SYSTEMS ENGINEERING PLAN (SEP) OUTLINE

June 2, 2015

Version 2.0

OPR: DASD (Systems Engineering) osd.sep@mail.mil

MANDATED FORMAT FOR ALL SYSTEMS ENGINEERING PLANS

PROGRAM NAME – ACAT LEVEL

SYSTEMS ENGINEERING PLAN
VERSION ___

SUPPORTING MILESTONE _
AND
[APPROPRIATE PHASE NAME]

[DATE]

****

OFFICE OF THE SECRETARY OF DEFENSE (OSD) APPROVAL

_____ _____
Date

Deputy Assistant Secretary of Defense
Systems Engineering
(for MDAPs and MAIS Programs)

[or designated SEP approval authority]

OPR: DASD (Systems Engineering) osd.sep@mail.mil

SUBMITTED BY

Name Program Lead Systems Engineer	Date	Name Program Manager	Date

CONCURRENCE

Name Lead/Chief Systems Engineer (Program Executive Office, System Center or Command)	Date	Name Program Executive Officer or Equivalent	Date

COMPONENT APPROVAL

Name Title, Office Component SEP Approval Authority	Date

Table of Contents

1. Introduction – Purpose and Update Plan
2. Program Technical Requirements
   2.1. Architectures and Interface Control
   2.2. Technical Certifications
3. Engineering Resources and Management
   3.1. Technical Schedule and Schedule Risk Assessment
   3.2. Engineering Resources and Cost/Schedule Reporting
   3.3. Technical Risk and Opportunity Management
   3.4. Technical Organization
   3.5. Relationships with External Technical Organizations
   3.6. Technical Performance Measures and Metrics
4. Technical Activities and Products
   4.1. Results of Previous Phase SE Activities
   4.2. Planned SE Activities for the Next Phase
   4.3. Requirements Development and Change Process
   4.4. Technical Reviews
   4.5. Configuration and Change Management
   4.6. Design Considerations
   4.7. Engineering Tools

Annex A – Acronyms

NOTE: All sections above are driven by Section 139b of title 10 United States Code and DoDI 5000.02 policy; additional content is optional at the discretion of the Component.

Tables and Figures

(Mandated are listed below)

Tables

Table 1.1-1	SEP Update Record
Table 2.2-1	Certification Requirements
Table 3.4.4-2	IPT Team Details
Table 3.5-1	Required Memoranda of Agreement
Table 3.6-1	Technical Performance Measures and Metrics
Table 4.4-1-n	Technical Review Details
Table 4.6-1	Design Considerations
Table 4.6-2	R&M Activity Planning and Timing
Table 4.7-1	Engineering Tools

Figures

Figure 3.1-1	System Technical Schedule
Figure 3.3-1	Risks Reporting Matrix
Figure 3.3-2	Risk Burn-Down Plan
Figure 3.3-3	Opportunity Tracking Matrix
Figure 3.4.1-1	Program Office Organization
Figure 3.4.2-1	Program Technical Staffing
Figure 3.4.3-1	Contractor Program Office Organization
Figure 3.4.3-2	Contractor Technical Staffing
Figure 3.4.4-1	IPT/WG Team Hierarchy
Figure 3.5-1	System-of-Systems Schedule
Figure 3.6-1	Reliability Growth Curve
Figure 4.3.1-1	Requirements Decomposition/Specification Tree/Baselines
Figure 4.5-1	Configuration Management Process

(Additional, non-mandatory tables and figures may be included at the Component's direction or the Program Manager's discretion.)

1. Introduction – Purpose and Update Plan

- Who uses the Systems Engineering Plan (SEP)?
- What is the plan to align Prime Contractor's Systems Engineering Management Plan (SEMP) with the Program Management Office (PMO) SEP?
- Describe and provide reasoning for any tailoring of the SEP Outline.
- Summarize how the SEP is updated and the criteria for doing so to include:
  - Timing of SEP updates such as following a conducted technical review, prior to milestones, or Development Request for Proposal (RFP) Release Decision Point, or as a result of systems engineering (SE) planning changes;
  - The SEP should be updated after contract award to reflect 1) the winning contractor(s)' technical approach reflected in the SEMP and 2) details not available prior to contract award;
  - Updating authority; and
  - Approval authorities for different types of updates.

Expectations:

Program Managers will prepare a SEP to manage the systems engineering activities starting at Milestone A (DoDI 5000.02, Enclosure 3, Para. 2.a., Page 81). The SEP should be a "living" "go to" technical planning document and the blueprint for the conduct, management, and control of the technical aspects of the government's program from concept to disposal. SE planning should be kept current throughout the acquisition lifecycle.

- ***The SEP will support the Acquisition Strategy and be consistent with other program documentation (DoDI 5000.02, Enclosure 3, Para. 2.a., Page 81).***
- ***The SEP is not prepared solely for staff review and approval, but is primarily for use within the program as a planning and management tool, highly specific to the program and tailored to meet program needs.***
- ***SEP defines the methods for implementing all system requirements having technical content, technical staffing, and technical management.***
- ***Milestone Decision Authority (MDA)-approved SEP provides authority and empowers the Lead Systems Engineer (LSE)/Chief Engineer to execute the program's technical planning.***
- ***For all Major Defense Acquisition Program (MDAP) and Major Automated Information Systems (MAIS) programs, the Deputy Assistant Secretary of Defense, for Systems Engineering (DASD(SE)) will review and approve SEP updates for each milestone (MS) A, B and C review.***
  - ***DoD Components will provide a Component approved draft SEP 45 calendar days prior to the Development RFP Release Decision Point to DASD(SE).***
  - ***DoD Components can approve SEP updates to support SE technical reviews and program changes that impact the technical approach (DoDI 5000.02, Enclosure 3, Para. 2.b., Page 81).***
- ***The SEP (either an approved Plan or a draft Plan) should be included in the RFP as either guidance or a compliance document depending on the maturity of the plan and the acquisition strategy. This allows offerors to develop a draft SEMP that aligns with the SEP.***

Tailoring for Technology Maturation and Risk Reduction (TMRR) and Engineering and Manufacturing Development (EMD) phases: SEP will be updated after contractor award to reflect the winning contractor(s)' technical strategy reflected in SEMP (DoDI 5000.02, Enclosure 3, Para. 2.b.(2), Page 82).

Revision Number	Date	Log of Changes Made and Description of Reason Changes	Approved By
0.7	April 2012	Addressed Lead Systems Engineer's (LSE's) concerns – see comments in separate file	LSE
0.8	June 2013	Updated Section 1 with draft requirements Added technical review to Section 4.4, Technical Reviews section	LSE
0.9	October 2013	Addressed SE WIPT (to include Service and OSD) comments – many changes – see Comment Resolution Matrix (CRM)	LSE
1.0	November 2013	Milestone A SEP (Updated to support TMRR phase systems engineering activities)	DASD(SE)
Etc.			

Table 1.1-1 SEP Update Record (mandated) (sample)

Expectation: SEP includes a change log which describes the changes made for each SEP update.

2. Program Technical Requirements

2.1. Architectures and Interface Control – Describe the process for creating the architecture products the program will develop, including the planned DODAF architecture products and the system level physical, functional and software architectures. Explain how architecture products are related to requirements definition. Describe how engineering and architecture activities are linked. (See Defense Acquisition Guidebook (DAG) section 4.3.12. Architecture Design Process for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638341). Include the following:

- List of the program's planned suite of DoDAF or equivalent architecture products with status of each, if created.
- A current system physical architecture diagram (delineating physical interfaces), if created.
- A current system functional architecture diagram (delineating functional interfaces), if created.
- A current system software architecture diagram (delineating allocated software functions). If no software architecture diagram was created, describe how software architecture priorities are developed and documented.
- Document interface requirements and interface products to track interdependent program touch points. (Note: Section 3.5 describes interface management activities).
- List of the system's mission-critical interoperabilities. If the corresponding interface requirements have been validated through kill-chain analysis or Joint Mission Thread development, provide the detail information.

Expectations: Architectures are generated to better describe and understand the system and how the subsystems join together, to include internal and external

interfaces, to form the system. Plans to develop architecture products to support requirements and specification development are understood.

2.2. Technical Certifications - Summarize in the following table format the system-level technical certifications which are obtained during program's life-cycle (see example in Table 2.2-1 and DAG section 4.1.5. Certifications for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638303&lang=en-US).

Certification	PMO Team/PoC	Activities to Obtain Certification[1]	Certification Authority	Expected Certification Date
Airworthiness	Airframe IPT			?Q FY?
Joint Interoperability Test Command (JITC)	Systems Engineering Integration and Test (SEIT)	Operational test demonstrates system: Is able to support military operations; Is able to be entered and managed on the network; Effectively exchanges information.	JITC system interoperability test certification memorandum	?Q FY?
Weapon System Explosives Safety Review Board (WSESRB)	SEIT	Complete action items. Submit WSESRB package to board.		
Transportability				?Q FY?
Insensitive Munitions (IM)	Manufacturing Working Group	Reference Document: *PEO IM Strategic Plan*		?Q FY?
Etc.				?Q FY?

Table 2.2-1 Certification Requirements (mandated) (sample)

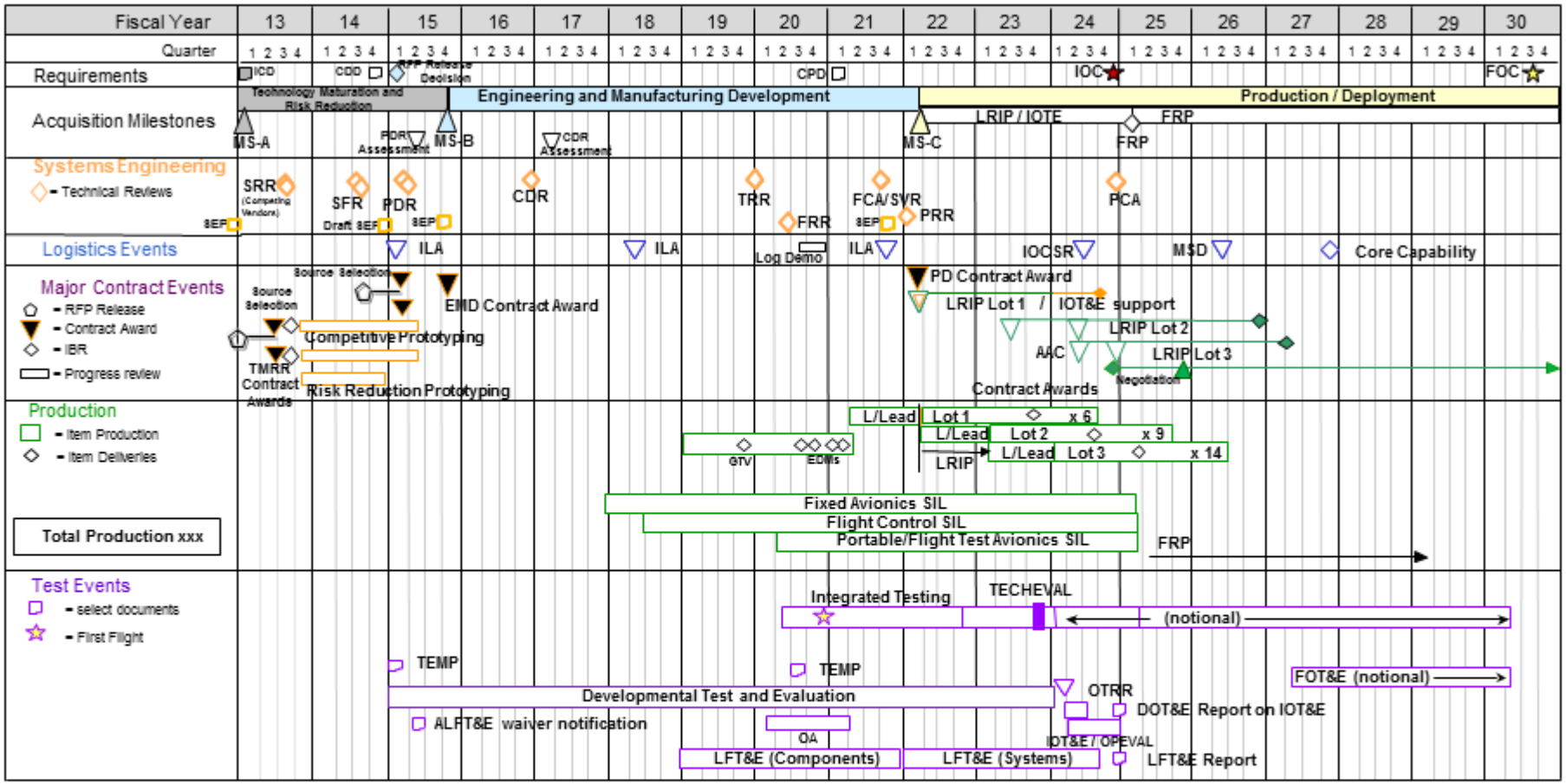
[1] This entry should be specific such as a specification compliance matrix; test, inspection, or analysis, or a combination. It can also reference a document for more information such as the Test and Evaluation Master Plan (TEMP).

Expectations: Programs plan required technical certification activities and timing into the program Integrated Master Plan (IMP) and Integrated Master Schedule (IMS).

3. Engineering Resources and Management

3.1. Technical Schedule and Schedule Risk Assessment

- Identify who is responsible for technical schedule planning and execution.
- Describe how are program tasks identified and managed.
- List scheduling/planning assumptions.
- Identify which program office position/team is responsible for keeping the schedule up-to-date.



ALFT&E: Alternative Life Fire Test & Evaluation
CDR: Critical Design Review
EDM: Engineering Development Model
EMD: Engineering & Manufacturing Development
FCA: Functional Configuration Audit
FOT&E: Follow-On Operational Test & Evaluation
FRP: Full Rate Production
FRR: Flight Readiness Review
GTV: Ground Test Vehicle
ILA: Independent Logistics Assessment
IOT&E: Initial Operation Test & Evaluation
LFT&E: Live Fire Test & Evaluation
LRIP: Low-Rate Initial Production
MSD: Material Support Data
OA: Operational Assessment
OPEVAL: Operational Evaluation
OTRR: Operational Test Readiness Review
PCA: Physical Configuration Audit
PDR: Preliminary Design Review
PRR: Production Readiness Review
SFR: System Functional Review
SIL: Systems Integration Lab
SRR: System Requirements Review
SVR: System Verification Review
TMRR: Technology Maturation and Risk Reduction
TECHEVAL: Technical Evaluation
TRR: Test Readiness Review

Figure 3.1-1 System Technical Schedule (mandated) (notional sample) *Note: Include an "as-of" date – time sensitive figure.*

- **Technical Schedule** - Provide a current (Note: current is defined as less than 3 months in age as of date submitted to Component SEP approval authority) detailed, integrated, life-cycle system schedule (see Figure 3.1-1) (with particular emphasis on the next acquisition phase) to include:
- **Planned activities**
  - Planned significant activities (activities which are performed in order to produce the system):
    - SE technical reviews and audits
    - Technology on/off – ramps
    - RFP release dates
    - Software releases
    - Hardware (HW)/Software (SW) Integration phases
    - Contract award (including bridge contracts)
    - Testing events/phases
    - System-level certifications
    - Key developmental, operational, integrated testing
    - Technology Readiness Assessments (TRAs)
    - Manufacturing assessments
    - Logistics/sustainment events
    - Long-lead or advanced procurements
    - Technology development efforts to include prototyping
    - Production lot/phases
    - Need dates for Government Furnished Equipment (GFE) deliveries

Expectations: Programs should properly phase activities and key events (e.g., competitive and risk reduction prototyping, TRA, Preliminary Design Review (PDR), Critical Design Review (CDR), etc.) to ensure a strong basis for making financial commitments. Program schedules are event driven and reflect adequate time for SE, integration, test, corrective actions and contingencies. SEPs for approval should include a current schedule.

- **Schedule Risk Assessment** - Summarize the program's schedule risk assessment (SRA) process which help determine the level of risk associated with various tasks and their effect on overall program schedule objectives, and its results to include:
  - How often schedule health checks are conducted on the IMS and how results are used to improve the IMS structure.
  - Discuss what SRA techniques are used to determine program schedule risk (e.g., critical path analysis, Monte Carlo simulations, etc.).
  - Describe the inherent impact of schedule constraints and dependencies and actions taken or planned to mitigate schedule drivers.
  - Identify the timeline to complete periodic SRAs and results of any SRAs accomplished.
  - Describe the process and periodicity for identifying items on the critical path and identify risk mitigation activities to meet schedule objectives.

Expectation: Programs should use SRAs to inform source selection as well as readiness for technical reviews and acquisition decision points.

3.2. Engineering Resources and Cost/Schedule Reporting – List and summarize the program oversight and management systems that integrate cost, schedule, and technical performance goals, metrics, and resources. (See DAG section 4.3.2. Technical Planning for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638326&lang=en-US.)

- Work Breakdown Structure (WBS)
  - Summarize the relationship among the WBS, product structure, and schedule.
  - Identify the stakeholders who develop the WBS and contractor's WBS (CWBS).
  - Explain the traceability between the system's technical requirements and WBS.
- Integrated Master Plan (IMP) / Integrated Master Schedule (IMS)
  - Discuss the relationship of the program's IMP to the contractor(s) IMS; how are they linked/interfaced; and what are their primary data elements?
  - Identify who or what team (e.g., Integrated Product Team / Working Group (IPT/WG)) is responsible for developing the IMP; when is it required; and whether it is a part of the RFP
  - Describe how identified technical risks are incorporated into the program's IMP and IMS.
  - If used, discuss how the program uses Earned Value Management (EVM) cost reporting to track/monitor the status of IMS execution and performance to plan.

Expectations: Summarize how the program integrates WBS, IMP/IMS, and EVM program management tools in order to gain insight into balancing program requirements and constraints against cost, schedule, or technical risk.

- ***Programs have an adequate IMP and IMS. They should require an IMS from its contractor(s). The IMP and IMS clearly communicate the expectations of the program team, and provide traceability to the management and execution of the program by IPTs. They also provide traceability to the WBS, the CWBS, the Statement of Work (SOW), systems engineering, and risk management, which together define the products and key processes associated with program success.***
- ***Program events, accomplishments, and criteria defined in the government's IMP/program schedule, when combined with offeror-proposed events, should define top-level structure of IMS for execution.***
- ***Programs require offerors to provide a tight linkage across IMP, IMS, risk mitigation, WBS, and cost in their proposals and with EVMS when implemented.***
- ***In the RFP, offerors are directed to:***
  - ***Add key tasks only to the level necessary to define and sequence work, identify dependencies, document risk mitigations and deliverables, and support cost estimation and basis of estimate (BOE) preparation.***
  - ***Include cross linkage to the IMP in the offeror's IMS, WBS, BOE, and risk mitigation steps.***
  - ***Incorporate additional detailed planning as part of the program kickoff and Integrated Baseline Review (IBR) process.***

3.3. Technical Risk and Opportunity Management

- **Risk and Opportunity Management Process Diagrams** – Diagram the processes for how the program plans to manage engineering and integration (internal and external) risks and opportunities for technology development outcomes that could have a positive impact on meeting performance objectives as well as thresholds. Also outline how these processes are integrated with the contractor(s) processes. This should include how the program identifies, quantifies, and analyzes risks; and plans for, implements (including funding), and tracks risk mitigation. (See DAG section 4.3.6. Risk Management Process for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638335&lang=en-US.)
- **Roles, Responsibilities, and Authorities**
  - Indicate roles, responsibilities, and authorities within the risk management process for:
    - Reporting/identifying risks
    - Criteria used to determine if a "risk" submitted for consideration becomes a risk or not (typically, criteria for likelihood and consequence.
    - Adding/modifying risks
    - Changing likelihood and consequence of a risk
    - Closing/retiring a risk
  - If Risk Review Boards or Risk Management Boards are part of the process, indicate who are the chair and participants and how often they meet.
- **Risk Management**
  - List the risk tool(s) the program (program office and contractor(s)) uses to perform risk management in Table 4.7-1.
  - If program office and contractor(s) use different risk tools, how is the information transferred across them? NOTE: In general, the same tool should be used. If the contractor's tool is acceptable, then this merely requires Government direct, networked access to that tool.
  - Technical Risks and Mitigation Planning – Summarize the key engineering, integration, reliability, manufacturing, technology and unique software risks and planned mitigation measures for each risk.
  - Risk Reporting - Provide a risks reporting matrix (see Figure 3.3-1) or a listing of the <u>current</u> system-level <u>technical</u> risks with
    - As-of date
    - Risk rating
    - Risk Description and driver
    - Mitigation activities, and expected closure date

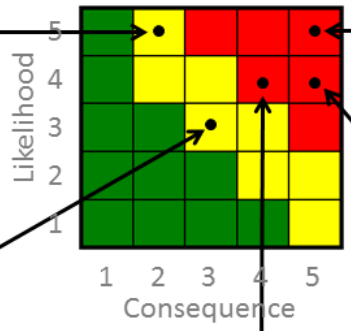
- **Risk Burn-Down -** Describe the program's use of risk burn-down curves to show how mitigation activities are implemented to control and retire risks. Also discuss how activities are linked to Technical Performance Measures and to the project schedule for critical tasks. For each high technical risk, provide the risk burn-down curve. (See figure 3.3-2 for a sample risk burn-down plan.)

Expectations: Programs use hierarchal boards to address risks and have integrated risk systems with their contractors, and their approach to identify risks is both top-down and bottoms-up. Risks related to technology maturation, internal and external integration, and each design consideration indicated in Table 4.6-1 should be considered in risk identification. SEPs submitted for approval contain a current, updated Risk Reporting Matrix and associated Risk Burn-Down curves for high technical risks.

Level	Likelihood	Probability of Occurrence
1	Not Likely	~10%
2	Low Likelihood	~ 30%
3	Likely	~ 50%
4	Highly Likely	~ 70%
5	Near Certainty	~ 90%

- Risk ID Number: 31
- Risk Driver:
- Risk Mitigation Action:
  - Cost: $
- Closure Date:
- Cost Impacts:
  - RDT&E: $ or %
  - Production: $ or %
- Schedule Impacts:
  - Months:
- Performance Impacts:
  - Only achieves XX% of aaa KPP performance

- Risk ID Number: 99
- Risk Driver:
- Risk Mitigation Action:
  - Cost: $
- Closure Date:
- Cost Impacts:
  - RDT&E: $ or %
  - Production: $ or %
  - O&M: $ or %
- Schedule Impacts:
  - Months:
- Performance Impacts:
  - Only YY% of abc KSA performance



- Risk ID Number: 22
- Risk Driver:
- Risk Mitigation Action:
  - Cost: $
- Closure Date:
- Cost Impacts:
  - Production: $ or %
  - O&M: $ or %
- Schedule Impacts:
  - Months:

- Risk ID Number: 4
- Risk Driver:
- Risk Mitigation Action:
  - Cost: $
- Closure Date:
- Cost Impacts:
  - Production: $ or %
- Schedule Impacts:
  - Months:
- Performance Impacts:
  - May trade xyz performance

- Risk ID Number: 18
- Risk Driver:
- Risk Mitigation Action:
  - Cost: $
- Closure Date:
- Cost Impacts:
  - RDT&E: $ or %
  - Production: $ or %
- Schedule Impacts:
  - Months:

Level	Technical Performance	Schedule	Cost		
			RDT&E	Procurement	Operations & Maintenance
1	Minimal or no consequence to technical performance	Minimal or no impact	Minimal or no impact **< $A or _% of budget**	Minimal or no impact **< $A or _% of budget**	Minimal or no impact **< $A or _% of budget**
2	Minor reduction in technical performance or supportability; can be tolerated with little or no impact on program	Able to meet key dates **Slip ≤ months**	Budget increase or unit production cost increase **$A ≤ $B or _% of budget**	Budget increase or unit production cost increase **$A ≤ $B or _% of budget**	Budget increase or unit production cost increase **$A ≤ $B or _% of budget**
3	Moderate reduction in technical performance or supportability with limited impact on program objectives	Minor schedule slip. Able to meet key milestones with no schedule float **Slip ≤ months**	Budget increase or unit production cost increase **$B ≤ $C or _% of budget**	Budget increase or unit production cost increase **$B ≤ $C or _% of budget**	Budget increase or unit production cost increase **$B ≤ $C or _% of budget**
4	Significant degradation in technical performance or major shortfall in supportability; may jeopardize program success	Program critical path affected **Slip ≤ months**	Budget increase or unit production cost increase **$C ≤ $D or _% of budget**	Budget increase or unit production cost increase **$C ≤ $D or _% of budget**	Budget increase or unit production cost increase **$C ≤ $D or _% of budget**
5	Severe degradation in technical performance; cannot meet KPP or key technical/supportability threshold; will jeopardize program success	Cannot meet key program milestones **Slip ≤ months**	Exceeds APB threshold **>$D or _% of budget**	Exceeds APB threshold **>$D or _% of budget**	Exceeds APB threshold **>$D or _% of budget**

Figure 3.3-1 Risks Reporting Matrix (mandated) (sample)
Note: Include an as-of date – time sensitive figure

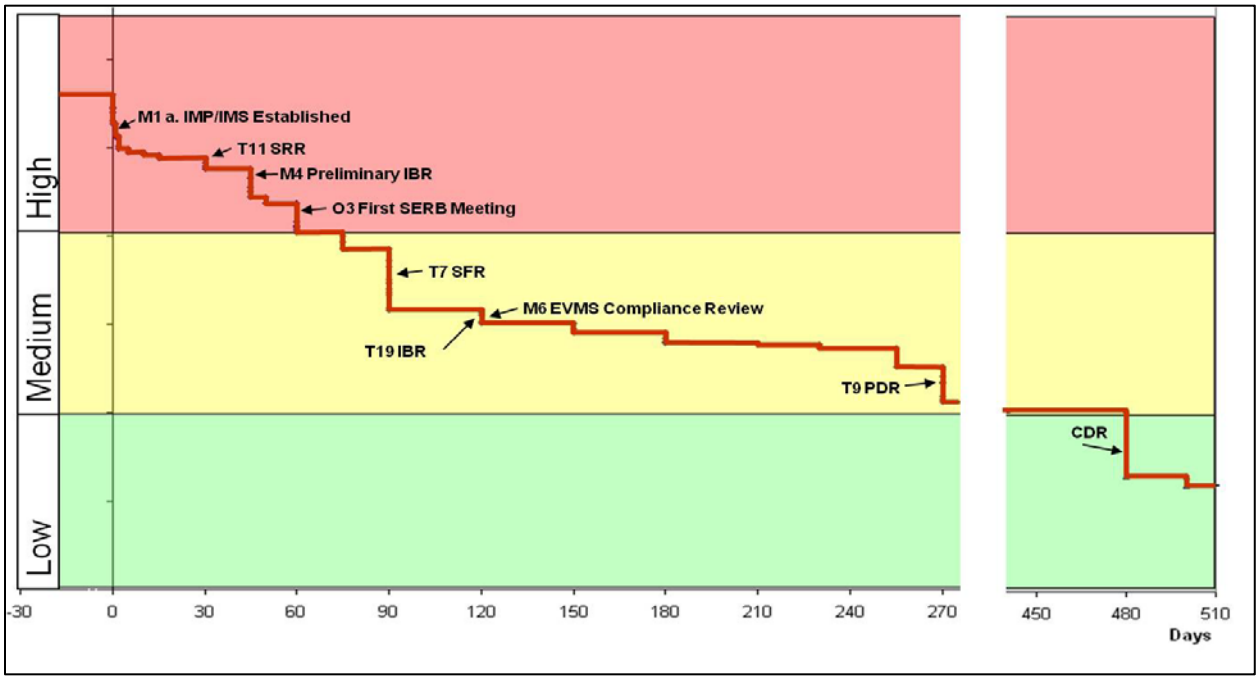


Figure 3.3-2 Risk Burn-down Plan (optional) (sample)
Note: Include an as-of date – time sensitive figure

- **Opportunity Management** - Discuss the program's opportunity management plans to create, identify, analyze, plan, implement, and track initiatives (including technology investment planning) that can yield improvements in the program's cost, schedule, and/or performance baseline through reallocation of resources.
    - If applicable, insert a chart or table that depicts the opportunities being pursued, and summarize the cost/benefit analysis and expected closure dates. (See an example in Figure 3.3-3.)

Opportunity	Likeli-hood	Cost	Benefit					
			RDT&E	Procurement	O&M	Schedule	Performance	Activity
1. **Opportunity 1: Procure Smith Rotor blades instead of Jones rotor blades**		$2M			$7M	6 month margin	4% greater lift	Summarize the activity to realize the opportunity
2. Opportunity 2 (describe the opportunity in terms of what it will provide the program, the benefit to the program, and the cost to the program)		$15K	$25K		$1.1M			
3. Opportunity 3 (describe the opportunity in terms of what it will provide the program, the benefit to the program, and the cost to the program)		$211K		$0.4M	$3.6M	4 months less long lead time needed		

Figure 3.3-3 Opportunity Tracking Matrix (if applicable) (sample)

3.4. Technical Organization

3.4.1. Government Program Office Organization – Provide planned program office organization structure (i.e., wiring diagram to illustrate hierarchy and any positions which are not filled) with an as-of date, and include the following elements:

- Legend, as applicable (e.g., color-coding)
- Organization to which the program office reports
- Program Manager
- Lead/Chief Systems Engineer (LSE/CSE)
- Other Key Leadership Positions (KLP) (see USD(AT&L) memo, Key Leadership Positions and Qualification Criteria, dated November 8, 2013)
- Functional Leads (e.g., test and evaluation (T&E), logistics, risk, production, reliability, software)
- Core, matrix, and contractor support personnel
- Field or additional Service representatives

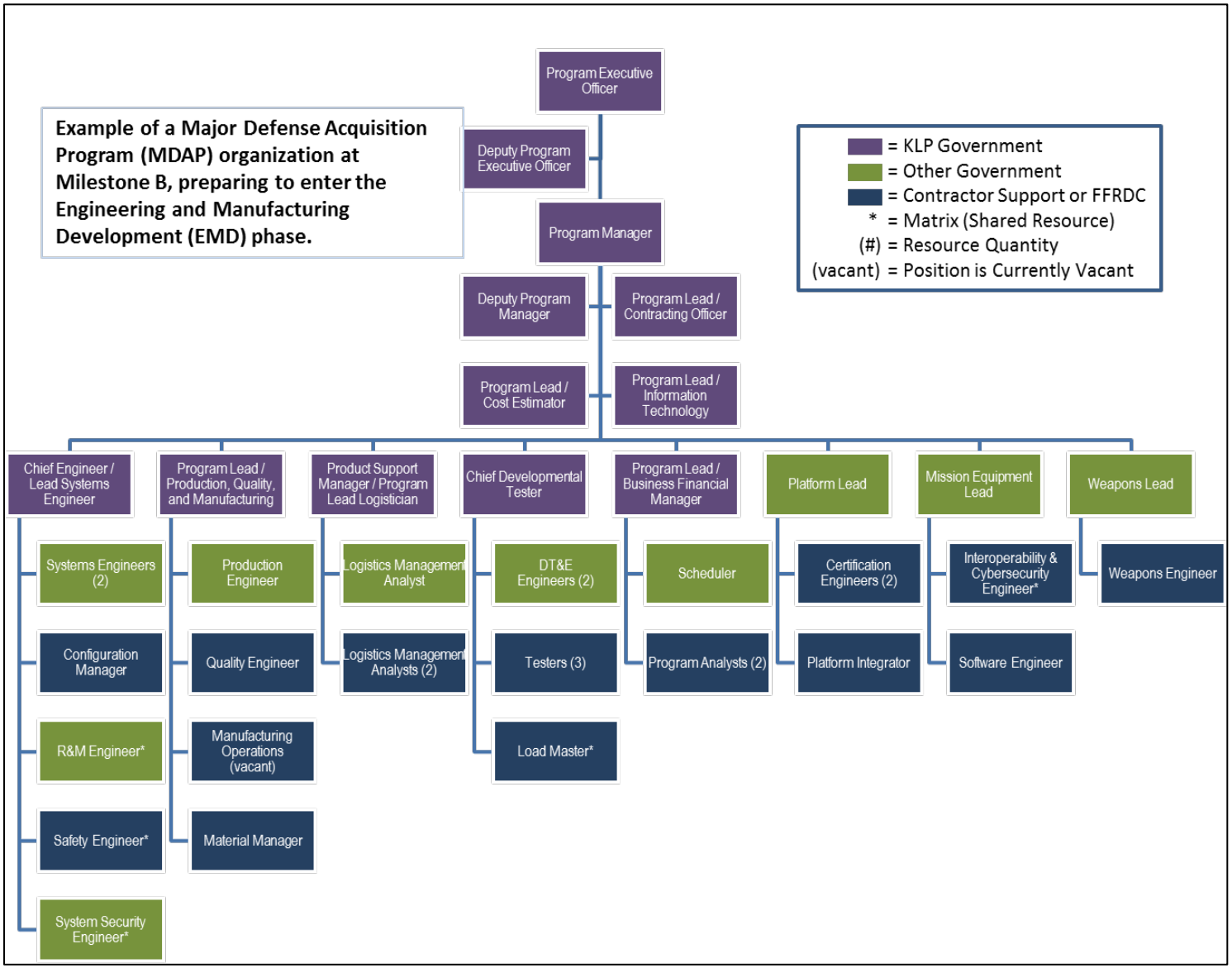


Figure 3.4.1-1: Program Office Organization (mandated) (sample)
Note: Include an as-of date – time sensitive figure

3.4.2. Program Office Technical Staffing Levels – Summarize the program's technical staffing plan to include:

- Process and tools program uses to determine required technical staffing;
- Risks and increased demands on existing resources if staffing requirements are not met;
- A figure (e.g., sand chart) to show the number of required Government program office full-time equivalent (FTE) positions (e.g., organic, matrix support, and contractor support) over time, by key program events (e.g., milestones and technical reviews);
- Adequacy of software development staffing resources;

Expectation: Programs should use a workload analysis tool to determine adequate level of staffing, appropriate skill mix, and required amount of experience to properly staff, manage, and execute successfully.

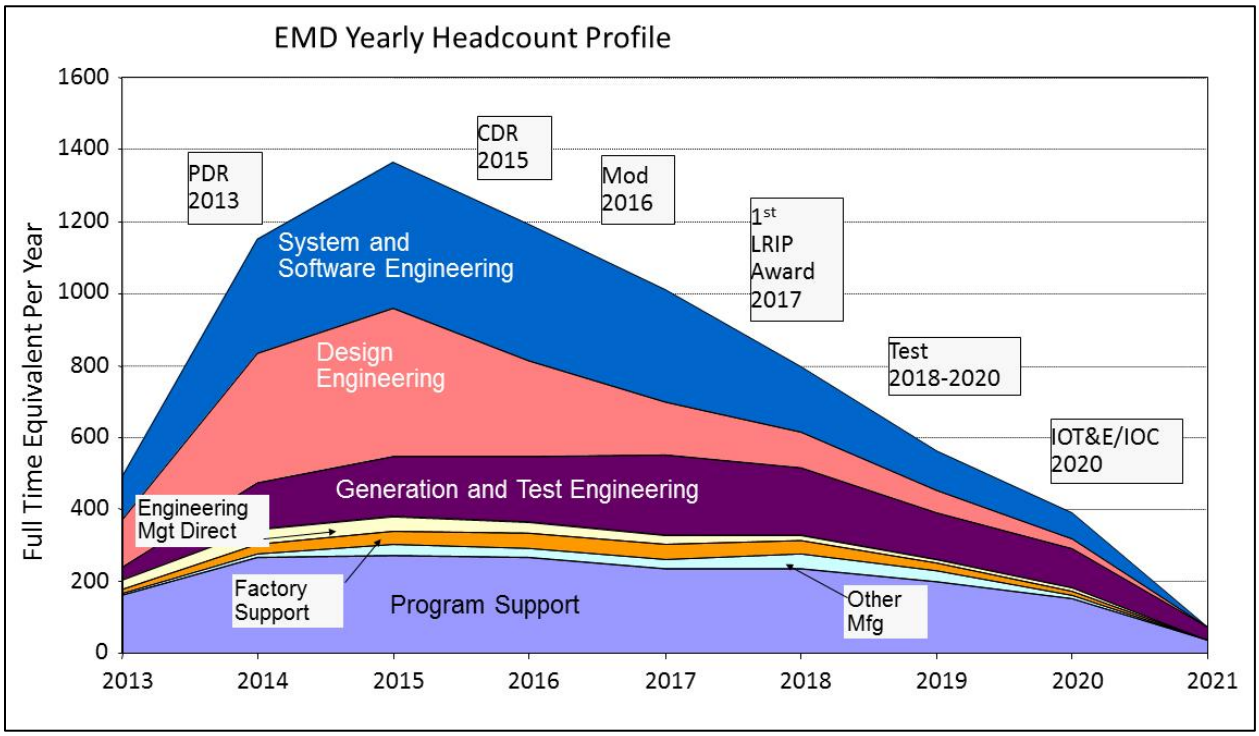


Figure 3.4.2-1 Program Technical Staffing (mandated) (sample)

3.4.3. Contractor(s) Program Office Organization – When available, provide diagrams of the contractor(s) program office organization and staffing plans in figures analogous to Figures 3.4.1-1 and 3.4.2-1.

- For programs still under competition, identify the approaches used to manage flow of information in the competitive environment.

3.4.4. Engineering Team Organization and Staffing

- **Integrated Product Team (IPT) Organization** – Provide diagrams that show the Government and contractors (when available) IPTs and their associated Working IPTs and Working Groups interrelated vertically and horizontally and that illustrate the hierarchy and relationship among them (see Figure 3.4.4-1). Identify the Government and contractor(s)' leadership for all teams.

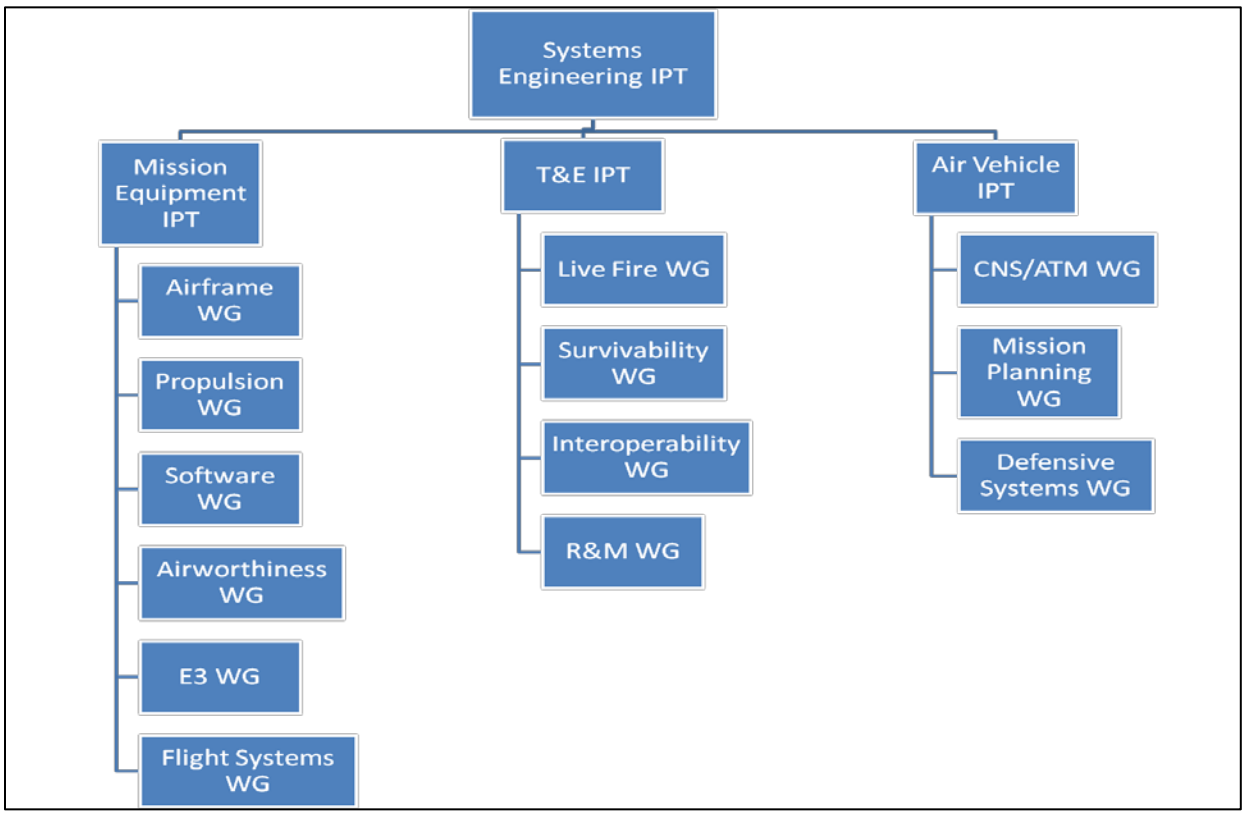


Figure 3.4.4-1 IPT/WG Team Hierarchy (mandated) (sample)

- **IPT Details** – For Government and contractor(s) (when available) IPTs and other key teams (e.g., Level 1 and 2 IPTS and WGs), include the following details either by attaching approved charters or as a table as seen below, Table 3.4.4-2:

  - IPT name
  - Chairperson position and name
  - Functional team membership (to include external program members and all design consideration areas from Section 4.6)
  - IPT roles, responsibilities, and authorities
  - IPT processes
  - IPT products (e.g., updated baselines, risks, etc.)
  - IPT-specific metrics

  Note*: Ensure that the IPTs in the figure above match the IPTs in the table below!*

Expectation: Program personnel should integrate SE activities with all appropriate functional and stakeholder organizations. In addition, IPTs should include personnel responsible for each of the design consideration areas in Section 4.6, Table 4.6-1.

Team Name	Chairperson	Team Membership (by Function or Organization)	Team Role, Responsibility, and Authority	Products and Metrics
SEIPT	Lead SE	• Program Office o Platform Lead o Mission Equipment Lead o Weapons Lead o Test Manager o Logistics Manager o SW Lead o Production/Quality Manager o Safety Lead o Interoperability Rep. o R&M Lead o System Security Engineering Lead • PEO and Program Manager • Service Representative • OSD SE • Key Subcontractor or Suppliers • External programs	Role: IPT Purpose (e.g. Aircraft Design and Development) Responsibilities: Integrate all technical efforts (Example) • Manage and oversee design activities • Oversee configuration management of requirements and their traceability • Manage Specialty Engineering activities including the following disciplines: survivability/vulnerability, human systems/factors, 'Electromagnetic Environmental Effects (E3), Reliability and Maintainability (including Availability), System Security, and Environmental Impacts to System/Subsystem Performance • Manage Safety and Certification requirements • Ensure compliance with applicable International, Federal, State, and local ESOH laws, regulations, and treaties • Manage system manufacturing assessments, weight, and facilities management (System Integration Laboratory) planning • Perform functional allocations and translate the system definition into WBS • Ensure compliance with all Specialty Engineering specification requirements • Manage SEIT performance through EVMS, TPMs, and other metrics and risk assessments • Identify and communicate SEIT issues to leadership • Evaluate technical and performance content and cost/schedule impacts to support the CCB process • Support test plan development and execution • Support the T&E IPT in system verification requirements • Support the Product Support IPT Working Groups and other TIMs	Products: SEP/SEP Updates WBS, IMP/IMS Input Specifications Metrics tracked by IPT: -Cost -Performance -Schedule

			• Develop and support the SEIT part of the incremental development and technology refresh processes • Support PMRs • Support program technical reviews and audits Perform SEIT trade studies to support affordability goals/caps Schedule and frequency of meetings Date of signed IPT charter and signatory	
XXX IPT	XXX Lead	• Program Office o Lead SE o Mission Equipment Lead o Weapons Lead o Test Manager o Logistics Manager o SW Lead o R&M Lead o Production/Quality Manager o Safety Lead o System Security Lead o Interoperability Rep. Key Subcontractor or Suppliers	Role: IPT Purpose Responsibilities: Integrate all technical efforts • Team Member Responsibilities • Cost, Performance, Schedule Goals • Scope, Boundaries of IPT Responsibilities Schedule and frequency of meetings Date of signed IPT charter and signatory	Products: Specification input SEP input TEMP input AS input Metrics tracked by IPT: Technical Performance Measure (TPM) 1 TPM 2

Table 3.4.4-2 IPT Team Details (mandated unless charters are submitted) (sample)

- **IPT Alignment** – Briefly summarize how the Government teams relate to/interact with the Prime Contractor's teams, if they are not the same teams. Also discuss the participation of external programs on program IPTs.

Expectation: Programs should shift IPT focus depending on the acquisition phase.

Tailoring for the Production and Deployment Phase: *Describe how the organizational structure evolves after MS C. If the program doesn't have a Production IPT during EMD Phase, one should be established in the Production and Deployment (P&D) Phase.*

3.5. Relationships with External Technical Organizations – What processes or methods are used to document, facilitate, and manage interaction among SE team(s), external-to-program government organizations (e.g., OUSD, family of systems / system of systems (FoS/SoS), and contractor(s)/ competing contractor(s)) on technical tasks, activities, and responsibilities (e.g., requirements, technical baselines, and technical reviews) down to and including subcontractors.

- **Responsible Organization and Authority** - Identify the organization responsible for coordinating SE and integration efforts associated with the FoS/SoS and its authority to reallocate resources (funding and manpower).
- **Management** – Summarize how FoS/SoS interfaces are managed to include:
  - Resolution of issues that cross Program Manager, PEO, and Component lines;
  - Interface Control Documents (ICDs) and any interface control WGs (ICWGs);
  - Memorandums-of-Agreement (MOAs)- provide a list of MOAs which define the agreement between interdependent programs to cooperate and support with interface definitions, products and timelines (see Table 3.5-1)
  - "Triggers" that require a FoS/SoS member to inform the others if there is a cost, schedule, or performance deviation;
  - Describe who or what team (e.g., IPT/WG) is responsible for maintaining the alignment of the IMP and IMS across the interdependent programs;
  - Planned linkage between hardware and software upgrade programs within the FoS/SoS;
  - Any required Government Furnished Equipment/Property/Government Furnished Information (GFE/GFP/GFI) (e.g., test ranges, integration laboratories, and special equipment).
- **Schedule** - Include a schedule (optional) which shows FoS/SoS dependencies such as alignment of technical reviews, major milestones, test phases, GFE/GFP/GFI, etc.

REQUIRED MEMORANDA OF AGREEMENT				
Interface	**Cooperating Agency**	**Interface Control Authority**	**Required By Date**	**Impact if Not Completed**

Table 3.5-1 Required Memoranda of Agreement (mandated) (sample)

Expectations: Programs should:

- ***Recognize the importance of managing both the internal program schedule while maintaining synchronization with external programs' schedules.***
- ***Identify external interfaces with dependencies clearly defined. This should include interface control specifications or documents, which should be confirmed early on, and placed under strict configuration control. Compatibility with other interfacing systems and common architectures should be maintained throughout the development/design process.***
- ***Develop MOAs with interfacing organizations that include:***
  - ***Tripwires and notification to FoS/SoS members of any significant (nominally > 10%) variance in cost, schedule, or performance;***
  - ***Mechanisms for FoS/SoS members to comment on any proposed interface changes;***
  - ***Fast-track issue identification and resolution process.***
- ***Develop a synchronized program schedule with interfacing programs schedules to provide insight into the potential impact of interfacing program schedule changes to include milestones, technical reviews, and test periods. Appropriate linkages are included in the IMS to reflect the synchronization.***
- ***Inform Component and OSD staffs so they better understand synchronizing funding and aligning priorities with external programs.***

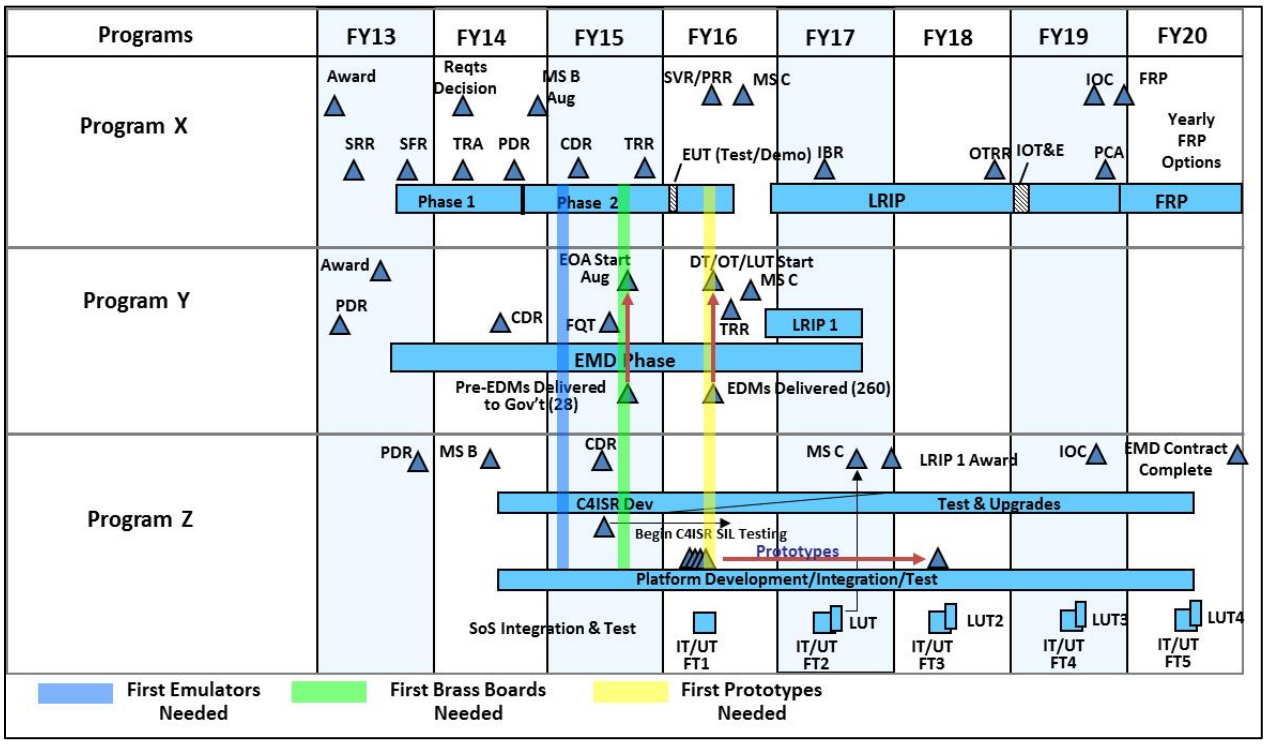


Figure 3.5-1 System-of-Systems Schedule (optional) (sample)
Note: Include an as-of date – time sensitive figure

3.6. Technical Performance Measures and Metrics – Summarize the program's strategy for selecting the set of measures for tracking and reporting the maturation of system development, design, and production in terms of progress against established plans. The measures should be specific, measurable, achievable, relevant, and time-bound — sufficient to provide insight into the technical progress and risk of the program. (See DAG section 4.3.4. Technical Assessment Process (https://acc.dau.mil/CommunityBrowser.aspx?id=638330&lang=en-US) for additional guidance.) This explanation should include:

- An overview of the measurement planning and selection process, including the approach to monitor execution to the established plan, and identification of roles, responsibilities, and authorities for this process.
- A set of technical performance measures (TPMs), rationale for tracking, intermediate goals, and the plan to achieve them with as-of dates (to provide quantitative insight into requirements stability and specification compliance). Examples include TPMs in the areas of size, weight, power and cooling (i.e., SWAP-C), software, reliability, maintainability, manufacturing, and integration to assess "performance to plan." (See example in Table 3.6-1.)
- Indicate how the program documents adding or deleting any TPMs and changes of any TPM goals.
- Specify if there are any contractual provisions related to meeting TPM goals or objectives.

- Describe the traceability between Key Performance Parameters (KPPs), Key System Attributes (KSAs), key technical risks and identified TPMs, or other measures.
    - Identify planned manufacturing measures, appropriate to the program phase, to track manufacturing readiness performance to plan.
    - Identify software measures for software technical performance, process, progress, and quality.
- If joint mission thread analysis (JMT) was completed to support material development, then identify mapping between interoperability/interface specifications and the JMT.
- Describe how SEP TPMs are verified.

Product

Name	TPM Goal	Plan* / Actual	SRR Status	SFR Status	PDR Status	MS B Status	CDR Status	SVR/FCA Status	MS C Status	FRP Status	Comments
Aerodynamic Drag (count)	≤222	Plan	220	220	220	200	187	187	187	187	
		Actual	225	225	223	220					
Thermal Utilization (kW)	<60	Plan	62	58	58	55	51	51	51	50	Thermal Utilization is tracked as Risk Item 14. Mitigation plan achieves threshold performance at deployment.
		Actual	56	56	59	55					
Electrical Power Usage (kW)	≤201	Plan	180	180	150	123	123				
		Actual	150	150	185	123					
Operating Weight (lb)	<99,000	Plan	98,999	98,999	98,000	95,000	85,540				
		Actual	97,001	97,001	101,001	97,001					
Range (nm)	>1,000	Plan	900	900	1,000	1,100	1,100				
		Actual	1,111	1,111	1,101	1,111					
Time to perform end-to-end mission critical function (e.g. F2T2EA - find, fix, track, target, engage, assess)	15s	Plan	25	25	25	23	20	15	15	15	
		Actual	25	25	25	25					
Average Flyaway Unit Cost (number)	<1.5	Plan	1.5	1.3	1.3	1.1	1	1	1	1	
		Actual	1.3	1.3	2	1					

TPMs are tracked to intermediate goals to provide quantitative insight into requirements stability and specification compliance. TPMs are developed for software, reliability, manufacturing, and integration to assess "execution to plan."

Process

Name	TPM Goal	Plan / Actual	SRR Status	SFR Status	PDR Status	MS B Status	CDR Status	SVR/FCA Status	MS C Status	FRP Status	Comments
First pass yield (FPY) (Number of units coming out of a process divided by the number of units going into that process over a specified period of time)	>=0.95	Plan						0.95	0.96	0.97	
		Actual						0.94	0.95	0.97	
Schedule Deviation (% variance from baseline critical path)	<=5	Plan	5.3	5.3	5.3	5	5	5	5	5	
		Actual	8	7	6.5	5.5					
Government Staffing Deviation (% variance from planned vs. filled positions)	<=5	Plan	5.5	5.5	5.5	5	5	5	5	5	
		Actual	6.5	6.5	7	5.4					
Contractor Staffing Deviation (% variance from planned vs. filled positions)	<=5	Plan	10	7	6.5	5	5	5	5	5	
		Actual	9.5	7.5	7	5.4					
% of features / capabilities / mission threads demonstrated to government	100%	Plan	0	0	10	25	40	90	100	100	
		Actual	0	0	8	23					
% of SW size delivered (e.g. % of logical, effective SLOC)	100%	Plan	5	10	15	30	60	95	100	100	
		Actual	7	11	15	20					
# of show-stopper (Priority 1 & 2) defects open in each SW release	0	Plan	0	0	5	3	3	1	0	0	
		Actual	0	0	22	12					
Defect discovery profile (e.g. % of predicted defects discovered)	99.99%	Plan	0	0	10	20	40	95	98	99	
		Actual	0	0	15	20					

*Note: Contingency / Margin is 10% (Explain how margin or risk is managed.)

Table 3.6-1 Technical Performance Measures and Metrics (mandated) (sample)

Expectation: Programs use metrics to measure and report progress. These measures form the basis to assess readiness for Milestone decisions, IMP criteria, and contract incentives/actions. The metrics and measures are relevant to the current program phase and specifically the end of phase decision(s) to be made.

- **Reliability Growth Curve** - For reliability, Program Managers will use a growth curve to plan, illustrate, and report progress (DoDI 5000.02, Enclosure 3, Para. 12. c.). Growth curves are stated in a series of intermediate goals and tracked through fully integrated, system-level test and evaluation events until the reliability threshold is achieved. Figure 3.6-1 is an example of a reliability growth curve (a mandated requirement). If a single curve is not adequate to describe overall

system reliability, provide curves for critical subsystems with rationale for their selection.

Note: For ACAT I programs, performance-to-plan is checked during Program Support Assessments (PSAs) and other engagements.

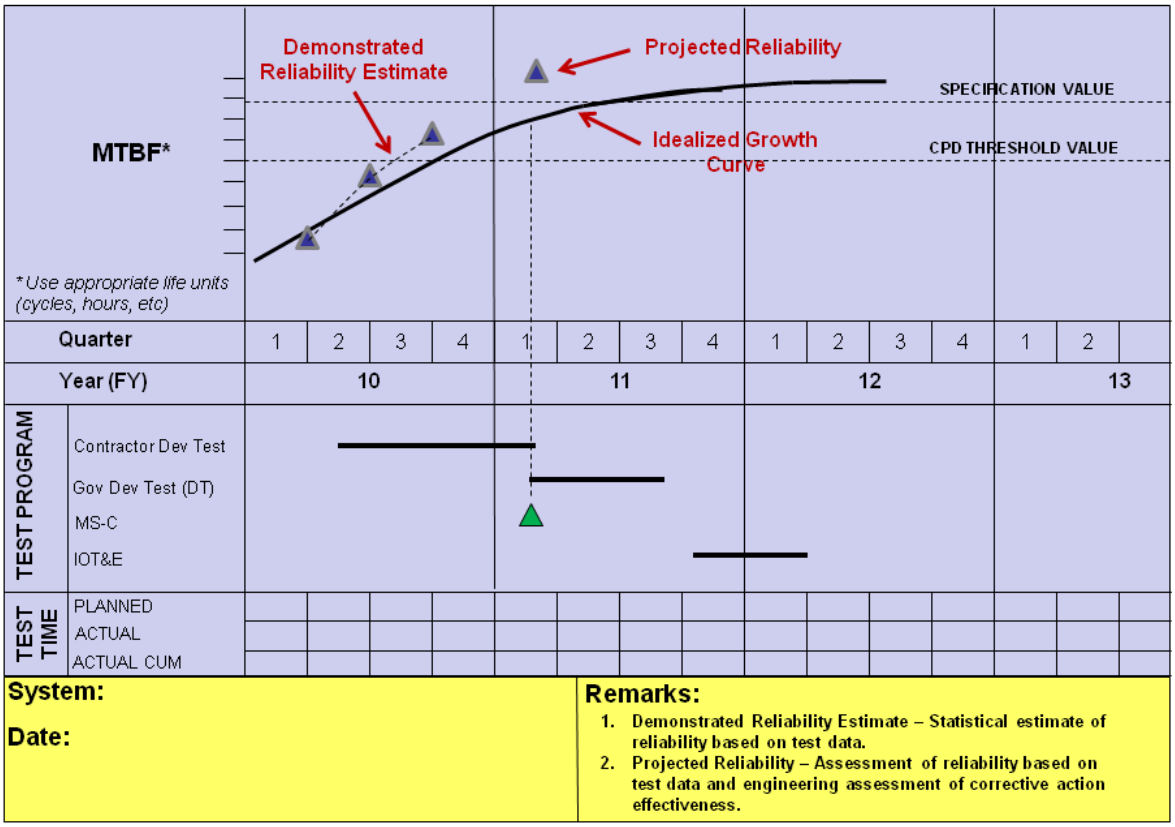


Figure 3.6-1 Reliability Growth Curve (mandated) (sample)

Expectation: Programs should understand the amount of testing, test schedule and resources available for achieving the specification requirement. Programs should consider the following:

- ***Provide a reliability growth curve for each reliability threshold.***
- ***Develop the growth planning curve as a function of appropriate life units (hours, cycles, etc.) to grow to the specification value.***
- ***How the starting point that represents the initial value of reliability for the system was determined.***
- ***How the rate of growth was determined. Rigorous test programs which foster the discovery of failures, coupled with management-supported analysis and timely corrective action, result in a faster growth rate. The rate of growth should be tied to realistic management metrics governing the fraction of initial failure rate to be addressed by corrective actions along with the effectiveness of the corrective action.***

- ***Describe the growth tracking and projection methodology used to monitor reliability growth during system-level test (e.g., AMSAA-Crowe Extended, AMPM).***

4. Technical Activities and Products

4.1. Results of Previous Phase SE Activities - Summarize (consider a tabular format) system-level technical reviews, trade studies, and independent reviews conducted to date; date(s) conducted; and key results or impact(s) to design and any related recommendations and status of actions taken. For MDAPs, these reviews include an assessment of manufacturing risk and readiness.

- For the Milestone A SEP, summarize the early systems engineering analysis and assessment results that show how the proposed materiel solution is technically feasible and has the ability to effectively address capability gaps, desired operational attributes, and associated external dependencies. Summarize the technical assessment of the software, integration, manufacturing, and reliability risks.
- For the Development RFP Release Decision Point / Milestone B SEP, summarize the results of system level technical reviews and trade studies that support the systems engineering trade-off analysis showing how cost varies as a function of system requirements, major design parameters, and schedule.
- For the Milestone C SEP, summarize the results of the system level technical reviews and audits (CDR, Production Readiness Review (PRR), Functional Configuration Audit (FCA), System Verification Review (SVR)), prototyping, modeling and simulation activities, and any additional systems engineering trade-off analyses supporting the final design.

4.2. Planned SE Activities for the Next Phase – Summarize key planned systems engineering, integration, and verification processes and activities established or modified since the previous acquisition phase, including updated risk reduction and mitigation strategies and technical and manufacturing maturity. Additionally, describe how the program plans for technology insertion and refresh.

4.3. Requirements Development and Change Process

- **Analysis and Decomposition** – How are top-level requirements (i.e., from Analysis of Alternatives (AoA), KPPs, KSAs, statutory, regulatory, certification, safety, software, hardware, etc.) traced from the source JCIDS documents down to configuration item (CI) build-to specifications and verification plans? (See an example in Figure 4.3.1-1 and DAG section 4.3.11 Requirements Analysis Process for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638340&lang=en-US.)
  - Identify which program office position or team (e.g., IPT/WG) is responsible for continuously ensuring the accurate traceability of requirements.
  - Identify the tool (s) the program plans to use (or continues to use) for requirements traceability in Tools Table 4.7-1.
  - If the program office and prime contractor(s) use different tools, how is information transferred across them?
  - What approach is used to ensure that there are no orphan or childless requirements?

- Describe how the JCIDS reliability and maintainability (R&M) thresholds were translated into contract specification requirements, ensuring they are consistent with those in the acquisition strategy.
- For Milestone A SEPs, describe how SE supports trade-off analysis input to ensure the system requirements (including KPPs and KSAs) are achievable within cost and schedule constraints.

Tailoring for TMRR phase: *Describe how risk reduction and competitive prototyping, the TRA, the PDR, and test results inform the program's KPP/KSAs for the EMD phase.*

Expectation: Program should trace all requirements from JCIDS (or equivalent requirements document) into a verification matrix.

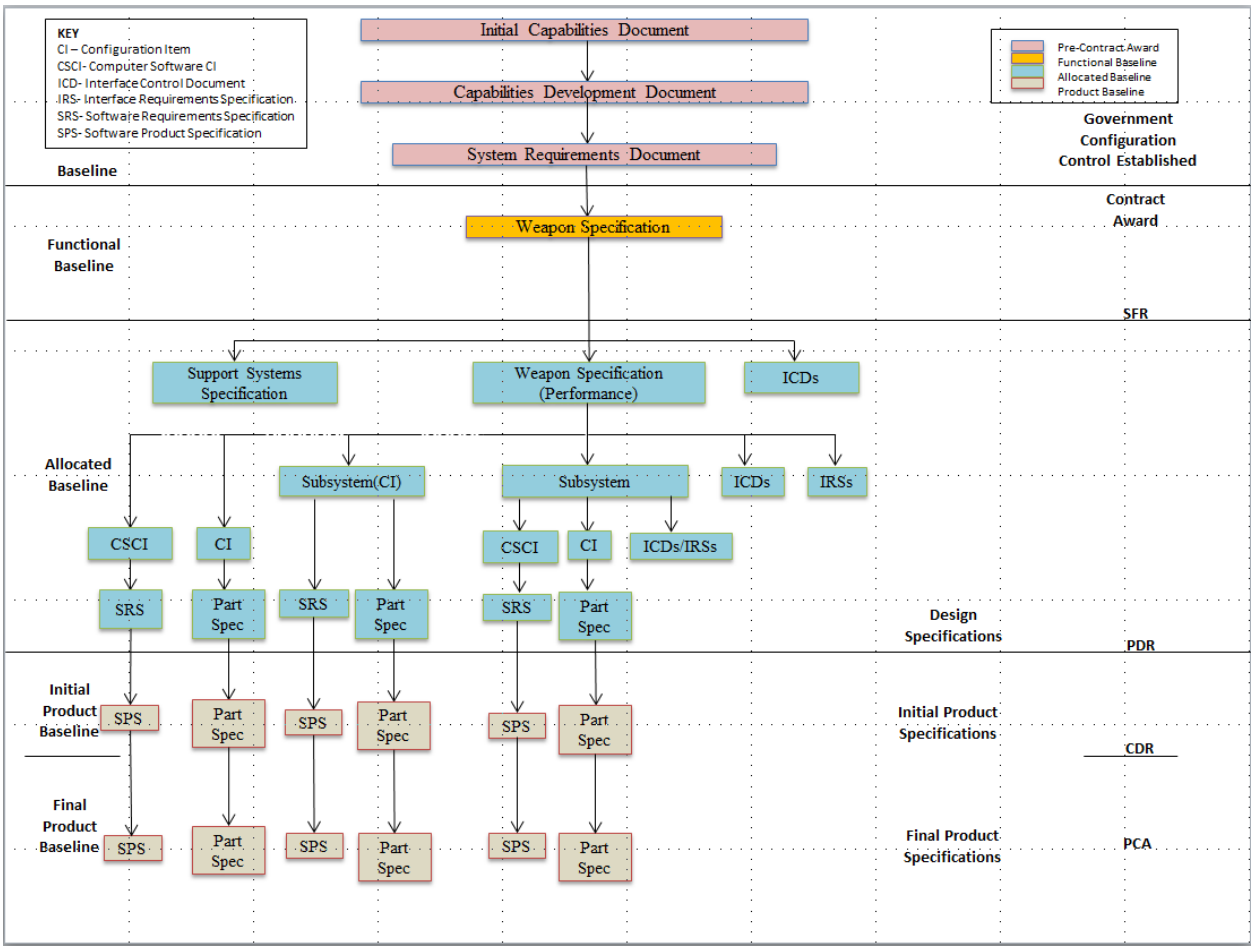


Figure 4.3.1-1 Requirements Decomposition/Specification Tree/Baselines (mandated) (sample)

- **Requirements Management and Change Process** – How are requirements managed and changes made and tracked?
  - If the program is a MDAP, and if it were to have a change in requirement which could result in a cost and/or schedule breech, summarize the mechanism by which the program involves its Configuration Steering Board.

- Identify which program office position or team (e.g., IPT/WG) is responsible for continuously ensuring the accurate management of requirements and requirement changes.

Expectation: Programs should ensure requirements traceability from the lowest level component all the way back to the user's capability document.

4.4. Technical Reviews

- **Technical Review Process** – Describe how the program conducts technical reviews of program progress for systems in development as a basis for transitioning between phases within the development plan of work. Summarize the PMO's plans for conducting each technical review with particular emphasis and detail on those technical reviews planned in the program's next acquisition phase. Identify which program office position is responsible for the overall conduct of system-level and/or key subsystem-level technical reviews. A diagram of the process with the objective timeframes for each activity before, during, and after the technical review may prove useful.

  - Identify who or what team has responsibility, authority, and accountability for determining:
    - Whether/when technical review entry criteria have been met;
    - What action items are to be tasked;
    - That tasked action items have been closed appropriately; and
    - That technical review exit criteria are met.
  - If not already addressed, identify the role of the program manager, LSE/CSE, and Technical Review Chair in the technical review process.

Expectation: Programs should use a standard process for conducting technical reviews.

- **Planned System-Level Technical Reviews** – For each planned system-level technical review in the next acquisition phase, include a marker on the program schedule (Figure 3.1-1) and a technical review table. (See an example in Table 4.4-1 and DAG section 4.2.8. Technical Reviews and Audits Overview for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638315&lang=en-US.) This table, or something analogous, is mandatory.

XXX Details Area	**XXX Review Details** (For this acquisition phase, fill out tailored criteria, etc.)
Chairperson	Identify the Technical Review Chair
PMO Participants	Identify Positions/functions/IPTs within the program offices which are anticipated to participate. **(**Engineering Leads; Risk, Logistics, and Configuration Managers, Defense Contracting Management Agency (DCMA) Rep., and Contracting Officer, etc.)
Anticipated Stakeholder Participant Organizations	Representatives (stakeholders) from Service SE and Test, DASD(SE), external programs, the User, and participants with sufficient objectivity with respect to satisfying the pre-established review criteria.
Purpose (of the review)	Describe the main purpose of the review and any specific SE goals.
Entrance Criteria	Identify tailored Entrance Criteria established for conducting an event-driven review.
Exit Criteria	Identify tailored Exit Criteria.
Products/Artifacts (from the review)	List expected products from the Technical Review (for example): • Established system allocated baseline • Updated risk assessment for EMD • What artifacts constitute the baseline • Assessment of Software development progress • Updated Cost Analysis Requirements Document (CARD) or CARD-like document based on system allocated baseline • Updated program schedule including system and SW critical path drivers • Approved Life-Cycle Sustainment Plan (LCSP) updating program sustainment development efforts and schedules

Table 4.4-1 Technical Review Details (mandated) (sample)

Tailoring for TMRR Phase: *At a minimum, provide details for how System Requirement Review (SRR)(s) and System Functional Review (SFR)(s) objectives are planned to be accomplished, and PDR(s) is planned by the program. For MDAPs, Section 2366b certification requires an MDA-level PDR Assessment.*

Tailoring for EMD Phase: *At a minimum, provide details for delta PDR (if conducted), SRR, SFR, and PDR if entering acquisition at MS B, CDR, and intent for accomplishing SVR/FCA and PRR objectives, as planned. If the acquisition strategy does not require a MS C, also provide details for meeting Physical Configuration Audit (PCA) objectives.*

Tailoring for P&D Phase: *At a minimum, provide details for how SVR/FCA/PRR (if not already detailed in the EMD Phase SEP), and PCA objectives are planned to be accomplished.*

Expectation: Programs plan and conduct event-driven technical reviews.

4.5. Configuration and Change Management

- **Technical Baseline Artifacts** – For each baseline established at a technical review, list and describe the planned or established artifacts (if not already identified in Section

4.4). Typically, at a minimum, describe the artifacts of the functional, allocated, and product baseline and when each technical baseline is established and verified. (See DAG section 4.3.7. Configuration Management Process for additional guidance: https://acc.dau.mil/CommunityBrowser.aspx?id=638336&lang=en-US.)

- SFR = Functional Baseline = Artifacts containing the system's performance (functional, interoperability, and interface characteristics) and the verification required to demonstrate the achievement of those specified characteristics.
- PDR = Allocated Baseline = Artifacts containing the functional and interface characteristics for all system elements (allocated and derived from the higher-level product structure hierarchy) and the verification required to demonstrate achievement of those specified characteristics.
- CDR = initial Product Baseline = Artifacts containing necessary physical (form, fit, and function) characteristics and selected functional characteristics designated for production acceptance testing and production test requirements, including "build-to" specifications for hardware (product, process, material specifications, engineering drawings, and other related data) and software (software module design - "code-to" specifications).

Expectation: Programs should understand which artifacts make up each technical baseline and manage changes appropriately. At completion of the system level Critical Design Review, the Program Manager will assume control of the initial product baseline, to the extent that the competitive environment permits (DoDI 5000.02, Enclosure 3, Para.8, page 84). Exceptions are explained.

- **Configuration Management/Control (and Change) Process Description** – Provide a process diagram of how the program maintains configuration control of its baselines. Describe the approach the program office takes to identify, document, audit, and control the functional and physical characteristics of the system design; track any changes; and provide an audit trail of program design decisions and design modifications. Identify when in the acquisition lifecycle the Government program office assumes configuration control of the initial product baseline at the completion of CDR or rationale for assuming control at a different point in time.

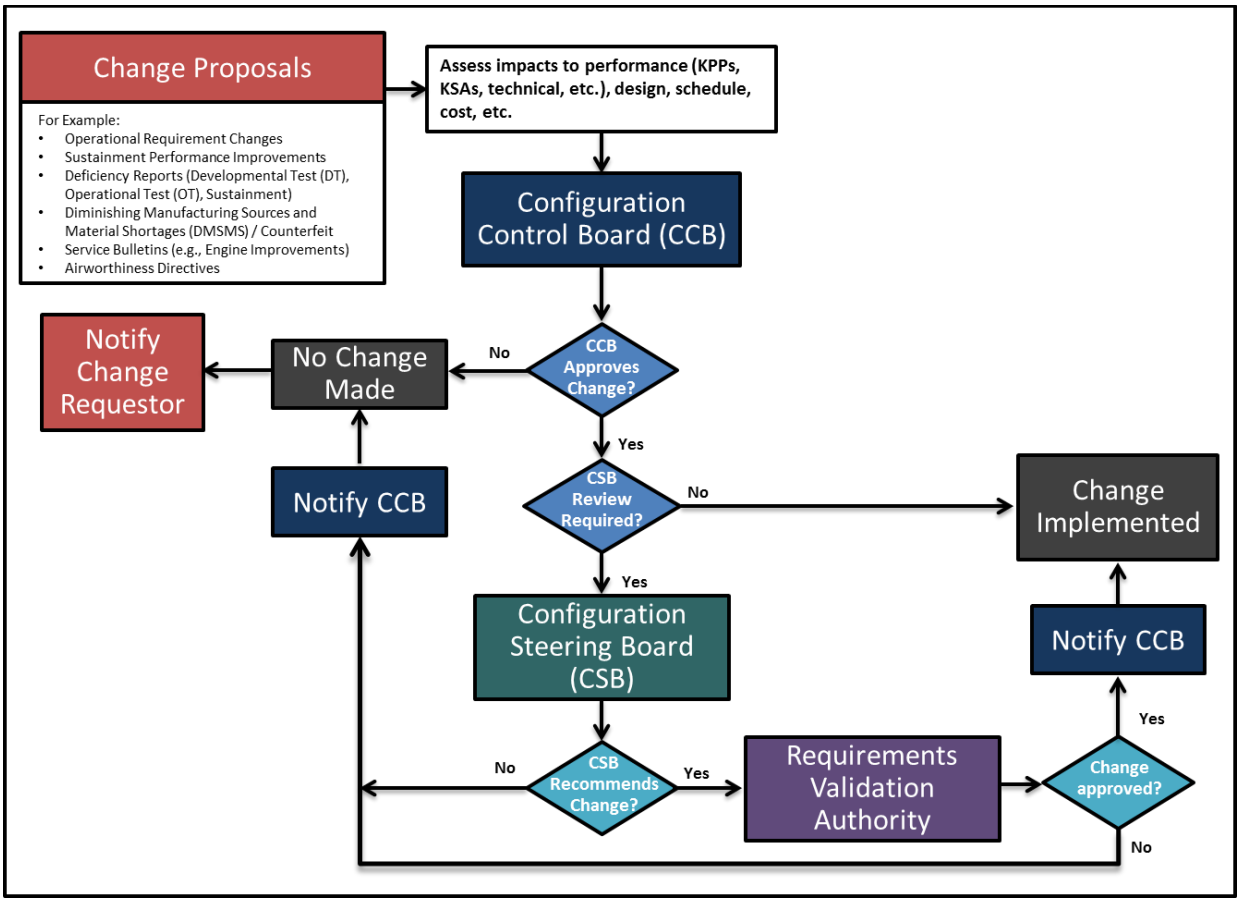


Figure 4.5-1 Configuration Management Process (mandated) (sample)

- **Roles, Responsibilities, and Authorities** - Summarize the roles, responsibilities, and authorities within the CM process. If this includes one or more configuration boards, describe the hierarchy of these boards, their frequency, who (by position) chairs them, who participates, and who (by position) has final authority in each.
- **Configuration Change Process** – Outline the process the program uses to change the technical baseline/configuration and specifically address:
  - How changes to a technical baseline are identified, evaluated, approved/disapproved, recorded, incorporated, and verified;
  - How product information is captured, maintained, and traced back to requirements;
  - How requirements for in-service configuration/design changes are determined and managed/controlled;
  - How internal and external interfaces are managed and controlled.
  - The process by which the program and external programs review configuration changes for possible impacts on each other's programs.

        - Describe how the Intellectual Property Strategy affects and influences the planned configuration control processes.
    - **Classification of Changes –** Define the classification of changes (Class 1, Class 2, etc.) applicable to the program and approval authority. Identify by position who in the CM process is responsible for determining the classification of a change and who (by position) verifies/confirms/approves it.

Expectation: Programs control their baselines. Configuration Management planning is consistent with the Intellectual Property Strategy.

4.6. Design Considerations – DAG Section 4.3.18, Design Considerations (https://acc.dau.mil/CommunityBrowser.aspx?id=638347&lang=en-US), contains a non-exhaustive list of design considerations; not all are equally relevant or critical to a given program, but all should be examined for relevancy. In the mandated table below, identify the key design considerations that are critical to the achievement of the program's technical requirements. In certain cases where additional documentation is required, those documents may be required to be embedded in the SEP or hot linked. (See DoDI 5000.02, Enclosure 1, Table 2.: http://www.acq.osd.mil/fo/docs/500002p.pdf)

- Describe the software development approach planned to be used that enable the developers to deliver capability in a series of manageable intermediate products.

Expectation: SEP demonstrates that the mandated design considerations are an integral part of the design decision process including trade study criteria.

Mapping Key Design Considerations into Contracts					
Name (Reference)	**Cognizant PMO Org**	**Certification**	**Documentation (hot link)**	**Contractual Requirements (CDRL #)**	**Description/Comments**
SE Tradeoff Analysis for Affordability					Provide a summary of planned and/or completed systems engineering trade-off analysis to assess system affordability and technical feasibility to support requirements, investment, and acquisition decisions. This analysis should show how cost varies as the major design parameters and time to complete are traded off against one another. The analysis should reflect attention to capability upgrades. The analysis supports MDA approval of an Affordability Requirement to be treated as a KPP in the Acquisition Decision Memorandum. The analytical summary should include a graphic illustrating cost tradeoff curves or trade space around major affordability drivers (including KPPs when they are major cost drivers) to show how the program has established a cost-effective design point for those affordability drivers.
Chemical, Biological, Radiological, and Nuclear (CBRN) Survivability					Describe how design incorporates the CBRN survivability requirements and how progress toward these requirements is tracked and documented over the acquisition lifecycle. "For additional information on CBRN Survivability, see https://www.dodtechipedia.mil/dodwiki/display/techipedia/Chemical%2C+Biological%2C+Radiological%2C+and+Nuclear+Survivability."
Corrosion Prevention and Control					Describe how design minimizes adverse impacts of corrosion and material deterioration on system cost, safety, and availability across the acquisition and sustainment life cycle. Corrosion prevention and control should be included in, but not limited to, requirements flow-down, contract language, design attributes, risk management, materials selection, manufacturing, test, maintenance, inspection, and modification.

Environmental, Safety and Occupational Health (ESOH)			PESHE NEPA Compliance Schedule (MS B & C)		Describe how design minimizes ESOH by summarizing how the program integrates ESOH considerations into SE processes to include method for tracking hazards and ESOH risks and mitigation plans throughout the life cycle of system.
Human Systems Integration (HSI)					Summarize how HSI is integrated within the SE processes, specifically addressing the human operator and maintainer requirement allocation approach that accounts for total system performance.
Item Unique Identification (IUID)			IUID Implementation Plan (MS A, Dev RFP Rel, MS B & C)		Describe how the program implements IUID to identify and track applicable major end items, etc.
Manufacturing and Producibility			Manufacturing Plan (optional plan)		Describe how manufacturing readiness and risk is assessed for the next acquisition phase. During Technology Maturation and Risk Reduction Phase, describe how manufacturing processes are assessed and demonstrated to the extent needed to verify that risk has been reduced to an acceptable level. During the Engineering and Manufacturing Development Phase, describe how the maturity of critical manufacturing processes are assessed to ensure they are affordable and executable. Prior to a production decision, describe how the program ensures manufacturing and producibility risks are acceptable, supplier qualifications are completed, and any applicable manufacturing processes are under statistical process control.
Open Systems Architectures					Describe how open systems architecture design principles support an open business model, and are incorporated into the program's design to enable affordable change, evolutionary acquisition, and interoperability. Provide rationale if it is not feasible or cost effective to apply an open systems approach.

System Security Engineering					Describe how design addresses protection of DoD warfighting capability from foreign intelligence collection; from hardware, software vulnerabilities and supply chain exploitation; and from battlefield loss throughout the system life cycle, balancing security requirements, designs, testing, and risk management in the respective trade spaces.
Technology Insertion and Refresh					Describe how the design enables technology insertion and refresh.
Reliability and Maintainability[3]			R&M contract language[1] RAM-C Report[2] (MS A, Dev RFP Rel, B, & C)		Describe how the program implements and contracts for a comprehensive R&M engineering program to include the phased activities in Table 4.6-2 and how R&M is integrated with SE processes.
Intelligence (Life-Cycle Mission Data Plan)			LMDP (MS A, Dev RFP Rel, B, & C) (If intelligence mission data dependent)		Summarize the program's plans to identify Intelligence Mission Data (IMD) requirements and IMD need dates. Summarize the plans to assess IMD risks and develop IMD (only required if dependent on IMD).
Insensitive Munitions					For systems containing energetics, describe the plan for meeting DoD and 10 USC 2389 (http://www.gpo.gov/fdsys/granule/USCODE-2010-title10/USCODE-2010-title10-subtitleA-partIV-chap141-sec2389) requirements.
Spectrum Supportability					Describe plans to comply with U.S. and host nation electromagnetic spectrum requirements.

Table 4.6-1 Design Considerations (mandated) (sample)

Table 4.6-1 Legend:

Name – See DAG section 4.3.18. Design Considerations (https://acc.dau.mil/CommunityBrowser.aspx?id=638347&lang=en-US) for a more comprehensive listing of design considerations.

Cognizant PMO Organization – Assigned IPT/WIPT/WG for oversight

Certification – As appropriate, to include Technical Authority and timeframe

Documentation – List appropriate PMO and/or contractor documents and hot link.

Contractual Requirements – List contract clauses which the PMO is using to address the named topic.

Description/Comments – As needed, to inform other PMO members and stakeholders

[1] Relevant R&M sections of the Systems Specification, SOW, Statement of Objectives (SOO), and Sections L and M

[2] DoDI 5000.02, Jan 7, 2015, Enclosure 3, para 12.b, (http://www.acq.osd.mil/fo/docs/500002p.pdf) DoD RAM-C Report Manual, June 1, 2009 (http://www.acq.osd.mil/se/docs/DoD-RAM-C-Manual.pdf)

[3] *Space programs should address Mission Assurance (MA) planning in the context of reliability and provide a description of MA activities undertaken to ensure that the system operates properly once launched into orbit. Specifically, space programs should describe how the Mission Assurance process employed meets the best practices described in the Mission Assurance Guide (reference Aerospace Corporation TOR-2007(8546)-6018, see section 10.6.4.1 Reliability Modeling and Chapter 13 Reliability). This description should include program phase-dependent processes and planning for MA in the next phase of the program and the way program MA processes adhere to applicable policies and guidance. Also describe the launch and operations readiness process.*

R&M Engineering Activity	Planning and Timing
R&M Allocations	
R&M Block Diagrams	
R&M Predictions	
Failure Definitions and Scoring Criteria	
Failure Mode, Effects, and Criticality Analysis (FMECA)	
Maintainability and Built-in Test Demonstrations	
Reliability Growth Testing at the System and Subsystem Level	
Failure Reporting , Analysis, and Corrective Action System (FRACAS)	
Etc.	

Table 4.6-2 R&M Activity Planning and Timing (mandated) (sample)

Expectation: Programs should understand that the content of the R&M artifacts need to be consistent with the level of design knowledge that makes up each technical baseline. (See DAG section 4.3.18.19 (https://acc.dau.mil/CommunityBrowser.aspx?id=638366&lang=en-US) for R&M guidance by acquisition phase.)

- ***R&M Allocations – R&M requirements assigned to individual items to attain desired system level performance. Preliminary allocations are expected by SFR with final allocations completed by PDR.***
- ***R&M Block Diagrams – The R&M block diagrams and math models prepared to reflect the equipment/system configuration. Preliminary block diagrams are expected by SFR with the final completed by PDR.***
- ***R&M Predictions – The R&M predictions provide an evaluation of the proposed design or for comparison of alternative designs. Preliminary predictions are expected by PDR with the final by CDR.***
- ***Failure Definition and Scoring Criteria – Failure definitions and scoring criteria to make assessments of R&M contract requirements.***
- ***FMECA – Analyses performed to assess the severity of the effects of component/subsystem failures on system performance. Preliminary analyses are expected by PDR with the final by CDR.***
- ***Maintainability and Built-In Test – Assessment of the quantitative and qualitative maintainability and Built-In test characteristics of the design.***
- ***Reliability Growth Testing at the System and Subsystem Level – Reliability testing of development systems to identify failure modes, which if uncorrected could cause the equipment to exhibit unacceptable levels of reliability performance during operational usage.***

- ***FRACAS – Engineering activity during development, production, and sustainment to provide management visibility and control for R&M improvement of hardware and associated software by timely and disciplined utilization of failure data to generate and implement effective corrective actions to prevent failure recurrence.***

4.7. Engineering Tools – In a table, identify the tools the program plans to use, the purpose and responsible IPT. (See an example in Table 4.7-1 and DAG Section 4.3.19. Tools, Techniques, and Lessons Learned (https://acc.dau.mil/CommunityBrowser.aspx?id=638372&lang=en-US) guidance for selecting tools in support of each of the systems engineering processes.)

Engineering Tool	Purpose	Position/IPT Responsibility
IMS (e.g., MS Project ®, Primavera ®)	Depicts work package dependencies and manage the programs schedule and critical path tasks	
Requirements Management Tool (e.g., IBM® Rational® DOORS®)	Requirements Traceability and Verification Methodology and Completion	SE IPT/Rqmts Manager
Requirements Verification Matrix (RVM)	Requirements Verification	
Computer-Aided Design/Engineering (CAD/CAE) (e.g., Computer-Aided Three-Dimensional Interactive Application (CATIA))	Virtual Design tool	SE IPT
Risk Management Information System (RMIS)	To identify, analyze, monitor and mitigate program risks	SE IPT/Risk Manager
System Modeling	Capture and Communicate Design Solution and show how it traces and satisfies the requirements	SE IPT/ System Modeling Lead, Architecture Lead
Software Integration Lab (SIL)	Integrating tactical software	SW WG
Software Engineering	Design	SW WG
Software Cost Estimating (e.g., COCOMO)	Software cost estimating	SW WG
Producibility/Throughput Analysis Tool		Manufacturing WG
Line of Balance	Production planning	Manufacturing WG
Reliability Growth (e.g., RGA®, PM2, RGTM, AMPM)	Reliability growth planning and tracking	SE IPT/R&M Lead
Etc.		

Table 4.7-1 Engineering Tools (mandated) (sample)

- **Modeling and Simulation** – Describe how modeling and simulation activities are integrated into program planning and engineering efforts to support analysis and decisions. Describe which models, data processes and artifacts are integrated, managed, and controlled.

Expectation: Programs should ensure design solutions are documented based upon sound SE practices using engineering tools to augment the technical approach. Programs should define tool interfaces when the government and contractor(s) plan to use different tools for the same purpose. Programs should plan and budget the necessary resources to procure needed tools.

Annex A – Acronyms

Provide a list of all acronyms used in the SEP