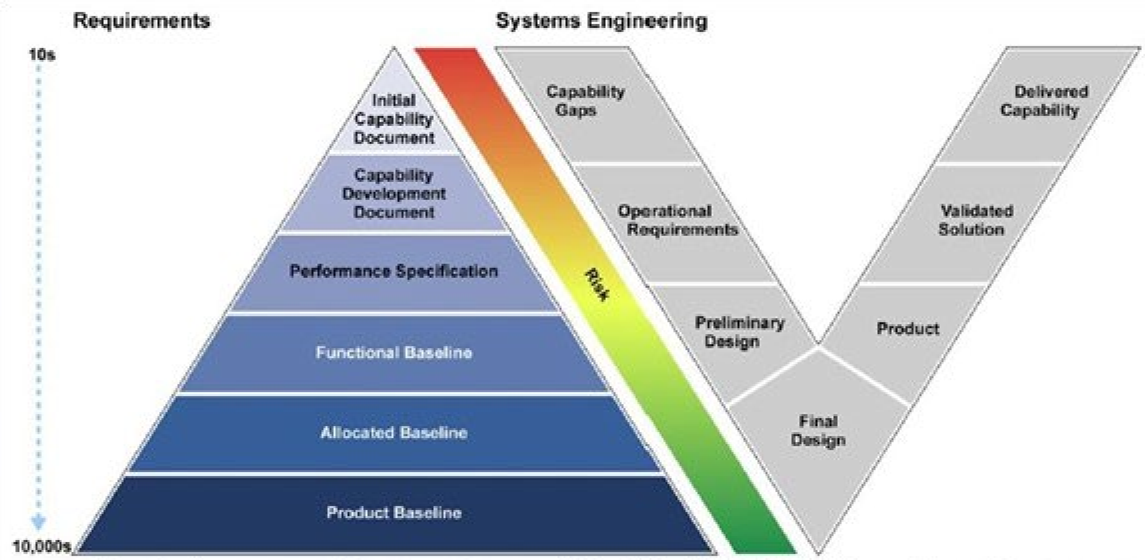
A2.6.1. The requirements process is used to develop and analyze user, product and component requirements to assure consistency between them and the program's technical plans and work products, and to manage requirements evolution through the life cycle.

A2.6.2. Developing increasingly detailed derived requirements is a continuous, iterative process that occurs as the multiple layers of a complex product are defined (for example, requirements flow from the stakeholders to the product, segment, etc., and eventually down to hardware and/or software component levels). See **Figure A2.1**.

A2.6.2.1. As more detailed design requirements are identified, program stakeholders can make informed trades between the requirements and available resources, potentially achieving a match and establishing a sound basis for a program business case. As the requirements decomposition process takes place, engineering and design knowledge grows and overall risk should decrease, leading to more realistic cost and schedule estimates and more predictable program outcomes.

A2.6.2.2. The responsibility for developing requirements down through the levels is generally met through partnerships between the government and vendor stakeholders. The government organizations are generally more responsible for the higher levels (starting with operational requirements), and the vendors are generally more responsible for lower levels. The division of responsibilities between the government and vendor partners is specific to each program.

Figure A2.1. Requirements Decomposition and Systems Engineering.



Note: Reference source Government Accountability Office (GAO) 17-77, *Weapon System Requirements: Detailed Systems Engineering Prior to Product Development Positions Programs for Success.*

A2.6.3. Each government office that has a stake in the requirements process is typically responsible for defining and baselining the requirements levels under its control and monitoring the vendors' definition(s) at their levels. Requirements should be managed and maintained with discipline so that changes are not executed without recognizing the impacts to the program, system and user(s). Requirements should be analyzed throughout the product life cycle to ensure they are both necessary and sufficient.

A2.6.4. Recommended Minimum Actions:

A2.6.4.1. Identify and involve stakeholders when developing requirements.

A2.6.4.2. Identify and document primary (operational user), compulsory (e.g., statutory, regulatory, KPPs, interfaces), and derived (programmatic) requirements.

A2.6.4.3. Prioritize the requirements.

A2.6.4.4. Manage the requirements (avoid requirements creep).

A2.6.4.5. Ensure requirements have bidirectional traceability from the user need to the design solution.

A2.6.5. Artifacts:

A2.6.5.1. Requirements stakeholder lists, with MOAs/MOUs/EMAs/SMAs as required

A2.6.5.2. Stakeholder requirements documents (e.g., JCIDS requirements documents, Concept of Operations, System Requirements Document (SRD), Request for Proposal (RFP), performance specifications).

A2.6.5.3. Requirements traceability matrix / correlation matrix or table

A2.6.5.4. Functional baseline, allocated baseline, product baseline

A2.6.5.5. Technical review documentation (e.g., entrance and exit criteria, meeting minutes, action items)

A2.6.6. For additional information on requirements see the following sources:

A2.6.6.1. CJCSI 3170.01, *Joint Capabilities Integration and Development System (JCIDS)*, and the *JCIDS Manual*

A2.6.6.2. MIL-HDBK-520A, *Systems Requirements Document Guidance*

A2.6.6.3. MIL-HDBK-524, *Interoperable Systems Management and Requirements Transformation (iSmart) Process*

A2.6.6.4. MIL-HDBK-1587, *Materials and Process Requirements for Air Force Weapons Systems*

A2.6.6.5. MIL-HDBK-1785, *System Security Engineering Program Management Requirements*

A2.6.6.6. MIL-STD-46855A, *Human Engineering Requirements for Military Systems, Equipment, and Facilities*

A2.6.6.7. AFI 10-601, *Operational Capability Requirements Development*

A2.7. Risk Management.

A2.7.1. The risk management process is used to identify potential problems before they occur, so that risk handling activities may be planned and implemented as needed to increase the chances of meeting program objectives within the program's constraints.

A2.7.2. IAW DoDI 5000.02 and AFI 63-101/20-101, PMs pursue comprehensive, integrated risk analysis throughout the life cycle and prepare/maintain a Risk Management Plan (RMP). The PM has primary responsibility for risk management and the RMP; the program LSE/CE takes program direction from the PM and ensures that technical risks are incorporated into both the program's overall risk management effort and its LCSE strategy. Risk identification and estimation of likelihood and consequences, particularly for those risks involved in meeting cost/schedule/performance requirements, largely determine the acquisition strategy. For this reason, the RMP is typically incorporated into the Acquisition Strategy or other appropriate planning document. The RMP is linked to the risk management activities described in other planning documents (e.g., Source Selection Plan, LCSP, SEP, and Programmatic Environmental, Safety and Occupational Health Evaluation).

A2.7.2.1. The LSE/CE, in support of the PM, for threat/intelligence-sensitive activities/projects/programs, works with the program's assigned acquisition intelligence support to incorporate intelligence mission data (IMD) shortfall and threat risk considerations, including the likelihood and consequence(s) of critical intelligence parameter breaches, into the technical risk management process through the intelligence supportability analysis (ISA) process.

A2.7.2.1.1. IAW the AFMC Materiel Intelligence Enterprise (MIE) Manual, an activity, project or program shall be considered threat/intelligence-sensitive if at any point in its lifecycle the effort: 1) produces, consumes, processes, or handles intelligence information; 2) requires intelligence-related Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policy or Planning and Direction, Collection, Processing, Analysis and Production, and Dissemination intelligence support; or 3) requires threat support to make programmatic decisions.

A2.7.2.1.2. ISA is the process by which intelligence-related requirements and supporting intelligence infrastructure necessary to successfully acquire and employ DAF capabilities are identified, documented, planned for, and addressed, thereby ensuring intelligence supportability. Intelligence health assessments (IHA) detail the status of a program's intelligence supportability and identify intelligence-related risks derived through the ISA process, including IMD risk management planning IAW DODD 5250.01. IHA factors shall be evaluated and incorporated into a program's overall risk assessment. IAW the AFMC MIE Manual, assigned Senior Intelligence Officers shall develop IHAs, as appropriate, to support risk management decisions by PEOs, technology executive offices, and other Materiel Leaders (e.g., Program/Project Managers).

A2.7.3. Independent Technical Risk Assessments (ITRAs) in accordance with Title 10, U.S.C., Section 4271, shall be conducted on all Major Defense Acquisition Programs prior to Milestone A or B approval, and any decision to enter into low-rate initial production or full-rate production. ITRAs shall be completed in a timely manner to facilitate milestone or production decisions by the Milestone Decision Authority (MDA), and every effort shall be expended to prevent any unreasonable delay.

A2.7.3.1. The ITRA shall consider the full spectrum of Technology, Engineering and Integration risk and the potential impacts to cost, schedule, and performance. ITRAs provide a view of program technical risk, independent of the program or component. When conducted in the first instance for each covered program, the ITRA shall facilitate the MDA's establishment of program cost, schedule, and performance goals as required by title 10, U.S.C. Section 4271.

A2.7.3.2. An ITRA conducted prior to Milestone A shall identify critical technologies and manufacturing processes that need to be matured. At subsequent milestone or production decisions, ITRAs shall identify critical technologies and manufacturing processes that have not been successfully demonstrated in a relevant environment. ITRAs shall be provided to the MDA to support the determinations, certifications, and reporting to Congress in accordance with Title 10, U.S.C., Sections 4251, 4252, and 4253.

A2.7.4. Recommended Minimum Actions:

A2.7.4.1. Develop a risk management approach. The approach should include the intent to identify risk "cause and effect chains" which include root causes (a.k.a. risk events), contributing causes, impacts, and outcomes. The approach should address all risk categories/areas/events that may have a detrimental impact on at least one dimension of consequence (cost/schedule/performance) for the program. Although predictive in nature, the approach should also address contingency planning when negative events do occur.

A2.7.4.2. Identify and document risk cause and effect chains, along with associated risk assumptions, event dependencies, and risk event timeframes.

A2.7.4.3. Analyze risk cause and effect chains. Define risk likelihood and consequence criteria and determine likelihood and consequence for each risk based on the established criteria.

A2.7.4.4. Assess and prioritize risks based on likelihood, consequence(s), timeframe and other factors relevant to the program at its current point in the life cycle. Consider aggregating interrelated risks.

A2.7.4.5. Develop and implement an appropriate risk handling plan for each identified risk.

A2.7.4.6. Track identified risks; monitor and periodically assess/report status of risk handling activities.

A2.7.5. Artifacts:

A2.7.5.1. Risk Management Plan

A2.7.5.2. Risk reporting matrix with defined likelihood and consequence criteria

A2.7.5.3. Detailed risk analysis/review documentation

A2.7.5.4. Results of failure modes, effects, and criticality analysis (FMECA)

A2.7.6. For additional information on risk management see the following sources:

A2.7.6.1. DASD(SE), *Department of Defense Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs*

A2.7.6.2. DAU - Acquisition Community Connection - Risk Management Tools site

A2.7.6.3. DoDM 4151.22-M, *Reliability Centered Maintenance (RCM)*

A2.7.6.4. MIL-STD-882E, *System Safety*

A2.7.6.5. Risk Management Plan (RMP) Template (see **Attachment 1** reference for URLs)

A2.7.6.6. DAFPAM 63-128, *Integrated Life Cycle Management*

A2.7.6.7. AFI 91-202, *The US Air Force Mishap Prevention Program*

A2.7.6.8. Air Force Institute of Technology (AFIT) School of Systems and Logistics (AFIT/LS) Life Cycle Risk Management Group site.

A2.8. Configuration Management.

A2.8.1. Configuration management and planning provide a basis for documenting and managing the decisions made in the SE processes. It also identifies the program/system resources available and helps to produce a sustainment plan for cradle-to-grave supportability. Over the life cycle, the configuration management process establishes and maintains the integrity of the product’s technical baseline while accommodating change. A baseline is a set of specifications, design data and associated lists, source code listings or other work/data products, formally reviewed and agreed on, that thereafter serves as the basis for further development and authoritative representation of the product.

A2.8.2. A system's technical baseline includes a functional baseline, an allocated baseline and a product baseline. Each is a reference from which to measure progress of the system's development, enable CM, and assure OSS&E. A progression of technical baselines is developed during the development life cycle of a product, and each baseline is typically approved at the appropriate systems engineering technical review.

A2.8.2.1. Functional Baseline (a.k.a. Requirements Baseline) - The documented, validated and approved system-level (top level) or CI functional and performance requirements and design constraints, their allocation or assignment to the next level, and all changes approved IAW the contract. Typically, this baseline is initially approved at the System Functional Review (SFR) or similar event, using the Capability Development Document (CDD) and System Performance Specification as inputs to the SFR.

A2.8.2.2. Allocated Baseline - The System’s or CI’s documented, validated, and approved "design-to" requirements and all changes approved IAW the contract. The allocated baseline includes (a) the physical hierarchy, (b) the design-to requirements for each product in the hierarchy, and (c) separable documentation identifying all design-to requirements for each component and integrated grouping of components. Typically, this baseline is initially approved at the Preliminary Design Review (PDR) or similar event, using the Item Performance Specification(s) as an input to the PDR.

A2.8.2.3. Product Baseline - The "build-to" requirements as designed for each physical element to be manufactured; the software code for each software element that has been separately designed or tested; and the "buy-to" requirements for any other physical element, part, or material to be procured from a subcontractor or vendor. Typically, this baseline is initially approved at the Critical Design Review (CDR) or similar event, using the Item Detail Specification(s) as an input to the CDR.

A2.8.3. The technical baseline provides a stable basis for continuing evolution of CIs, which are defined as aggregations of work products that are designated for configuration management and are treated as single entities within the configuration management process. Once a baseline is established, configuration change becomes a formalized process, which provides stability during design and over the life cycle.

A2.8.4. Recommended Minimum Actions:

A2.8.4.1. Document the configuration management process.

A2.8.4.2. Establish a Configuration Control Board (CCB).

A2.8.4.3. Identify the CIs and maintain CI lists.

A2.8.4.4. Establish and maintain the technical baseline.

A2.8.4.5. Document changes to the CIs and maintain change logs.

A2.8.4.6. Perform configuration audits (e.g., Functional Configuration Audit (FCA), Physical Configuration Audit (PCA)) to maintain integrity of the configuration baselines.

A2.8.5. Artifacts:

A2.8.5.1. Configuration Management Plan (CMP).

A2.8.5.2. CCB Charter, decisions and supporting rationale. AFTO Form 872, *Configuration Control Board Directive*, may be used to document CCB decisions and supporting rationale.

A2.8.5.3. List of CIs

A2.8.5.4. Technical baseline description(s) (e.g., functional, allocated, product)

A2.8.5.5. Change requests

A2.8.5.6. Configuration audit results

A2.8.5.7. Action items to address discrepancies

A2.8.6. For additional information on CM see the following sources:

A2.8.6.1. MIL-HDBK-61B, *Configuration Management Guidance*

A2.8.6.2. Defense Logistics Agency (DLA) Military Engineering Data Asset Locator System (MEDALS)

A2.8.6.3. AFI 21-101 AFMCSUP, *Aircraft and Equipment Maintenance Management*

A2.8.6.4. TO 00-5-15, *Air Force Time Compliance Technical Order Process*

A2.8.6.5. TO 00-20-2, *Maintenance Data Documentation*

A2.8.6.6. AF Portal, functional area *Product Data Acquisition*

A2.8.6.7. EIA-649C, *Configuration Management Standard*

A2.8.6.8. EIA-649-1A, *Configuration Management Requirements for Defense Contracts*

A2.8.6.9. GEIA-HB-649A, *Configuration Management Standard Implementation Guide*

A2.8.6.10. IEEE 828, *Configuration Management in Systems and Software Engineering*

A2.9. Design.

A2.9.1. The Design process involves conceiving and proofing an integrated solution that satisfies product requirements. It focuses on product design, initial implementation, and integration. As each level of the product is defined, there is an iterative process of allocation, high level design and requirements definition for the next lower level.

A2.9.1.1. Some design considerations are required by laws, regulations or treaties, and others are required by a particular product domain or Service component. These mandates should be incorporated during the requirements analysis process to achieve balance across all of the system requirements. The program should review system/item design requirements to determine conformance with government policy and legal compliance, and to identify potential integration and interoperability challenges.

A2.9.1.2. There are five types of defense standards ("MIL-STDs"), each of which can influence system/item design: interface standards, design criteria standards, manufacturing process standards, standard practices, and test method standards. Many of these standards are available via the ASSIST Database. Standards are also referenced in DAFPAM 63-128.

A2.9.2. Product design consists of two broad phases that may overlap in execution: preliminary and detailed design. Preliminary design establishes product capabilities and the product architecture, including product partitions, product-component identifications, product states and modes, major inter-component interfaces, and external product interfaces. Detailed design fully defines the structure and capabilities of the product components. During detailed design, the product architecture details are finalized and product components and interfaces are completely defined (detailed in the context of containing all the information needed to manufacture, code, or otherwise implement the design as a product or product component).

A2.9.3. Product integration is achieved through progressive assembly of product components, in one stage or in incremental stages, according to a defined integration sequence and procedures. A critical aspect of product integration is the management of interfaces to the products and between product components to ensure compatibility among the interfaces. Attention should be paid to interface management throughout the program.

A2.9.4. Recommended Minimum Actions:

A2.9.4.1. Evaluate design alternatives based on established selection criteria.

A2.9.4.2. Develop detailed designs for components, end items, systems, etc.

A2.9.4.3. Develop design documentation (e.g., DODAF views, interface design documents).

A2.9.4.4. Develop initial designs for each component, end item, system, etc. based on identified requirements, statutory/regulatory mandates, and constraints. Consider purchasing COTS products versus developing new ones.

A2.9.4.5. Establish and maintain design artifacts that describe the conditions, functions, operating modes and operating states specific to the components of the design architecture.

A2.9.4.6. Prepare Acquisition and Sustainment Data Package / Technical Data Package(s).

A2.9.5. Artifacts:

A2.9.5.1. Design criteria (e.g., KPPs, interfaces, statutory/regulatory requirements)

A2.9.5.2. Design interface control documents/data (e.g., DoDAF views, engineering drawings/models, use cases, interface control documents, interface requirements document, interface design documents, Bill of Materials).

A2.9.5.3. Documented baseline (e.g., functional, allocated)

A2.9.5.4. Trade studies/analyses

A2.9.5.5. Acquisition and Sustainment Data Package / Technical Data Package

A2.9.6. For additional information on design considerations see the following sources:

A2.9.6.1. DAG, Systems Engineering Processes, *Design Considerations*

A2.9.6.2. MIL-STD-31000B, *Technical Data Packages*

A2.9.6.3. MIL-STD-1472H, *Human Engineering*

A2.9.6.4. MIL-STD-46855A, *Human Engineering Requirements for Military Systems, Equipment, and Facilities*

A2.10. Manufacturing.

A2.10.1. The manufacturing process is used to prepare for and produce the required product and includes the following: (1) application of industrial base and manufacturing process expertise/information to the requirements and design processes; (2) planning for and managing the manufacturing process maturation efforts needed for successful transition from product development to rate production; and (3) stabilizing a sustained rate of production while assuring affordable quality products.

A2.10.2. Clear manufacturing readiness criteria should exist for each phase of the program and be agreed to by stakeholders. Manufacturing readiness assessments should be conducted to confirm manufacturing readiness at key points in the program. Manufacturing transition plans are established to address the manufacturing readiness criteria and executed to ensure maturation of manufacturing capability. The residuals of manufacturing (e.g., facilities, processes, tooling, and test equipment) should be integrated into the support infrastructure required for the remainder of the product life cycle.

A2.10.3. Recommended Minimum Actions:

A2.10.3.1. Establish and maintain strategy and plans for manufacturing.

A2.10.3.2. Include manufacturing and quality management requirements in contracts.

A2.10.3.3. Assess and report manufacturing readiness using the DoD Manufacturing Readiness Levels.

A2.10.3.4. During TMRR, initiate manufacturing technology development efforts to address manufacturing risks.

A2.10.3.5. During EMD, mature manufacturing capabilities in support of CDR and Milestone C.

A2.10.3.6. During Production and Deployment, monitor and review production metrics to ensure program cost, schedule, and quality goals are met.

A2.10.3.7. During Operations & Support, assess the capabilities of maintenance organizations to perform O&S activities.

A2.10.4. Artifacts:

A2.10.4.1. Manufacturing Plan

A2.10.4.2. Quality Assurance Program Plan

A2.10.4.3. Manufacturing and Quality Statement of Work requirements

A2.10.4.4. Manufacturing Readiness Level Assessment report, including Manufacturing Maturation Plans

A2.10.4.5. Manufacturing and Quality metrics

A2.10.4.6. Documented baseline (e.g., product)

A2.10.5. For additional information on manufacturing see the following sources:

A2.10.5.1. *Defense Manufacturing Management Guide for Program Managers*

A2.10.5.2. MIL-HDBK-896A, *Manufacturing Management Program Guide*

A2.10.5.3. AFI 63-145, *Manufacturing and Quality Management*

A2.10.5.4. TO 00-35D-54, *USAF Deficiency Reporting, Investigation, and Resolution*

A2.10.5.5. SAE AS9102B, *Aerospace First Article Inspection Requirement*

A2.10.5.6. SAE AS9103A, *Quality Management Systems - Variation Management of Key Characteristics*

A2.10.5.7. OSD Manufacturing Technology Program, *DoD Manufacturing Readiness Level Deskbook*

A2.10.5.8. SAE AS6500, *Manufacturing Management Program*

A2.10.5.9. SAE AS9100D, *Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations*

A2.11. Verification and Validation.

A2.11.1. The verification process ensures that work products meet their specified requirements, whereas the validation process demonstrates that a product fulfills its intended use when placed in its intended environment.

A2.11.2. The PM and LSE/CE manage verification activities and methods as defined in the functional and allocated baselines and review the results of verification. Verification activities and results are documented among the artifacts for the FCA and the System Verification Review (SVR). The output of the Verification process is a verified, production-representative article with documentation to support Initial Operational Test and Evaluation (IOT&E). The SVR provides a determination of the extent to which the system meets the system performance specification.

A2.11.3. The PM and LSE/CE should ensure that a proper verification environment exists, that it selects work products to evaluate based on documented criteria, and that the supplier uses appropriate methods to verify its work products. In this context, the T&E community is a major stakeholder and should participate in up-front planning through final product acceptance.

A2.11.4. Validation consists of evaluating the operational safety, suitability, effectiveness, sustainability, and survivability of the system or system elements under operationally realistic conditions. The PM and LSE/CE are responsible for supporting the validation process. The execution of the validation process is typically conducted by independent testers IAW the program TEMP. System end users and other stakeholders are typically involved in validation activities. Product validation activities can be applied to all aspects of the product in any of its intended environments, such as operations, training, manufacturing, maintenance, and support services.

A2.11.5. Recommended Minimum Actions:

A2.11.5.1. Form an Integrated Test Team (ITT).

A2.11.5.2. Document an integrated approach for verification and validation (include methodology, procedures, criteria, required environments, required resources, etc.).

A2.11.5.3. Conduct verification and validation according to the plan.

A2.11.5.4. Ensure any necessary certifications and accreditations are completed.

A2.11.5.5. Document and analyze the results of the verification and validation activities and perform any necessary corrective actions.

A2.11.6. Artifacts:

A2.11.6.1. ITT Charter

A2.11.6.2. Test plan (e.g., TEMP, Software Test Plan)

A2.11.6.3. Test reports

A2.11.6.4. Certification and accreditation approvals

A2.11.6.5. Deficiency reports

A2.11.6.6. Corrective action plan

A2.11.7. For additional information on verification and validation see the following sources:

A2.11.7.1. DoD Modeling & Simulation Coordination Office (M&SCO), *Verification, Validation & Accreditation Recommended Practices Guide (RPG)*

A2.11.7.2. *Director, Operational Test & Evaluation (DOT&E) TEMP Guidebook*

A2.11.7.3. MIL-STD-3022, *Documentation of Verification, Validation, and Accreditation (VV&A) for Models and Simulations*

A2.11.7.4. DoDI5000.89 DAFI99-103 AFMCSUP, *Capabilities-Based Test and Evaluation*

A2.11.7.5. DAFMAN 63-119, *Mission-Oriented Test Readiness Certification*

A2.11.7.6. ISO/IEEE 26702, *Systems Engineering - Application and Management of the Systems Engineering Process*

A2.12. Transition, Fielding, and Sustainment.

A2.12.1. The transition, fielding, and sustainment process is used to prepare for and execute the support, maintenance, repair, and disposal of a product while ensuring it is operationally safe, suitable, and effective. Transition is the process applied to move any system/element to the next level in the physical architecture. For the overall system, it is the process to install and field the system to the user in the operational environment. The item/system may need to be integrated with other items/systems in the operational environment IAW defined external interfaces, which would require TFS to be performed in conjunction with integration and interface management processes for a smooth transition.

A2.12.2. Early planning for system TFS reduces risk and supports rapid delivery and acceptance by the system's end user. TFS considerations should include, as appropriate, user and maintainer requirements, training, deployability, support tasks, support equipment, and packaging, handling, storage, and transportation (PHS&T). Part of the TFS process is ensuring that each site is properly prepared for the receipt, acceptance, and/or installation of the system.

A2.12.3. The overarching support concept should be considered from the start of any development or modification effort. Support concepts like CBM+ typically drive requirements and design decisions. Early logistics/sustainment representation in development of TFS concepts and related requirements is necessary to reduce total ownership costs.

A2.12.4. Recommended Minimum Actions:

A2.12.4.1. Identify/establish TFS activities to support operations, maintenance, repair, and disposal of the product.

A2.12.4.2. Establish list of qualified suppliers.

A2.12.4.3. Establish and maintain strategy and plan(s) for transitioning acquired products into operational use and support.

A2.12.4.4. Establish and maintain inventory and supplier management/control.

A2.12.4.5. Maintain OSS&E end states, and baseline.

A2.12.5. Artifacts:

A2.12.5.1. LCSP (or equivalent)

A2.12.5.2. Materiel Fielding Plan (may be part of the LCSP or AS)

A2.12.5.3. TOs and training manuals

A2.12.5.4. IUID Implementation Plan

A2.12.5.5. Acquisition and Sustainment Data Packages / Technical Data Packages

A2.12.5.6. Intellectual Property Strategy

A2.12.6. For additional information on TFS see the following sources:

A2.12.6.1. DoDM 4160.21 Volumes 1-4, *Defense Materiel Disposition*

A2.12.6.2. DoDI 4151.22, *Condition Based Maintenance Plus (CBM+) for Materiel Maintenance*

A2.12.6.3. AFI 16-402, *Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination*

A2.12.6.4. AFI 20-106 IP, *Management of Aviation Critical Safety Items*

A2.12.6.5. AFI 21-101 AFMCSUP, *Aircraft and Equipment Maintenance Management*

A2.12.6.6. AFLCMC/LG, *Logistics Health Assessment (LHA) User Guide*

A2.12.6.7. Air Force Product Support Tool Kit (PSTK)

A2.12.6.8. Defense Standardization Program Office (DSPO) SD-22, *A Guidebook of Best Practices and Tools for Implementing a Proactive DMSMS Management Program*.

A2.13. System Security Engineering.

A2.13.1. System Security Engineering (SSE) is a subset of system engineering. It is the systematic application of engineering principles to design systems that are difficult to manipulate maliciously and readily recover from the manipulation attempts. Many defined specialties must be managed to arrive at robust protection and recovery to include anti-tamper, cybersecurity, STINFO protection, and trusted systems and networks (TSN). The ultimate goal is to afford decision makers on the residual risk. To determine the residual risk the program must assess the overall risk, correct identified deficiencies, and do so within established funds and schedule. No one specialty is sufficient to provide adequate protection and failure to address all results in systems that are inadequately protected with susceptibility to easy malicious manipulation. The documentation for the processes enhances understanding current decisions and facilitates future upgrades.

A2.13.2. SSE is taken concurrently with overall system engineering process. Most often SSE activities are indistinguishable from system engineering activities, as they are systems engineering best practices.

A2.13.3. Recommended Minimum Actions:

A2.13.3.1. The breadth, depth, and overall authority for protecting infrastructure and weapons systems is categorized by protection development phase contained in *System Security Engineering Cyber Guidebook*. Application specific for Command TSN is contained in the AFMC Trusted Systems and Networks Implementation Plan is in the AFMC Systems Engineering Toolbox at **https://usaf.dps.mil/:b:/t/AFMCTSNRoundTable/EfyWkb2xeQZAi90NEmBVhj8BBb2h0shGM6vwW_gB6SVEXQ?e=U0aESl**.

A2.13.3.2. Contact the respective center TSN Focal Point for guidance.

A2.13.3.3. Obtain hardware and software bill of materials for system.

A2.13.3.4. Request available intel and contractor illumination.

A2.13.3.5. Expand cybersecurity criticality analysis to encompass critical microelectronics.

A2.13.4. Artifacts:

A2.13.4.1. Systems Engineering Plan section identifying critical components, their protection scheme (including security and privacy controls from NIST SP 800-53) and test techniques to assess protection scheme(s) effectiveness.

A2.13.4.2. Program Protection Plan section detailing critical functions, critical components, and the assessment of system impact if compromise.

A2.13.4.3. TSN Risk Assessment results

A2.13.4.4. Life-cycle Sustainment Plan sections containing notice of critical components, their protection, and sustainment. Properly document critical components in sustainment form.

A2.13.5. For additional information, see the following sources:

A2.13.5.1. DoDI 5200.44, *Protection of Mission Critical Functions to Achieve Trusted Systems and Networks (TSN)*

A2.13.5.2. DoDM 4140.01, Volume 11, *DoD Supply Chain Materiel Management Procedures: Inventory Accountability and Special Management and Handling*

A2.13.5.3. DoDI 5000.83 DAFI 63-113, *Technology and Program Protection to Maintain Technological Advantage*

A2.13.5.4. AFI 17-130, *Cybersecurity Program Management*

Attachment 3

OPERATIONAL SAFETY, SUITABILITY, AND EFFECTIVENESS

A3.1. OSS&E-related goals or end states (not including airworthiness) are accomplished by achieving and preserving technical integrity through use of disciplined SE practices, proper O&M, effective supply systems, and distribution of state/trend information to system stakeholders. Overall, an effective program OSS&E approach is one in which competent people make reasonable and defensible program, engineering, and technical decisions throughout the life cycle to maintain the required safety, suitability, and effectiveness characteristics of systems and items.

A3.1.1. The PM, with LSE/CE, is ultimately responsible for the implementation and execution of OSS&E-related procedures for the system and/or end items. However, since the operational sponsor bears responsibility for some OSS&E-related procedures within their MAJCOM, the PM and LSE/CE should work to ensure that the user MAJCOM(s) and their operating units understand their roles in assuring OSS&E.

A3.1.2. To ensure all external organizations are aware of their roles in continued OSS&E assurance, a flow-down of requirements to other organizations through contracts, MOAs, SLAs, or other means should be employed where they add value.

A3.1.3. Any changes that impact the OSS&E baseline or form, fit, function, and interface (F3I) need to be communicated/coordinated with each customer. The goal is for the PM, LSE/CE and operational/functional users to be kept informed of changes (and the impacts of those changes) to equipment installed on the platform that they manage or operate.

A3.1.4. The PM receiving equipment with OSS&E assurance managed elsewhere is still responsible for the integrated system OSS&E assurance.

A3.1.5. For additional information see MIL-HDBK-260, *Reference Data for Logistics Metrics*, and *AFOTEC Operational Test and Evaluation Guide, 11th Edition*, 24 Aug 2020. Also, see **Figure A3.1** and **Table A3.1**.

A3.1.5.1. Safety Metrics Considerations. Safety DRs, TCTOs, CSIs and FMECA should be addressed by risk assessment-- reference MIL-STD-882, *System Safety.* Also, reference AFI 91-204, *Safety Investigations and Reports*, for mishap reporting.

A3.1.5.2. Suitability Metrics Considerations. Reference TO 00-20-2, *Maintenance Data Documentation*. Also, review metrics/data provided by the Air Force Logistics, Installations and Mission Support - Enterprise View (LIMS-EV) capability. More information on LIMS-EV is available via the Air Force Portal.

A3.1.5.3. Effectiveness Metrics Considerations. Reference TO 00-20-2. Also, reference user effectiveness KPPs and KSAs from the JCIDS requirements documents; effectiveness specifications from program SRD; and T&E Measures of Performance (MoPs) and Measures of Effectiveness (MoEs).

Figure A3.1. OSS&E Metrics Taxonomy (Development Example).

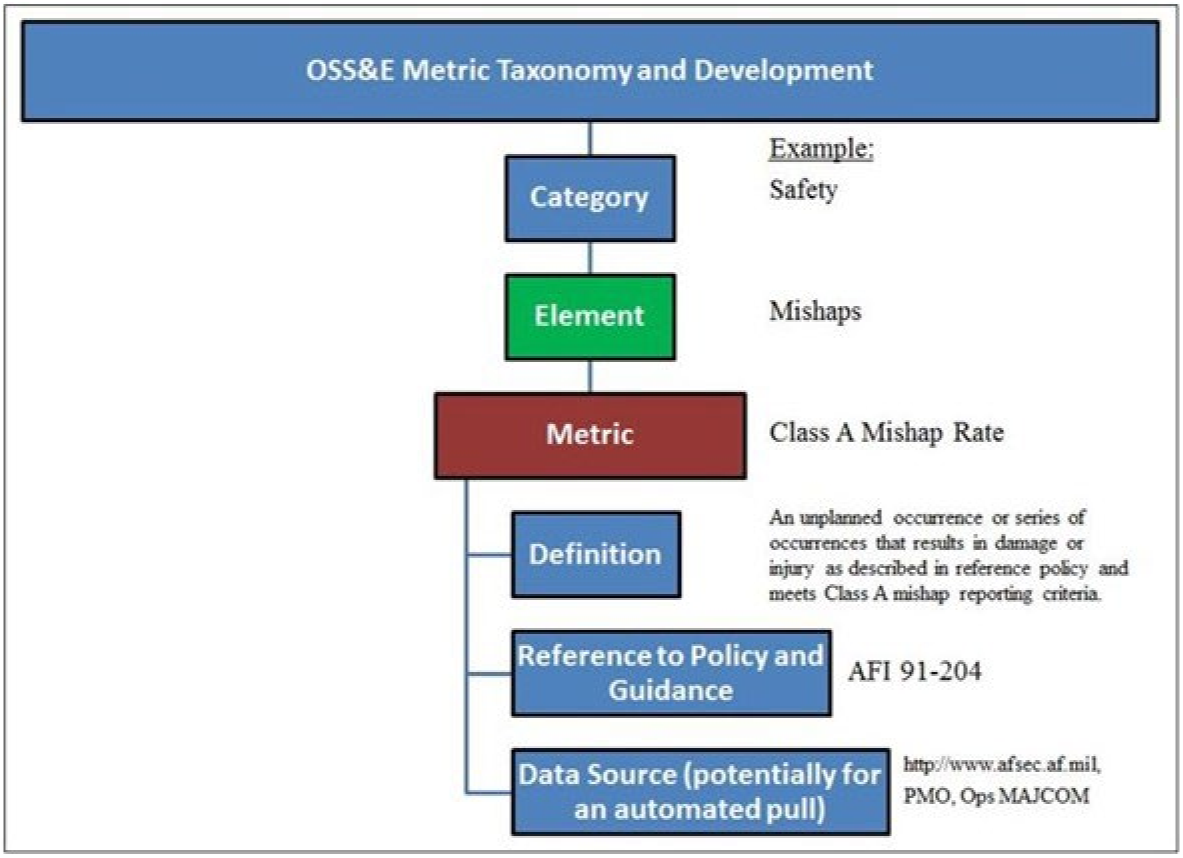


Table A3.1. OSS&E Metrics Examples (Notional, Tailorable).

Safety (SE)	Suitability (SU)	Effectiveness (EF)
SE1 – Class A Mishap Rate Std = 1/100,000 flying hours	SU1 – Mission Availability Std = 75% (includes all primary mission systems)	EF1 – Mean Detect Range Std = R_0 (1m^2 Radar Cross Section, Combat Air Patrol orbit altitude)
SE2 – Total Mishap Rate Std = 1/10,000 flying hours (combined Class A/B/C)	SU2 – Mean Time Between Critical Failure (MTBCF) Std = 120 hours (includes all primary mission systems)	EF2 – Electronic Countermeasures Std = Fully effective against STAR-E18 Table 3 threats

Safety (SE)	Suitability (SU)	Effectiveness (EF)
SE3 – Deficiency Resolution Std = CAT-1 DRs, DULL SWORD, Unsatisfactory Reports (URs – nuclear) resolved within 90 days	SU3 – Average Mean Time to Repair Std = 5 hours	EF3 – Interoperability Std = Meets all TO-051-C Table 7 Information Exchange Requirements (IERs)
SE4 – Dropped Objects Std = 1/50,000 flying hours	SU4 – Total Not Mission Capable for Maint. (TNMCM) Std =	EF4 – Mission Crew Effectiveness Std = Rating of 7 or higher for all mission crews
SE5 – Unit ORIs/NSIs/UCIs Std = All certified O&M units receive "Sat" or higher rating for safety	SU5 – Total Not Mission Capable for Supply (TNMCS) Std =	EF5 – Gun Circular Error Probability (CEP) Std = xx feet and yy% at range zzz
SE6 – Nuclear Surety Cert. Std =	SU6 - Mission Capable Rate Std = 0.70 (operation fleet)	

A3.2. OSS&E Baseline - Components. The items composing the program's OSS&E baseline are tailorable to the program and its life cycle phase; but in general, an OSS&E baseline includes:

A3.2.1. A complete set of traceable requirements (including user requirements, derived program requirements, and certification/statutory/regulatory requirements).

A3.2.2. Descriptive configuration information, characteristics, and limitations of hardware and software product(s) satisfying the requirements.

A3.2.3. Information on the support and procedures needed to ensure that the product(s) continue(s) to meet requirements throughout the life cycle.

A3.2.4. A system model that captures functions, behavior, components, interfaces, and data flow (internally and externally, as applicable).

A3.3. In order to assure OSS&E, the PM and the LSE/CE ensure documentation of authority for activities that impact design considerations or involve providing technical direction for the use and sustainment of the weapon system/end item.

A3.3.1. For the system or end item, the program's designated overall Engineering Authority fulfills the role of the Design Control Activity defined in Title 10 U.S.C. Section 3243, and may fulfill the ESA role IAW AFI 20-106 IP, *Management of Aviation Critical Safety Items*.

A3.3.2. The LSE/CE is the program's overall Engineering/Technical Authority. However, supporting organizations may appoint Engineering/Technical Authorities IAW their applicable policies and guidance. Regardless of the assigning OPR, each Authority manages, documents, and tracks any further delegation of their authority and provides copy to the PM and LSE/CE-- see **Chapter 3** and DAFPAM 63-128 for required/recommended processes. Individuals who are designated/delegated as an Engineering/Technical Authority are responsible for reviewing and endorsing the informational artifacts and metrics applicable to their assigned activities.

A3.3.3. The PM and LSE/CE collaborate with the appropriate center EN to determine the qualifications necessary for an individual to be an Engineering/Technical Authority for the designated program activity. Also, the PM and LSE/CE establish clear reporting guidelines for communicating program-related engineering concerns from individuals designated as an Engineering or Technical Authority.

A3.3.4. The delegation of engineering authority to Air Force Sustainment Center (AFSC) supply chain groups can use delegation templates endorsed by the applicable center ENs.

A3.3.5. Document processes to provide engineering disposition to resolve nonstandard conditions. Reference TO 00-25-107, *Maintenance Assistance*; TO 00-5-3, *Air Force Technical Order Life Cycle Management*; and AFMCMAN 63-1202, *Air Force Materiel Command Engineering Technical Assistance (ETAR) Process*. Also, document processes to resolve maintenance TO deficiencies or errors-- reference TO 00-5-1, *AF Technical Order System*.

Attachment 4

SYSTEMS ENGINEERING PLAN REQUIREMENTS

A4.1. SEP production requirements and waivers/exemptions for AFMC programs are established in DoDI 5000.02, DoDI 5000.88, AFI 63-101/20-101 and AFI 61-101. This AFMCI does not expand applicability of SEP production requirements beyond what is published in higher guidance. However, an AFMC program which is required to produce a SEP should contain the following information, tailored to the program life cycle phase. The SEP can reference other program documents with the content described below rather than duplicate the same information.

A4.1.1. A description of how OSS&E-related life cycle processes shall be implemented, executed and verified by both the implementing and operational commands.

A4.1.2. A definition of when the OSS&E baseline shall be brought under government configuration control.

A4.1.3. A description of OSS&E-related data management systems and planned compatibility with Air Force acquisition, logistics, operations, and sustainment architectures.

A4.1.4. Engineering/technical resources required to execute the product support strategy.

A4.1.5. Engineering/technical risks that have been accepted at levels above the PM.

A4.2. If the PM has chosen to develop a HSI plan as a separate document, that document should be referenced in the SEP. See **Attachment 5** for more details.

A4.3. The program LSE/CE ensures the SEP conforms to the common documented SE processes (with approved tailoring and/or waivers) prior to review/approval by the PM.

A4.4. Product Group systems/items in the O&S phase should develop a Group/Directorate-level SEP that identifies maintenance and sustainment processes for equipment replacement and replenishment.

Attachment 5

HUMAN SYSTEMS INTEGRATION ACTIVITIES BY PROGRAM PHASE

A5.1. The human is a critical component in any system. HSI planning and implementation addresses the systematic integration of interrelated domains-- human factors engineering; personnel; habitability; manpower; training; safety and occupational health; and force protection and survivability-- in order to accomplish the DoD 5000 series goals to optimize total system performance and ownership costs. HSI includes interdisciplinary technical and management processes for integrating human considerations within and across all system elements. HSI is a tailored, "total system" approach that includes humans, technology, the operational context, and the necessary interfaces between and among the system elements to make them all work in harmony.

A5.1.1. HSI is a key component of SE and LCSE processes requiring HSI planning to address human centered design issues across trade space and related domains. HSI planning content can be included in the SEP or the PM's plan for HSI can also be a separate document. The PM can require a HSI plan from the contractor (Human Systems Integration Program Plan or HSIPP) through a Data Item Description (DID) DI-HFAC-81743A or can develop an "organic" government plan (Human Systems Integration Plan or HSIP), which can be especially useful for complex systems and programs. If the HSI plan is a separate document, that document should be referenced in the SEP. At a minimum, HSI plans should be updated prior to each program milestone (or equivalent decision point).

A5.1.2. Early and frequent consideration of HSI is integral to effective implementation. For program acquisitions consisting of Government Off-the-Shelf (GOTS), COTS and/or non-developmental items, the equipment and its integration with the overall system are still assessed and addressed for implications on the human and human performance. HSI is assessed and addressed in design trade studies and risk mitigations. The HSI assessment is tailored to program needs and should be accomplished prior to milestones and program reviews. HSI assessments capture HSI issues that may require mitigation/resolution before potentially causing a major system redesign.

A5.1.3. IAW DoDI 5000.02, PMs ensure that AF HSI staff are aware of and engaged with WIPTs tasked with the development and review of program planning documents that reflect HSI planning and inform program decisions. HSI shall be considered at each milestone during the program life cycle, and should be coordinated with other enabling functionals such as, intelligence, logistics, and the user communities during each acquisition phase. HSI-related assessments/activities by program life cycle phases are described below-- these can be tailored to reflect the unique needs of the program and the type of item/system being developed.

A5.2. Materiel Solution Analysis Phase Activities (Pre-Milestone A).

A5.2.1. Perform HSI task analyses and assessments to identify major HSI-related concerns and capability gaps. Target audience is identified and includes all those who operate, maintain, support or are transported by the system.

A5.2.2. Work with the operational sponsor to document HSI considerations in the AoA Report and in the Technology Development Strategy.

A5.2.3. Ensure that appropriate HSI trade-offs are completed to contribute to the optimization of the overall cost, schedule, performance, and overall affordability of the viable materiel solutions.

A5.2.4. Include HSI planning in the development of system specifications and associated objectives/thresholds through human-related Measures of Effectiveness (MoE), Measures of Suitability (MoS) and Measures of Performance (MoP), as applicable.

A5.2.5. Address HSI implications evolving from the ICD and analyses/assessments in the draft CDD/CPD.

A5.2.6. Ensure KPPs, KSAs or other attributes which address HSI domains are considered/included during requirements development.

A5.2.7. Develop HSI-related risk handling planning.

A5.2.8. Develop and integrate HSI planning with technical and program planning.

A5.2.9. Estimate costs for HSI support through the system life cycle and include in cost estimates.

A5.2.10. As applicable, assess and document HSI considerations as requirements in the draft SRD / system performance specification.

A5.2.11. As applicable, perform or place on contract HSI-related demonstrations, analyses and risk reduction studies using mock-ups or modeling and simulation (M&S) to analyze critical performance elements.

A5.2.12. Capture and utilize HSI lessons learned at Milestone A for the next phase activity.

A5.3. Technology Maturation & Risk Reduction Phase Activities (Pre-Milestone B).

A5.3.1. Review the SEP and provide input to the TEMP, focusing on usability, sustainability and other applicable HSI considerations.

A5.3.2. Plan for and implement HSI, integrated with technical and program planning:

A5.3.2.1. Develop or update HSI plans/planning as applicable, including managerial and technical approaches.

A5.3.2.2. Summarize HSI planning or reference the HSI plan in the SEP.

A5.3.2.3. Determine/establish HSI personnel participation in IPTs and/or WGs.

A5.3.2.4. Ensure HSI considerations include design, integration, modification, test, verification, certification, logistics planning, operational support, and disposal.

A5.3.2.5. Ensure HSI planning, evaluations and studies are placed on contract IAW program plans and requirements. As needed, select the appropriate Data Item Descriptions (DID) for inclusion in the Contract Data Requirements List (CDRL), and place concise wording in the Statement of Work (SOW), Statement of Objectives (SOO) or Performance Work Statement (PWS). Review HSI-related contractor deliverables.

A5.3.2.6. Ensure logistics planning includes maintainability and other HSI considerations.

A5.3.2.7. Establish HSI-related metrics as needed, including Technical Performance Measures, Systems Engineering artifacts, and elements of the technical baseline.

A5.3.2.8. Ensure HSI personnel participate in technical and design reviews.

A5.3.2.9. Conduct HSI trade studies, as needed.

A5.3.2.10. Ensure HSI issues/concerns identified during test are addressed.

A5.3.2.11. IAW system and program requirements, document HSI-specific entrance and exit criteria for design and programmatic reviews.

A5.3.2.12. Establish and implement a process for identification, tracking, and mitigation of human-related concerns and risks integrated with the overall program risk management process.

A5.3.3. Plan for sustainment of and training for the system. Ensure documentation within the LCSP and technical planning.

A5.3.4. Review Manpower Estimate Report as required.

A5.3.5. IAW the *JCIDS Manual*, work with the operational sponsor to ensure adequacy of HSI-related capability requirements in the CDD prior to CDD validation.

A5.3.6. As applicable, assess, translate, refine, and document HSI considerations as requirements in the SRD / system performance specification IAW overall program plans and requirements.

A5.3.7. Generate risk assessment criteria for human-related concerns.

A5.3.8. Include HSI considerations in ATDs and prototyping efforts.

A5.3.9. Ensure HSI tradeoffs are considered, demonstrated, and refined in ATD and prototype development.

A5.3.10. Capture and utilize HSI lessons learned at Milestone B for the next phase activity.

A5.4. Engineering & Manufacturing Development Phase Activities (Pre-Milestone C).

A5.4.1. Plan for sustainment of and training for the system. Ensure documentation within the LCSP and technical planning.

A5.4.2. Ensure needed HSI planning, evaluations and studies are on contract IAW program plans and requirements. Select the appropriate DIDs for inclusion in the CDRL, and place concise wording in the SOW, SOO, or PWS.

A5.4.3. Review contractor deliverables for adequacy of HSI implementation and performance of HSI-related evaluations and studies.

A5.4.4. Enable HSI participation in WGs/IPTs, with special emphasis on design reviews.

A5.4.5. Ensure HSI considerations are reflected in the product baseline for the system and its constituent system elements.

A5.4.6. Coordinate with Developmental Test and Evaluation (DT&E) community on human performance considerations derived from weapon system capability-based requirements and program documentation.

A5.4.7. Review test, operational assessment and evaluation reports, and results of HSI-related system elements. Ensure deficiencies are captured in the program risk management process.

A5.4.8. Finalize design decisions and document human-in-the-loop tradeoffs.

A5.4.9. Capture and utilize HSI lessons learned at Milestone C for the next phase activity.

A5.5. Production & Deployment Phase Activities (Post-Milestone C).

A5.5.1. Update SEP and TEMP based on human effectiveness in system utilization during initial system tests.

A5.5.2. Analyze and work to resolve any operational deficiencies in the system's ability to meet HSI-related requirements.

A5.5.3. Review finalization and implementation of training program.

A5.5.4. Assess new contracts for HSI-related considerations, risks, and inputs.

A5.5.5. Capture and utilize HSI lessons learned from IOT&E for the next phase activity.

A5.6. Operations & Sustainment Phase Activities.

A5.6.1. Include consideration of human concerns (e.g., human tasks, usability, anthropometric accommodations, maintainability) in system upgrades and modifications.

A5.6.2. Participate in system safety and incident reviews to help identify human-related root causes.

A5.6.3. Capture and provide lessons learned for future CBA and AoA efforts.

A5.6.4. Provide input on Deficiency Reports with human implications, as required.

A5.7. HSI Relationships.

A5.7.1. The PM implements HSI early in the acquisition process and throughout the product life cycle. On behalf of the PM, the LSE/CE should implement either a HSI IPT or include an HSI lead in the Systems Engineering IPT. Additional HSI resources to support program office activities are available from the broader HSI community (AFMC/EN and AFLCMC/EN).

A5.7.1.1. HSI organizations and processes facilitate trade-offs among human-centric domains without replacing or duplicating individual domain activities, responsibilities and reporting channels.

A5.7.1.2. HSI organizations and processes inform the PM and LSE/CE to support program decision-making.

A5.7.2. The program LSE/CE helps the PM to ensure HSI issues are properly addressed. The LSE/CE is responsible for HSI technical content presented in the SEP, milestone decision inputs, and technical reviews. In addition, the LSE/CE should provide HSI support through the HSI POC for the program IPTs. In collaboration with the PM, the LSE/CE should communicate HSI opportunities and risks to the center DoE, center level technical authority and PEO DoE in support of the PEO program portfolio and program milestone decisions.

A5.7.3. AFMC/ENS and AFLCMC ensure that HSI is effectively accomplished across acquisition program offices via the AFLCMC Human Systems Integration Enterprise chaired by the Crew Systems Engineering and HSI Enterprise Branch (AFLCMC/EZFC). The AFLCMC HSI Enterprise creates a network of HSI practitioners from each of the AFLCMC execution directorates and connects them with domain expertise from a variety of functional communities.

A5.8. HSI Guidance and Resources. For more information, refer to:

A5.8.1. *AF HSI Requirements Pocket Guide*

A5.8.2. AFOTEC Operational Test and Evaluation Guide, 11th Edition, 24 Aug 2020

A5.8.3. DAFPAM 63-128

A5.8.4. Defense Acquisition Guidebook

A5.8.5. *HSI and ESOH Handbook for Pre-Milestone A JCIDS and AoA Activities*

A5.8.6. MIL-STD-1472H

A5.8.7. MIL-STD-46855A

Attachment 6

DELEGATED ENGINEERING AUTHORITY FOR AFMC FORM 202 PROCESSES

A6.1. This attachment provides LSE/CEs with recommended guidance on the delegation of engineering/technical authority to depot maintenance engineers that develop engineering disposition for technical problems beyond published authority. Specifically, it provides guidance on how maintenance engineers may participate in the approval of the AFMC Form 202, *Nonconforming Technical Assistance Request and Reply*. This guidance does not direct the LSE/CE to delegate authority; instead, it provides a recommended process to facilitate delegated engineering authority efforts. While this guidance focuses on the AFMC 202 process, organizations may be able to utilize elements of this process to tailor their AFMC 107 and/or DLA 339 processes IAW TO 00-25-107 and DLA Form 339 guidance. Note: This attachment cancels, incorporates, and updates information from the *AFMC 202 Delegated Engineering Authority Process Guide v1.0, 18 September 2012*.

A6.1.1. If the LSE/CE and/or PM determine that delegated engineering authority is warranted, they ensure that the designee(s) is/are qualified and technically competent to provide sound engineering disposition for problem resolution.

A6.2. *General Principles.*

A6.2.1. Air Force policy vests the overall programmatic responsibility for a weapon system with the PM. The LSE/CE is the overall engineering/technical authority for the program, and usually has delegated programmatic responsibilities/authorities from the PM, which are related to executing engineering and technical tasks for the program. Through this arrangement, the LSE/CE typically acts on behalf of the PM to maintain control of the OSS&E baseline and airworthiness. Policy and disciplined SE require the PM and LSE/CE to clearly document and describe any delegated program management, engineering or technical authority, and to ensure delegated authority for activities are limited to competent organic and contractor activities. It is therefore necessary for the LSE/CE to have insight into the competencies of engineers with delegated engineering/technical authority.

A6.2.2. While the OSS&E and airworthiness characteristics of the system are the paramount consideration, both AFLCMC and AFSC has a shared responsibility to the warfighter to meet their aircraft availability requirements. Among many factors, the engineering support provided to maintenance and repair actions has a direct effect on an AFMC center's ability to meet warfighter availability requirements. This attachment provides AFMC centers with a consistent mechanism to partner with the program office in the execution of engineering support to maintenance organizations, establishing a process that balances OSS&E and airworthiness principles with aircraft availability needs and providing clear lines of authority.

A6.3. Recommended Non-Delegable and Delegable Tasks.

A6.3.1. Non-Delegable. Due to the potential OSS&E/airworthiness implications and the necessity for independence, 202s meeting the following criteria should generally not be delegated to a maintenance engineer as the engineering approval authority in block 26E. While LSE/CEs have the flexibility to delegate authority as they deem necessary, items on the list below are generally outside of AFMC norms for delegation. The items on the list below should not be delegated unless the LSE/CE (in collaboration with the PM) determines it is necessary and presents acceptable risk. Recommended non-delegable tasks include:

A6.3.1.1. CSIs, safety of flight, parts/repairs with catastrophic failure consequences, major structural repairs, nuclear certified items, deferred repairs, interface changes, deviation to work specifications, new manufacturing processes, low observable critical item or processes, disposition of product quality deficiency report, material substitution, new repairs and/or repair processes, changes with the potential to degrade reliability or performance, changing of test limits/requirements, changing of calibration requirements on weapons system support equipment, hardness critical items/processes, corrosion prevention and control requirements, changes that affect program office contract or warranty, and dispositions that require contracted expertise.

A6.3.2. Delegable. When the business case supports delegation, typical delegable tasks include those that have the following characteristics: negligible consequences in accordance with MIL-STD-882; known approved repair using standard process; qualified proven process; does not have appreciable cost increase to life cycle; repair expected to last through depot cycle. Note: "Negligible" is defined as “could result in injury or illness not resulting in a lost workday, loss exceeding $2K but less than $10K, or minimal environmental damage not violating law or regulation.” Tasks that typically have these characteristics include but are not limited to:

A6.3.2.1. Form 202 rejection, condemnations, reclamations, oversize holes/fasteners, rework assessment, secondary structure repairs, clarification of TO, troubleshooting, catalog analysis, reissue 202 within limitations of AFMCMAN 63-1202, remove and replace a qualified part, temporary support equipment substitutes, repairing beyond TO limits due to limited supply, repeat authority, sequencing of subsystem / component removal / installation, and parts substitution where: previously approved or not yet in TO and consumables (common, recurring, bench stock).

A6.4. *Form 202 Engineering Delegation Responsibilities.*

A6.4.1. General Responsibilities. While LSE/CEs are generally permitted to delegate engineering/technical authorities to qualified and competent organic organizations and contractors, there is no mandated standard process to delegate these authorities. AFPAM 63-128 provides general recommended procedures. The following paragraphs outline the specific responsibilities associated with delegating engineering authority from a program office LSE/CE to a maintenance engineer in an organic maintenance organization.

A6.4.2. There are two key engineering roles in the development and approval of the 202. While these roles are generally applicable to program office engineers, the scope of this paragraph is in the context of delegation to engineers in the maintenance organization. Policy and sound engineering practices require that the engineer developing the disposition instructions in Part B of the 202 cannot be the same engineer who approves the repair.

A6.4.2.1. The engineer developing the disposition instructions is referred to as the disposition engineer and has “1st Signature” approval (Block 26A).

A6.4.2.2. The engineer who approves the recommended disposition on the 202 is referred to as the engineering approval authority and has "2nd Signature" approval (Block 26E).

A6.4.3. LSE/CE Responsibilities. In accordance with his/her documented authorities, the LSE/CE has the final engineering/technical responsibility for the program and weapon system. LSE/CEs ensure that delegated engineering/technical authorities have been delegated in writing, that the scope/limits of the delegations are clearly identified, and that delegations are limited to qualified individuals who are technically competent to perform tasks within the scope of their delegation. Specific LSE/CE responsibilities include:

A6.4.3.1. Delegate in writing any LSE/CE authorities delegated to the disposition engineer or the engineering approval authority.

A6.4.3.1.1. Because the delegation letter designates (by name) an engineer who may assume authority for delegated aircraft, processes and component configuration control deviations, as well as airworthiness, it is imperative that the delegation letter clearly identify what that engineer can and cannot approve.

A6.4.3.2. Monitor 202 dispositions for OSS&E and airworthiness assurance purposes.

A6.4.3.3. Ensure appropriate mentoring of new disposition engineers and engineering approval authorities to ensure their delegated authorities are being fulfilled appropriately.

A6.4.3.4. Conduct annual audit of 202s in which a maintenance engineer has been approved as the engineering approval authority. Quarterly or semiannual audits are recommended upon initial delegation (i.e., in the first year of delegation).

A6.4.3.5. Provide technical support and direction whenever dispositions are outside the expertise of the disposition engineer or engineering approval authority.

A6.4.4. Disposition Engineer Responsibilities. Disposition engineers are typically delegated specific authorities from the LSE/CE. The disposition engineer's primary role is to develop the disposition instructions in Blocks 21 and 22 of the 202. The disposition engineer's signature means he/she is attesting that the recommended disposition is accurate and based on sound engineering; and that if the recommendation is approved and implemented as proposed there will be no detriment to the OSS&E or airworthiness characteristics of the system. This does not preclude someone other than the disposition engineer from developing/providing recommendations to the disposition engineer. Specific disposition engineer duties include:

A6.4.4.1. Ensure authorities are executed within the scope of the delegated engineering authority letter from the LSE/CE.

A6.4.4.2. Provide written disposition via the Form 202 or utilize an approved automated Form 202.

A6.4.4.3. Review 202 Part A, information/attachments and ensure they are complete, accurate, and include pertinent technical data references, pictures, etc. for incorporation into applicable Air Force data repository.

A6.4.4.4. When necessary, review the problem with maintenance personnel who originated the 202 request to clarify any issues or obtain needed information.

A6.4.4.5. Ensure all coordination required in **paragraph A6.4.4.11** below is received and annotated on the 202.

A6.4.4.6. Complete the 202, Part B, Block 17-26A IAW AFMCMAN 63-1202 as required to meet the 202 delegation authority granted by the program office LSE/CE.

A6.4.4.7. Submit the 202 to the appropriate engineering approval authority for Block 26E approval.

A6.4.4.8. Notify the applicable program office via applicable form (e.g., Air Force Technical Order (AFTO) Form 22, *Technical Manual Change Recommendation and Reply*) when there is a need to correct/update technical orders, drawings and/or the work specification (if applicable).

A6.4.4.9. Ensure all changes to technical data procedures, even one-time changes via a 202, are verified by performance or as otherwise specified by TO 00-5-3 or the LSE/CE in the delegation letter.

A6.4.4.10. Notify engineering approval authorities if they will be unavailable for extended periods.

A6.4.4.11. Special coordination requirements for disposition engineers. Certain categories of dispositions require program office subject matter expert (SME) coordination, and in general apply to disposition engineers regardless of organizational location. As specified below, the following disposition instructions are coordinated with the SMEs prior to submitting to the engineering approval authority:

A6.4.4.11.1. Repairs to or replacement of fatigue critical structure is coordinated with program office aircraft structural integrity program (ASIP) manager.

A6.4.4.11.2. New or prototyped Non-Destructive Inspection (NDI) procedures are coordinated with the AFLCMC program office ASIP manager and the AFSC weapon system NDI PM or qualified NAS 410 Level III support point.

A6.4.4.11.3. Work-arounds, complicated structural repairs, efforts to save structure, or repair/replacement that requires analysis to ensure the integrity of the disposition approach are coordinated with program office engineering. Any additional OEM support required for the 202 disposition is the responsibility of the program office engineering staff; therefore, the 202 should be returned to the program office for further disposition instructions.

A6.4.4.11.4. Any defects found during analytical condition inspections are coordinated with the Analytical Condition Inspection Manager in the program office.

A6.4.4.11.5. Any request to waive (or not work) technical requirements specified by work specification, technical order and/or drawings are worked through the program office LSE/CE. The 202 is not used to request a waiver for technical requirements.

A6.4.4.11.6. Deferred Repairs, Interim Repairs and Alternate Part Substitutions are coordinated with the program office to assess life cycle impacts.

A6.4.4.11.7. Follow any additional review and coordination as required by local OIs.

A6.4.5. Engineering Approval Authority Responsibilities. The Engineering Approval Authority works within an engineering organization. The responsibilities below are independent of whether the Engineering Approval Authority works directly for the LSE/CE or the maintenance organization. Specific duties for the Engineering Approval Authority include:

A6.4.5.1. Ensure that approvals are within the scope of the delegated authorities from the LSE/CE.

A6.4.5.2. Review 202s for completeness, accuracy, soundness of engineering practices/principles, technical resolution proposed, and for cost, schedule and weapon system life cycle considerations. If the 202 is incorrect, the 202 is demoted back to the responsible disposition engineer for revision.

A6.4.5.3. Ensure all coordination required in **paragraph A6.4.4.11** is received and annotated on the 202.

A6.4.5.4. Complete the 202, Part B, Block 26E IAW AFMCMAN 63-1202 as required to meet the 202 delegation authority from the program office LSE/CE.

A6.4.5.5. Ensure timely completion of open 202s.

A6.4.5.6. Ensure the completed 202, with signatures and all attachments, is retained in the authorized electronic system or repository.

A6.4.6. Air Logistics Complex (ALC) Technical Director Responsibilities. The ALC (or equivalent) Technical Director's responsibilities regarding delegated engineering authority include:

A6.4.6.1. Submit/recommend requests for delegated engineering authority for ALC-assigned disposition engineers and engineering approval authorities to the applicable weapon system LSE/CEs.

A6.4.6.2. Ensure each ALC-assigned disposition engineer and engineering approval authority is rated within an engineering chain that is outside of the group/directorate that is conducting the maintenance.

A6.4.6.3. Provide processes, training, tools and facilities to enable the engineering activity. This includes standardized processes supporting the LSE/CE's required audits.

A6.4.7. Maintenance Supervisors of Disposition Engineers and Engineering Approval Authorities. Supervisors of disposition engineers and engineering approval authorities will ensure the disposition engineers and engineering approval authorities have sufficient technical training to achieve and maintain proficiency in the technical areas that delegated engineering authority has been granted and as required by their applicable LSE/CE.

A6.4.8. Depot Maintenance Planner. While the detailed responsibilities of the depot maintenance planner are outside the scope of this instruction, they play a key role in the 202 disposition process. Disposition engineers should be aware of and leverage the planner's role in the 202 process. In many cases, the disposition engineer can help the planner with their part of the 202 process by verifying that there are no technical data (drawings, technical orders, etc.) or procedures that exist to address the deficiency, and by ensuring the deficiency description is clearly and accurately documented on the 202.

A6.5. *Rating Chain for Disposition Engineer and Engineering Approval Authority.*

A6.5.1. Each disposition engineer and Engineering Approval Authority is rated within an engineering chain that is outside of the Group/Directorate that is conducting the maintenance.

A6.5.2. Disposition engineers are rated within an engineering chain separate from the Maintenance Product Group/Directorate that is being supported by the delegated Engineering Authority.

A6.5.3. Engineering approval authority in the maintenance organization is assigned to a person within an engineering organization in the Air Logistics Complex (or equivalent), typically the ALC Technical Director; and the rater is a senior engineer on a Critical Engineering Position as defined by AFMCI 62-202, *Criteria for Critical Engineering Positions*. The program office LSE/CE should provide input to the supervisor/rater of the Engineering Approval Authority.

A6.6. Delegation Letters. Delegations are made via formal delegation letter from the LSE/CE. **Table A6.2** and **Table A6.3** in this attachment provide specific templates for delegation letters to disposition engineers and engineering approval authorities. These are recommended (not mandatory) templates, and they may be tailored for specific programs and organizations. However, regardless of tailoring, the following is required for delegation to disposition engineers and engineering approval authorities:

A6.6.1. Delegations are reviewed and updated IAW **Chapter 3** of this instruction.

A6.6.2. Delegation letters stipulate that no further delegation is authorized.

A6.7. *Business Case and Justification for Delegation of Engineering Authority.*

A6.7.1. It is the responsibility of the maintenance organization to initiate the business case for delegation, but it is developed in conjunction with the program office because several items will require input from the program office. The applicable weapon system PM is the final decision authority of the business case and the decision to delegate or not; however, since AF policy designates the LSE/CE as the program's final Engineering/Technical Authority, LSE/CE coordination is also required. The business case should be reviewed no less often than biennially to assess improvement opportunities and possible expansion/reduction in the scope of responsibilities. The business case should follow the outline below-- it can be tailored to program needs to include program-unique content and other factors.

A6.7.1.1. Proposed scope of delegation.

A6.7.1.2. Schedule benefit (or "none anticipated"): Programmed Depot Maintenance (PDM) flow reduction, 202 flow times, etc.

A6.7.1.3. Cost benefit (or "none anticipated"): labor cost, cost avoidance, implementation cost, etc.

A6.7.1.4. Risks: OSS&E and airworthiness related risks, cost/schedule risk, etc., including risk reduction and any proposed mitigations.

A6.7.1.5. Intangible benefits: better responses, reduce invalid 202s, other opportunities.

A6.7.1.6. Documentation: supporting documentation such as quantity of 202s processed, existing flow times, and qualification of engineers compared to desired qualifications.

A6.7.1.7. Comparative Analysis: overall comparison of existing process against the process being proposed. Comparison should also include any other applicable options and an implementation recommendation.

A6.8. Annual Reviews. The LSE/CE or his/her staff should meet annually with the delegated engineering authority engineers (disposition engineers and engineering approval authorities) to assess the delegated efforts, the 202 disposition response time and the rationale for resources (if any) that were required from the program office. Initially it is recommended that such reviews occur more frequently to ensure proper implementation of delegated engineering authority efforts.

A6.9. Non-Concurrence. The LSE/CE or his/her staff should periodically review completed 202s to ensure they are of adequate quality and that dispositions did not have unintended OSS&E or airworthiness consequences. The LSE/CE retains the right to non-concur and readdress any previously completed 202 disposition.

A6.10. Memorandum of Agreement (MOA). Depending on the needs of the program office and the maintenance organization, it may be necessary to document organizational level agreements to facilitate delegated engineering authority. A tailorable MOA template is provided in **Table A6.4** The examples included in the recommended MOA template are just examples of decisions that should be considered and are not intended to recommend a decision. The need for a formal MOA should consider the following:

A6.10.1. Is there a benefit to rotating engineers between the program office and the maintenance organization?

A6.10.2. Is there a benefit to participating in various cross-organizational meetings (e.g., production meetings)?

A6.10.3. Are there specific training requirements?

A6.10.4. Are there detailed agreements that apply to multiple delegated engineering authorities that are better captured in an MOA?

A6.11. *Depot Maintenance Delegated Engineering Authority - Recommended Qualifications for Disposition Engineers and Engineering Approval Authorities.*

A6.11.1. To aid in the consistent interpretation of what constitutes an engineer with sufficient competency to have delegated engineering authority, PMs and LSE/CEs should consider the qualification guidelines in **Table A6.1** The delegated Engineering Authority engineers should meet the knowledge/skills/abilities as defined in the standard core documents for a given series/grade. In addition, the LSE/CE and/or PM may require delegated engineering authorities to have additional qualifications prior to delegation, such as specific weapon system familiarization courses. In all cases regardless of organizational location, engineering approval authorities should be journeymen level (at a minimum) in their field of engineering.

A6.11.2. Note: A December 2012 memo from SAF/AQR (*Selecting Professional S&E* (Scientist and Engineer) *Employees (Science, Technology and Engineering)*) states that "all professional engineering Standard Core Personnel Documents (SCPDs) will contain the following statement: 'A professional engineering degree at the bachelor's level from an Accreditation Board for Engineering and Technology (ABET) accredited institution in [specific discipline of position] or a closely related engineering discipline is highly desired."

A6.11.3. There may be occasions where the maintenance engineer being considered as a disposition engineer or engineering approval authority holds an engineering degree outside of their assigned job series. In these cases, the engineer can take qualifying engineering courses more appropriate to the assigned series. Examples of qualifying aerospace engineering courses include: aerodynamics, fracture mechanics, finite element analysis, propulsion systems, dynamic systems and controls, control systems, dynamics of atmospheric flight, elements of space flight, and airframe structures. Examples of qualifying mechanical engineering courses include: fluid mechanics, mechanics of solids, materials science, strength of materials, and heat/mass transfer.

Table A6.1. Recommended Qualification Guidelines for Disposition Engineer and Engineering Approval Authority Engineers.

	Disposition Engineer (Block 26A)		Engineering Approval Authority (Block 26E)
Minimum Requirements	Entry Level	Journeyman	Journeyman
Education:			
Undergraduate Engineering Degree	Bachelor of Science Engineering degree (e.g., Mech., Elect., Aero.) AND four (4) qualifying engineering courses if the degree is outside the assigned series (see paragraph A6.11)		
Job-Specific Coursework	As identified by LSE/CE		
Advanced Technical Degree	Not Required		Desired, Not Required
Experience:			
Weapon System or Product	None Required	Three (3) years of demonstrated tech. experience in a weapon system or commodity, in either a development or sustainment role	Five (5) years of experience applying engineering principles to solve weapon system problems
Systems Engineering Knowledge:			
OSS&E	One (1) year of weapon system experience	Three (3) years of weapon system experience	Three (3) years of weapon system experience
Airworthiness	AF Institute of Technology (AFIT) SYS 116, *Introduction to AF Airworthiness Certification*, or equivalent	AFIT SYS 116 or equivalent; and AFIT SYS 316, *Advanced Airworthiness Certification* or equivalent	AFIT SYS 116 or equivalent; and AFIT SYS 316 or equivalent

A6.12. Options in Lieu of Delegated Engineering Authority to a Maintenance Engineer. This attachment's recommended processes to enable engineering delegation to a maintenance organization's engineer do not prohibit the implementation of other alternatives to provide engineering support to production organizations. The maintenance organization and the program office may consider other options, such as reassigning a member of their staff to reside in the maintenance organization. This person would still be a direct report to the LSE/CE but might take day-to-day direction from maintenance supervision. Another option may include delegating engineering authority to qualified and competent contractors.

Table A6.2. Recommended Template for 202 Disposition Engineer Approval Delegation.

MEMORANDUM FOR: Requester (Typically ALC Tech. Director; Cc's to recipients) FROM: (Office symbol of program LSE/CE) SUBJECT: AFMC Form 202, Disposition Engineer Approval Delegation Reference: (Applicable AFIs, Operating Instructions and/or other applicable agreements) 1. The following individual(s) are hereby delegated first signature authority to sign AFMC Form 202, Block 26A. In addition, the area(s) of responsibility (AOR) have been designated for each individual (whereby individual may sign AFMC Form 202, Block 26A and develop disposition instructions except as noted in paragraph 3 below). This delegation letter is limited to technical matters on the ABC weapon system for which (the program LSE/CE) has engineering authority. 2. Identify reasons for revocation. This authority is granted on an individual engineer basis and is subject to review and termination if warranted. Termination of this delegation letter can result from (a) not adhering to AFMCMAN 63-1202; (b) not adhering to the requirements, limitations, or processes in (list applicable reference documents or OIs); and/or (c) developing incorrect or unsound dispositions. Multiple names may be listed if delegation boundaries are the same. Engineer 1 (office symbol), AOR: Mechanical Systems Engineer 2 (office symbol), AOR: Avionics/Electrical 3. Identify the scope of the authority delegated to the list of engineers above. Include any specific limitations that require a 202 to be rerouted to the program office. 4. Identify any specific 202s that require additional coordination, and program office points of contact. Items might include (a) impacts to technical orders that need coordination from technical content manager; (b) NDI results or structural repairs that need coordination with the Aircraft Structural Integrity Program lead and appropriate AFSC NDI PM or NAS 410 Level III support point; (c) impact to PDM work specifications; (d) Foreign Military Sales aircraft that require specific coordination; or (e) any other condition requiring coordination with a specific person. 5. Identify the automated system that will be used, specific workflow, org. boxes. 6. Identify duration of the delegation. Note that this authority cannot be further delegated.

7. POC for this subject is (name of program office POC), phone number, e-mail. Program Office LSE/CE Signature Block CC: List all disposition engineer recipients List all engineering approval authorities in the routing of the listed disposition engineer

Table A6.3. Recommended Template for 202 Engineering Approval Authority Delegation.

MEMORANDUM FOR: Individual(s) receiving Eng. Approval Authority delegation

FROM: (Office symbol of program LSE/CE)

SUBJECT: AFMC Form 202, Engineering Approval Authority Delegation

1. The following individual(s) are hereby delegated as engineering approval authorities to sign AFMC Form 202, Block 26E. Summarize the delegation, to include a description and the boundary of authority. Identify the applicable system, subsystem, or functional area of responsibility for which the authority is applicable.

2. If the delegation includes items included in the recommended non-delegable areas, include justification unless documented elsewhere.

3. Identify reasons for revocation. This authority is granted on an individual engineer basis and is subject to review and termination if warranted. Termination of this delegation letter can result from (a) not adhering to AFMCMAN 63-1202; (b) not adhering to the requirements, limitations or processes in (list applicable documents or OIs); and/or (c) developing incorrect or unsound dispositions. Multiple names may be listed if delegation boundaries are the same.

Engineer 1 (office symbol), AOR: Mechanical Systems

Engineer 2 (office symbol), AOR: Avionics/Electrical

4. Identify the scope of the authority delegated to the engineer(s) above. Include any specific limitations that require a 202 to be rerouted to the program office.

5. Identify any specific 202s that require additional coordination, and program office points of contact. Items might include (a) impacts to technical orders that need coordination from technical content manager; (b) NDI results or structural repairs that need coordination with the Aircraft Structural Integrity Program lead and appropriate AFSC NDI PM or NAS 410 Level III support point; (c) impact to PDM work specifications; (d) Foreign Military Sales aircraft that require specific coordination; or (e) any other condition requiring coordination with a specific person (e.g., Safety, Bio, Nuclear Cert).

6. Identify meetings, audits or other periodic reviews required by the program office.

7. Identify the automated system that will be used, specific workflow, org. boxes.

8. This delegation letter will be renewed on an annual/biennial basis. Note that this authority cannot be further delegated.

9. POC for this subject is (name of program office POC), phone number, e-mail. Program Office LSE/CE Signature Block CC: ALC (or equivalent) Technical Director

Table A6.4. Recommended Delegated Engineering Authority Organizational MOA Template.

1.0. PURPOSE. This agreement outlines organizational responsibilities and agreements necessary to execute delegated engineering authority for disposition and approval of the AFMC Form 202, *Engineer Technical Assistance Request*. The MOA is based on and supplements AFMCI 63-1201 and AFMCMAN 63-1202. All statements and agreements in this MOA are intended to ensure continued assurance of operational safety, suitability and effectiveness (OSS&E) and airworthiness throughout the life cycle of the weapon system.

2.0. AUTHORITY. DoDI 4000.19, *Support Agreements*; and AFI 25-201, *Intra-Service, Intra-Agency, and Inter-Agency Support Agreements Procedures*.

3.0. SCOPE. The scope of this MOA is limited to the engineers with delegated engineering authority, the maintenance organization they directly report to, and the ABC Program Management Office (PMO).

4.0. ASSUMPTIONS.

4.1. PMO engineering staff and logistics complex (or the applicable Maintenance Unit) engineers will collaborate to meet the needs of the weapon system being supported. Collaboration will also be necessary to foster the growth of the local engineering talent to the benefit of the weapon systems and the individuals involved.

4.2. The logistics complex will prioritize the workload of the engineers with delegated engineering authority; however, collaboration with the program office will be necessary to manage resources and weapon system needs.

4.3. Ultimately, the PMO is responsible to provide engineering support to the logistics complex when necessary, even when some delegated engineering authority has been granted. As such, it is in the best interest of all to ensure that the PMO is aware of pending absences if the program office will be needed to fill the gap.

5.0. AGREEMENTS. Some tailorable examples are provided below.

5.1. PMO Responsibilities:

5.1.1 Execute LSE/CE responsibilities IAW AFMCMAN 63-1202, AFMCI 63-1201.

5.1.1.1. The LSE/CE will ensure the individual(s) with delegated engineering authority meet(s) the recommended criteria within AFMCI 63-1201, and any system-specific criteria.

5.1.1.2. Monitor 202 performance and the common metrics. Performance metrics will be shared and discussed with the ALC Technical Director on a quarterly basis.

5.1.2. Rotate (exchange) engineers between logistics complex billets and program office billets. The production floor is a prime training ground for all engineers; but to become a well-rounded engineer time in a program office is also critical. It is in the best interest of both organizations to leverage rotation opportunities to facilitate the development of engineers.

5.1.3. Even when delegated engineering authority has been granted, the program office will still consider if and when program "owned" co-located engineers are required for support to the maintenance organization.

5.1.4. Oversee the 202 automated information system (AIS) and grant access to ALC engineers who have a delegated engineering authority. The 202 POC, who will sit in the program office, will be responsible for insuring that 202s are assigned within __ hours and are assigned to engineers who have the authority to work the 202's specific deficiencies. Site administrators should be made aware of long term absences. The program office and logistics complex can agree to allow ALC engineers to select 202s within their delegated engineering authority scope if the AIS is set up in a way to perform that function. (Note: if the program office is not the main 202 POC or site administrator, then add the POC/administrator organization to the MOA).

5.1.5. Ensure ALC engineering supervisors/engineers have schedules of meetings that they are required to participate in, program office engineering technical meetings, and other meetings required to ensure continued integration of the engineering providing OSS&E for the life cycle of the aircraft. These meetings will permit sharing of information regarding ongoing issues in the field and the depot, as well as planned/proposed modifications and other actions.

6.0. The logistics complex agrees to: (Some tailorable examples are provided below.)

6.1. Ensure engineers with delegated engineering authority are executing their responsibilities according to AFMCI 63-1201, and the following:

6.1.1. Disposition 202s to resolve discrepancies between the actual condition of the aircraft and the engineering standard, within the limitations of the delegated authority. The 202 dispositions will be focused on the entire life cycle of the aircraft, not just the current production cycle.

6.1.2. Ensure complete and accurate capture of deficiencies and corrective actions for future analysis by program office team. This will permit higher fidelity predictions of the state of the aircraft when it is inducted for its next maintenance.

6.1.3. Coordinate with program office engineers and the LSE/CE prior to disposition of certain categories of deficiencies to determine which group will provide the disposition. Those categories are fatigue critical areas (typically discovered during inspections driven by the Aircraft Structural Integrity Program); critical safety items; first time occurrences, large cracks, etc.

6.1.4. Work with the program office to rotate engineers between organizations as noted in para 5.1.2.

6.1.5. If program office support is required on the shop floor, the logistics complex will provide office space.

6.1.6. Ensure logistics center applicable delegated engineering authorities participate in the following regularly scheduled technical meetings and any critical ad hoc meetings: (list here).

6.1.7. Logistics complex engineers with delegated engineering authority will abide by the policies of the 202 automated information system (AIS), and work in conjunction with the PMO's 202 POC to make sure that 202s are assigned in a timely manner and records are loaded properly to the 202 AIS. The PMO 202 POC will be alerted to any delegated Engineering Authority who is or will be on extended leave, temporary duty (TDY), or otherwise cannot process a 202.

7.0. FINANCIAL MANAGEMENT. (Consider training courses, TDY, etc.)

7.1. The PMO will: (Address which org. pays for training, TDY and other expenses; coordinate with appropriate financial manager(s)). This is not recommending that the program pay for training; rather it is something that should be considered.

7.2. The logistics complex organization will: (program office and maintenance organization determine who will pay for TDY and other training).

8.0. COMPETENCY DEVELOPMENT AND MANAGEMENT. Some tailorable examples are:

8.1. The LSE/CE and ALC Tech. Director agree to the following rotational periods:

8.2. The ALC engineer is rotated back to the program office between __ and __ months for training, of a duration between __ and __ months.

8.3. It is the role of the supervisor to provide all necessary technical training as well as on-the-job training; but the logistics complex should coordinate with the program office. Both organizations should work together to find opportunities to provide on-the-job training to facilitate competency development of new delegated engineering authorities.

9.0. AUDITS AND INSPECTIONS. List any specific records or analysis that will be maintained and their location. Identify how the program will get access to 202s for periodic audit/inspection. Identify frequency of planned audits and if they will be scheduled or random.

10.0. MANPOWER. Some tailorable examples are provided below.

10.1. The program office LSE/CE should be consulted when hiring an engineer intended to fulfill the role of a delegated Engineering Authority to foster the nature of the delegated engineering authority relationships between organizations.

10.2. Because the decision to delegate engineering authority resides with the program office, the quantity of engineering hires should also be coordinated with the program office. While the logistics center can hire who they desire and as many as they see fit, it may be counterproductive if the program office does not intend to delegate.

11.0. AGREEMENT AND ADMINISTRATION. (Consider who will provide facilities, equipment, software, etc.)