Office of the Secretary of Defense

Systems Engineering Assessment Methodology
Defense Acquisition Program Support

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Chapter 3 – Pre-Milestone C Focus

OSD Systems
Assessment Methodology

Overview

Objective: Program assessments are intended to provide independent actionable recommendations to the government program office to improve execution of the program.

This Assessment Methodology has been developed to ensure that all program assessments are conducted using a consistent approach, and to ensure that the Program Assessment Team addresses all relevant Assessment Areas and Sub-Areas.

Description

The purpose of this methodology is to define the approach that will be used to assess defense system development programs by the OSD System Assessment Team. This definition describes the components of the methodology and provides guidance on its application.

The methodology is composed of a robust listing of programmatic and technical areas, sub-areas, and factors. This listing has been developed to be both broad in scope, as well as specific (detailed) enough to enable application to programs of all types (e. g., weapons, ships, aircraft, ground vehicles, avionics, communications, etc.). The methodology is intended for use at all phases of design, development, production, and deployment. Enclosures #1-3 each provide specific criteria, sample questions/requests for information and observations that pertain to programs approaching respective milestones A, B, and C. The typology of the methodology is adequately detailed for tailoring, to enable quick-look assessments as well as more comprehensive milestone decision assessments
The methodology's Assessment Areas, Sub-Areas, and Factors contained in each of the milestone applications should not be viewed as a checklist to be followed rigidly nor for that matter must each assessment address *all* Assessment Areas and Sub-Areas listed. On the contrary, this listing should be regarded as a *resource* that can be adapted, and/or used as a guide. The methodology also accommodates the transition to the Joint Capabilities Integration and Development System (JCIDS) from the traditional 'Requirements-Based' acquisition programs that currently exist. Additionally, the content of the methodology addresses most of the content of the new DoD Acquisition Guidebook (especially Chapter 4 of the Guidebook that pertains to the application of systems engineering). It is recommended that this Guidebook be used in conjunction with the Assessment Methodology.

The Methodology is based on the basic model of:

- Assessment Area – A mutually exclusive category of programmatic activity or focus
- Sub-Area – A decomposition of the major Assessment Area into related subject matter components
- Factor – A further decomposition of Sub-Areas, as appropriate to capture necessary detail and distinction in support of the stated scope and perspective

- Scope/Intent – A short description of the purpose for conducting an assessment regarding each Assessment Area and Sub-Area
- Perspective – A statement that sets the context for why the Assessment Area and associated Sub-Areas and Factors are defined and described as they are
- Criterion/Criteria – A short statement of how each Sub-Area should be complied with in a proper or effective manner. Mapped to the sample questions, the criteria provide a basis to assess the response to the sample questions.
- Sample Questions/Information Requests – A number of questions or prompts calling for explanations that can be used by the Assessment Team to enter into discussions with the Program Office and contractor, as part of conducting an assessment.
- Sample Observations – Drawn from existing program assessment experience, a selected number of examples are provided that illustrate prior program actions/activities, either positive or negative, that might exist under each Sub-Area.

It is envisioned that the Assessment Team would tailor the methodology for each individual assessment and use it as a guide both to ensure that the selected areas are comprehensively examined and addressed and to ensure that important areas are not overlooked. The extent of the tailoring depends upon the status of the program and special interest areas articulated by the requestor (s) of the assessment.

Assessment Team Structure

The Assessment Team would be comprised of a Team Leader from the Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics (OUSD/AT&L)/Defense Systems/Systems Engineering, and core subject matter expert members from OSD Staff (AT&L, Networking, Information, and Integration (NII), (Program Analysis & Evaluation (PA&E), Operational Test & Evaluation (OT&E), etc.) Additional subject matter experts could be recruited from the Services, DoD agencies, Federally Funded Research and Development Center (FFRDCs), Industry, and Academia, based on specific assessment needs matched with individual expertise.

Assessment Methodology Process

The Assessment Methodology process is comprised of the following key activities:

- Assessment Request (Overarching Integrated Product Team (OIPT) or AT&L)
- Initiate and Plan Assessment
- Perform Assessment
- Integrate and Report Assessment Results
- Evaluate Assessment Process and Results
- Evaluate for trends and insights

Application

The assessment areas are intended to cover a broad base of areas involved in the development of defense systems and are not meant to be exhaustive. Further, the areas are described only in general terms and are not intended to apply to every possible situation. It is not expected that every area will necessarily be used during an assessment.

However, the Program Assessment Team members, as part of the issue identification process, should at least review each of the areas. The Assessment Team Leader should look for additional areas to reduce the possibility of "area blindness", i. e., seeing only what is addressed in the methodology.

The key in applying the assessment process successfully is to select a highly qualified, experienced team leader, and populate the team with experienced senior individuals. Collectively, the assessment team should bring expertise, experience, and knowledge in all areas that the assessment will address.

The assessment areas should be used as a starting point only and be supplemented and supported with the sample questions and criteria included in the listing. The team should apply their personal experience and expertise to expand the assessment criteria as necessary to ensure that a thorough assessment is performed.

The sample questions and criteria provide a robust approach to gathering specific information within a given specific assessment as well as across multiple assessments. For each criterion listed in a given factor or sub-area, there is at least one question that corresponds to the criterion (cross referenced in brackets). This information is used to help create the appropriate assessment context and to guide the assessment process. Often, it will be necessary to apply each area differently based upon either a customer or a supplier perspective. In some cases, additional contextual distinctions are made in the "Perspective" sections and also in the lower level sections of each assessment area. For example, sufficiency of the cost and schedule to accomplish the development effort might be viewed differently from the acquisition (customer) perspective vis-à-vis the development (developer) perspective. These perspectives can be readily expanded to include all stakeholders, as appropriate, to capture the customer or supplier teams' concerns.

The sample observations are the result of a distillation of previous program assessments and are provided to illustrate the types and nature of program experiences (both positive and negative) that can be expected to typically occur. This value-added feature of the methodology is intended to prepare the assessment team for what to expect and also to be used as a thumbnail "sanity check" to verify that what might be observed in an assessment is to be expected, or otherwise.

The assessment scope is intended to look at a program whether it is a stand-alone 'System' or a 'System of Systems'. Thus, the Assessment Areas, Sub-Areas, and Factors, as well as the sample questions and criteria, although generally framed from the stand-alone system perspective, do offer some questions relevant to a system of systems. It is recognized that certain implementation technologies such as software have characteristics that are distinct and different from hardware, e.g. the implementation of the design takes different forms.

Thus there are Sub-Areas, Factors, and in particular, sample questions and criteria that are included in the appropriate software terminology to focus on these unique characteristics. The assessment is intended to address the System, while at the same time highlighting certain Sub-Areas and Factors peculiar to implementation technologies like software, which has been an Achilles heel on many defense programs.

Chapter 1
Pre-Milestone A Focus

1.0 Mission Capabilities/Requirements Assessment Area

Scope:
The review of mission capabilities/requirements is concerned with their clarity, completeness, reasonableness, testability, and stability; their implication for the resulting system operational requirements; and constraints by which the ensuing acquisition program is structured and executed. This includes interdependencies and interoperability requirements with other systems.

Perspective:
Customer: The Initial Capability Document (ICD) is probably the single most important document that defines the requirements and establishes ensuing acquisition activities to develop produce and field systems. The ICD describes the capability gap derived from the Joint Capability and Integration Development System (JCIDS) analysis process, and proposes materiel approaches to resolve the gap. It considers the DIA-validated threats, operational environment, joint concepts and other considerations to capture the evaluation of different materiel approaches. The ICD is not normally updated once approved. It becomes the baseline document for linkages between associated Capability Development Documents (CDDs) and Capability Production Documents (CPDs). The ICD supports the Analysis of Alternatives (AOA), Technical Development Strategy (TDS), Milestone A decisions, and subsequent TD phase activities.

Sub-Area 1.1 - Mission Capabilities/Requirements

Scope:
Assessment of key factors that address the manner in which the required capabilities are expected to be met in their intended operational setting.

Perspective:
Customer & Developer: The ICD is clear, complete, reasonable, testable and stable. It describes joint concepts, interface and interoperability requirements.

Factor 1.1.1 – Reasonableness

Criteria:
1.1.1.C1: (Customer) Milestone A review will not normally take place without a JROC-approved ICD or MNS. The ICD is to be vetted through the JTIDS analysis process, and fully coordinated by the Functional Capability Board (FCB) Principal Members. [1.1.1.Q1]
1.1.1.C2: (Customer) The ICD describes capability gaps and explains clearly why the recommended material approach is the best solution. The ICD clearly states required capabilities in broad and time phased operational goals. It should also capture the results of functional area analyses and functional needs analyses. [1.1.1.Q5]
1.1.1.C3: (Customer) The ICD clearly describes threats and the operational environment in which the capability must be exercised. The threats have been validated by the Defense Intelligence Agency (DIA). [1.1.1.Q2 & Q3]
1.1.1.C4: (Customer) The ICD explains how the required capabilities are linked with Joint Operational Concepts (JOCs), Joint Functional Concepts (JFCs), Joint Integration Concepts (JICs) and Integrated Architectures. [1.1.1.Q4]
1.1.1.C5: (Customer) Required attributes of the capability contain appropriate measure of effectiveness (MOEs), general enough so as not to prejudice a particular material solution. [1.1.1.Q5]
1.1.1.C6: (Customer) The ICD is properly supported by DOTMLPF analysis document. DOTMLPF refers to doctrine, operational concepts, tactics, materiel, leadership and education, personnel and facilities. [1.1.1.Q6]

<u>Sample Questions/Requests for Information:</u>
1.1.1.Q1: (Customer) Is there an approved ICD or MNS? If not, what is the plan for obtaining an ICD? [1.1.1.C1]
1.1.1.Q2: (Customer) Does the ICD describe operational environments in general terms of the current and projected threats to be countered? Does the ICD reference the DIA validated threat documents? [1.1.1.C3]
1.1.1.Q3: (Customer) Explain why the desired capabilities are essential to national security. [1.1.1.C1]
1.1.1.Q4: (Customer) Does the ICD describe mission areas, operational scenarios, and operational outcomes this capability contributes to? [1.1.1.C4]
1.1.1.Q5: (Customer) Describe the capability gap in terms of the missions, tasks, and functions, and the attributes of the desired capabilities in terms of desired effects? Are the desired effects general enough so as not to prejudice decisions in favor of a particular solution but specific enough to evaluate alternative approaches? [1.1.1.C2 & C5]
1.1.1.Q6: (Customer) Does the ICD summarize DOTMLPF analysis, ideas for materiel approaches, and analysis of materiel approaches? Does the ICD describe the best materiel approaches, and recommendations for further analysis during Concept Refinement (CR) phase? [1.1.1.C6]

<u>Sample Observations:</u>
1.1.1.O1: Active participation by the acquisition community in the development of ICD is essential for success of the subsequent acquisition activities.

Factor 1.1.2 – Stability

<u>Criteria</u>:
1.1.2.C1: (Customer) The ICD is properly supported by the analysis of all candidate approaches that address capability gaps. [1.1.2.Q1]
1.1.2.C2: (Customer) The ICD describes the materiel approaches for further AoA to be performed during the Concept Refinement (CR) phase. The constraints should be constructed to allow reasonable compromise between focusing the AoA and ensuring that novel and innovative approaches are considered. [1.1.2.Q2]
1.1.2.C3: (Customer) No changes should be made to the ICD between JROC approval and Milestone A review. [1.1.2.Q3]
1.1.2.C4: (Customer) Any changes should be reviewed by the JCIDS analysis process addressing changes to operation of concepts, Joint Concepts, Integrated Architectures, capability attributes, interoperability, DOTMLPF, technology maturity and responsiveness of the material approaches. [1.1.2.Q4]
1.1.2.C5: (Customer) The approved changes should be fully considered in conducting the final AoA. [1.1.2.Q5]

<u>Sample Questions/Requests for Information:</u>
1.1.2.Q1: (Customer) Has the ICD considered the best materiel approaches based on analysis of the relative cost, efficacy, performance, technology maturity, fielding time frame and risk? [1.1.2.C1]
1.1.2.Q2: (Customer) Does the ICD specify the key boundary conditions within which the AoA should be performed? Are the constraints for the AoA broad enough to consider more than two possible solutions? [1.1.2.C2]
1.1.2.Q3: (Customer) Has the ICD been changed? If changed, what were the changes and what caused them? [1.1.2.C3]
1.1.2.Q4: (Customer) Have the changes to the ICD been reviewed by the JCIDS analysis process for a complete analysis? [1.1.2.C4]
1.1.2.Q5: (Customer) Have the changes to the ICD been analyzed for their impact to the selected materiel approaches? Have the changes been considered in the AoA review process? [1.1.2.C5]

<u>Sample Observations:</u>
1.1.2.O1: The fact that the ICD has changed this early may indicate unclear and unstable requirements.

1.1.2.O2: Requirements change quickly with little warning and often without opportunity for the acquisition community to evaluate the impact and influence the changes.
1.1.2.O3: Assumptions and constraints for conducting AoA may be too restrictive. Such practices limit the materiel approaches to a minimum set of possible solutions, and may forego opportunities for novel and innovative approaches to solve the problems.

Factor 1.1.3 – Dependencies/External Interfaces

Criteria:
1.1.3.C1: (Customer) The ICD explains how the required capabilities are dependent upon other systems. [1.1.3.Q1 & Q3]
1.1.3.C2: (Customer) The ICD describes how the required capabilities are interfacing with other systems. The ICD defines the interoperability requirements of the capabilities in terms of high-level operational view (OV-1). The lines of the OV-1 show simple connectivity and what information is exchanged. [1.1.3.Q1]
1.1.3.C3: (Customer & Developer) A requirement is in place to develop a CDD that provides architecture view products" Operational Views (OV), System Views (SV), and Technical Views (TV) in accordance with the product definitions of the DoD Architecture Framework. [1.1.3.Q1]
1.1.3.C4: (Customer & Developer) The CDD includes the following integrated architecture products: AV-1, OV-2, OV-4, OV-5, OV-6C, SV-4, SV-5, SV-6; draft IT standards; interconnectivity profile; net-ready KPP (NR-KPP); information assurance compliance; and net-ready Key Interface Profile (NR-KIP). [1.1.3.Q2 & Q4]

Sample Questions/Requests for Information:
1.1.3.Q1: (Customer) Explain how the candidate program is linked with Joint Concepts (i.e., JOC/JFC/JIC) and other standards. [1.1.3.C1 & C2]
1.1.3.Q2: (Customer) Explain how the interoperability KPP, along with other KPP, will be developed during TD phase. [1.1.3.C4]
1.1.3.Q3: (Customer) Who has the authority and responsibility to develop external interfaces in a System-of-Systems (SoS) or Family-of-Systems (FoS)? [1.1.3.C1]
1.1.3.Q4: (Customer) Does OV-1 clearly define IERs between systems that make up the FoS or SoS? [1.1.3.C3]
1.1.3.Q5: (Customer) Describe the plans to develop integrated architecture products required for CDD. [1.1.3.C4]

Sample Observations:
1.1.3.O1: Not all external interface requirements were identified.
1.1.3.O2: All dependencies and external interface requirements were not identified or defined in the beginning.
1.1.3.O3: There are cases where AoA has not been performed or completed before entering into TD phase.

Factor 1.1.4 – Interoperability and Net-Readiness

Criteria:
1.1.4.C1: (Customer) The ICD appropriately addresses interoperability with the required national security system (NSS) and information technology system (ITS) infrastructure support, such as DISN, GCCS, GCSS, satellite system. [1.1.4.Q1 & Q2]
1.1.4.C2: (Customer) The ICD includes a high-level operational concept graphic (OV-1) that presents a top-level view of the interoperability requirements. [1.1.4.Q3]
1.1.4.C3: (Customer) Information exchanges between systems that make up the family of systems (FoS) or system of systems (SoS) are defined as high-level IERs. [1.1.4.Q3]
1.1.4.C4: (Customer & Developer) Plans are identified to develop an interoperability KPP during TD. An separate interoperability KPP should be identified for each block. [1.1.4.Q4, Q6 & Q7]
1.1.4.C5: (Customer & Developer) Interoperability requirements with Global Information Grid (GIG) are considered in the ICD. [1.1.4.Q3]

1.1.4.C6: (Customer & Developer) Plans are identified for net-centric attributes to migrate from through "point-to-point" interoperability to "many-to-many" net-centric environment. [1.1.4.Q9]
1.1.4.C7: (Customer) TDS includes collaboration with the Net-Centric Operations Warfare Reference Model (NCOW RM). [1.1.4.Q5, Q7 & Q9]

Sample Questions/Requests for Information:
1.1.4.Q1: (Customer) How is interoperability defined in the ICD? How is it measured? [1.1.4.C1]
1.1.4.Q2: (Customer) Does the ICD address required NSS and ITS infrastructure support such as DISN, GCCS, GCSS, satellite system? What IT/NSS standards will be implemented from the DoD Joint Technical Architecture (DoD JTA, Version 6.0). [1.1.4.C1]
1.1.4.Q3: (Customer) Are the interoperability requirements included in the ICD? Have the requirements considered interoperability with GIG? [1.1.4.C5]
1.1.4.Q4: (Customer) What was the relative importance of achieving net-ready interoperability in the decision making process regarding architecture, design and implementation? [1.1.4.C2 & C3]
1.1.4.Q5: (Customer) What regulations and policies are required to implement net-ready interoperability? What standards will be used to support interoperability? [1.1.4.C4]
1.1.4.Q6: (Customer) What is the plan to align net-ready requirements of the capability with the DoD NCOW Reference Model, Version 1.0? [1.1.4.C7]
1.1.4.Q7: (Customer) Describe the net-ready KPP for each block. List net-ready key interface profiles (NR-KIPs) for each block. [1.1.4.C7]
1.1.4.Q8: (Customer) How are the supportability requirements of the capability included in the ICD? [1.1.4.C4]
1.1.4.Q9: (Customer) What is the roadmap to migrate from interoperability through "point-to-point" interfaces to "many-to-many" typical of a network environment? [1.1.4.C6]
1.1.4.Q10: (Customer: For AIS Only) Does the ICD describe how the requirements relate to the Principal Staff Assistants (PSAs), Chief Information Officers (CIOs), and DoD component strategic planning? [1.1.4.C1]
1.1.4.Q11: (Customer: For AIS Only) Does the ICD describe the shortfalls of existing capabilities as well as the functional area, current organization and operational environment? [1.1.4.C1]
1.1.4.Q12: (Customer: For AIS Only) Does the ICD describe quantitative benchmarks of processing performance in terms of speed, productivity, and quality where comparable processes exist in the private sectors? [1.1.4.C1]

Sample Observations:
1.1.4.O1: Lack of clear definition of the interface requirements result in programs failing to achieve expected interoperability capabilities.
1.1.4.O2: Interoperability requirements are expressed in terms of IERs and no plans exist to advance to net-centric environment
1.1.4.O3: As NCES/GIG architectures and standards are evolving and being updated constantly, a net-ready capability cannot be successfully developed without vigilant attention and interactions with the DoD CIO office.

Factor 1.1.5 – Testability

Criteria:
1.1.5.C1: (Customer) The attributes of desired capabilities are described in broad terms. They are also defined by matrix such as time, distance, etc., that can be measured and tested. [1.1.5.Q1]
1.1.5.C2: (Customer) During concept refinement, an AoA is performed to arrive at the most cost-effective operational approach. All assumptions are critically reviewed and coordinated by all stakeholders. [1.1.5.Q2]
1.1.5.C3: (Customer) All interoperability requirements identified in OV-1 are measurable and testable. [1.1.5.Q3]
1.1.5.C4: (Customer) System engineering processes are used to generate detailed and executable requirement definitions during TD. The requirements definitions can be measurable and testable. [1.1.5.Q4]

Sample Questions/Requests for Information:
1.1.5.Q1: (Customer) Are the ICD parameters stated in measurable terms? [1.1.5.C1]
1.1.5.Q2: (Customer) Have the assumptions of the AoA plan been reviewed and coordinated by all stakeholders? [1.1.5.C2]
1.1.5.Q3: (Customer) Is the expected environment and operating condition of the capability clearly stated in the definitions of the measure of effectiveness and suitability? [1.1.5.C3]
1.1.5.Q4: (Customer) Explain the requirements management tools used in system engineering process. [1.1.5.C4]

Sample Observations:
1.1.5.O1: Documented measures of effectiveness are open to interpretation.
1.1.5.O2: Requirements parameters are opened to interpretation.

2.0 Resource Assessment Area

Sub-Area 2.1 – Technology Development Planning and Allocation

Scope:
Assess the amount of funding available to enter TD and testing including the funding profile and timeline, and how funding is projected to execute TD.

Perspective:
Customer: Allocated funds are sufficient to complete the TD phase.

Developer: Allocated program funding and expenditure rates track with planned TD work packages. All technology integration, demonstrations, analysis, simulation, experimentation, and testing needs along with support activities are accounted for.

Factor 2.1.1 – Sufficiency

Criteria:
2.1.1.C1: (Customer & Developer) The funding (amount and profile) and schedule duration to perform all the planned activities (including PM reviews) should be determined by systematic estimating methods which may include past completed program cost and schedule 'actuals' (history), independent cost estimates, etc. [2.1.1.Q1, Q2]
2.1.1.C2: (Customer & Developer) The T&E activity is adequately funded and adequate T&E resources (e.g. aerial targets, test ranges, etc.) are funded and available to conduct DT. [2.1.1.Q3]
2.1.1.C3: (Customer) An Initial Technology Review (ITR) was conducted to support the TD funding estimate. [2.1.1.Q4]

Sample Questions/Requests for Information:
2.1.1.Q1: (Customer & Developer) How is it determined that the planned and allocated funding and schedule are adequate to accomplish the TD? Does the type of funding match the planned scope of work? [2.1.1.C1]
2.1.1.Q2: (Customer & Developer) Identify what is covered by the funding and accommodated within the schedule. Please explain. [2.1.1.C1]
2.1.1.Q3: (Customer & Developer) Does planned funding include reserve funding to cover development test contingencies, engineering changes, T&E infrastructure and asset needs (ranges, targets, data collection/reduction/analysis, test participants and support) to conduct technology demonstration tests? Please explain. [2.1.1.C2]
2.1.1.Q4: (Customer) Provide the results of the ITR that were used to support the TD funding requirements. [2.1.1.C3]

Sample Observations:
2.1.1.O1: Insufficient program funding has resulted from poor cost estimating practices, as well as

ignoring the cost estimates developed to support the funding and scheduling realism decision. Funding profiles have been planned which are not realistically aligned with the program profile fiscal years needs.
2.1.1.O2: The inability to adequately identify and manage risk in the program leads to unexpected or unplanned cost growth.

Factor 2.1.2 – Continuity/Stability

Criteria:
2.1.2.C1: (Customer) It is important that the TD effort obtains and sustains funding to support its core requirements. This flow of funding needs to be stable and steady. [2.1.2.Q1]
(Logistics Support Comment)
2.1.2.C2: (Developer) Explain how the funding requirements were based on Performance Based Logistics. [2.1.2.Q2]

Sample Questions/Requests for Information:
2.1.2.Q1: (Customer) Describe how program funds have been allocated (by fiscal year) against the TD Program. Has the funding for this program been stable and steady so as to meet program needs? Please explain. [2.1.2.C1]
2.1.2.C2: (Developer) Explain how the total life cycle support requirements will be analyzed. Describe the basis for the estimates. [2.1.2.C2]

Sample Observations:
2.1.2.O1: Inconsistent and constrained funding is a common occurrence.
2.1.2.O2: Funding profile and timeliness are often insufficient for planned program phasing.

Sub-Area 2.2 – Personnel

Scope:
Assesses the capability of the existing workforce or the new work force envisioned and the thoroughness of the planning to acquire and train experienced personnel, and to evaluate worker performance to ensure a successful TD.

Perspective:
Customer: The TDO staff is the right mix of qualified personnel to complete TD.
Developer: Workforce management and training programs are high priority to ensure a stable work force to complete development and transition to production.

Factor 2.2.1 – Qualifications

Criteria:
2.2.1.C1: (Customer & Developer) Key contractor technical personnel including Chief Systems Engineer, head logistician, section chiefs, etc. have worked successfully on projects of similar complexity and have had significant work experience. [2.2.1.Q1]
2.2.1.C2: (Customer & Developer) The experience of the personnel is relevant to the current program in terms of both domain (e.g. system application) and complexity. [2.2.1.Q2]
2.2.1.C3: (Customer) Personnel in relevant positions must be trained to the appropriate certification levels in accordance with their acquisition career assignments. [2.2.1.Q1]

Sample Questions/Requests for Information:
2.2.1.Q1: (Customer & Developer) Please describe the experience level of each of the existing or planned key technical personnel. [2.2.1.C1 & c3]
2.2.1.Q2: (Customer & Developer) How is the experience of technical personnel relevant to the current activity? [2.2.1.C2]
2.2.1.Q3: (Customer) Are the personnel (e.g. program management, contracting, oversight) trained to the appropriate levels in accordance with their acquisition career assignments? Please explain. [2.2.1.C3]

Sample Observations:
2.2.1.O1 Contractor resources are readily acquired to leverage engineering experience during TD.

Factor 2.2.2 – Staffing

Criteria:
2.2.2.C1: (Developer) The contractor policy and program practice on workforce assignments should reflect a commitment to a stable workforce that will ensure that key personnel will exist with the TD program to address technical and other issues as they arise. [2.2.2.Q1]
2.2.2.C2: (Developer) Software development staffing should be consistent with level of effort required to conduct software integration, validation, and verification activities. [2.2.2.Q2]
2.2.2.C3: (Developer) Metrics used for manpower planning should be verified by contractor experience with similar TD efforts. [2.2.2.Q3]

Sample Questions/Requests for Information:
2.2.2.Q1: (Developer) Explain the procedures/policies that establish the priority of work force assignments across various activities, including this effort. [2.2.2.C1]
2.2.2.Q2: (Developer) How is software development staffing being addressed to support the software requirements of the TD effort? [2.2.2.C2]

Sample Observations:
2.2.2.O1: Lack of timely document review due to lack of government personnel availability.
2.2.2.O2: Negative program impacts caused by inter-program resource dependencies.

Factor 2.2.3 – Training

Criteria:
2.2.3.C1: (Developer) Policies and standards should be in-place to ensure the thorough and continual training of TD personnel. [2.2.3.Q1]
2.2.3.C2: (Developer) Training programs should use interactive tools and techniques, formal classroom or on-the-job training and be of duration commensurate with the type of job. [2.2.3.Q2]
2.2.3.C3: (Developer) The scope of the training program should include training of system operators to be used in the TD program.
2.2.3.C4: (Developer) Employee training programs should include periodic review and refresher training to maintain employee awareness of safety and environmental issues that can adversely affect the workforce and the program. [2.2.3.Q4]
2.2.3.C5: (Developer) The Quality Assurance organization identifies and provides the resources, such as skills, knowledge, tools, and equipment, which people need to implement and maintain the quality system. [2.2.3.Q5]

Sample Questions/Requests for Information:
2.2.3.Q1: (Developer) Describe any in-house training programs, continuing education and/or affiliations with academic centers. What are the standard requirements for training for TD personnel? [2.2.3.C1]
2.2.3.Q2: (Developer) How long does it take to train new technical personnel in the tools and methods needed to execute the activity position duties? Discuss the training methods used and the job positions and duration of training required for each. [2.2.3.C2]
2.2.3.Q3: (Developer) Have operators and maintainers been trained in preparation for TD testing.? Is a manning plan established? [2.2.3.C3]
2.2.3.Q4: (Developer) Describe the policies and procedures for training of employees in compliance with safety and environmental regulations. [2.2.3.C4]
2.2.3.Q5: (Developer) Describe the training programs for quality engineering, quality assurance, and quality conformance that are available to the employees. Describe specific training content, such as statistical methods and tools, design of experiments, etc., that are used to ensure quality of test products and processes. [2.2.3.C5]

Sample Observations:

2.2.3.O1: Training programs rely on outside educational sources for basic technical skills training.
2.2.3.O2: No formal program for workforce efficiency improvement. Individual departments are responsible for employee performance and incentives.
2.2.3.Q5 Training of personnel in simulations, war gaming and experimentation is adequately planned for the TD phase

Sub-Area 2.3 – Facilities

Scope:
Assesses the key areas of planning, utilization, and flexibility of the facilities and equipment to ensure that capabilities can be developed and demonstrated and cost and efficiency are adequately addressed in the TD phase.

Perspective:
Customer: Government-owned resources are available and adequate to support TD and test activities.
Developer: Plan and schedule the acquisition of equipment and facilities, which are accurately forecast, cost effective, and meet the needs of the planned TD program.

Factor 2.3.1 – Resources Planning

Criteria:
2.3.1.C1: (Developer) A key aspect of resource planning is the consideration of labor standards. These standards are important in workforce projection, but should also be considered when planning facilities and equipment, to ensure efficient utilization rates and overall productivity of the workforce. [2.3.1.Q1]
2.3.1.C2: (Developer) Environmental and safety regulations and standards are an integral part of the TD planning and should be compliant with federal, state, and contractor statutes and laws. Their impact on the cost of TD testing are evaluated. [2.3.1.Q2]
2.3.1.C3: (Customer & Developer) The identification and planned use of existing contractor assets and government-owned resources should be supported by the confirmed availability of the resources. Resource sharing between programs should be on a non-competing basis. [2.3.1.Q3]
2.3.1.C4: (Developer) The TD Plan provides for scheduled and unscheduled maintenance with little disruption to the demonstration schedule. [2.3.1.Q4]
2.3.1.C5: (Developer) Make/buy decisions are consistent with contractor policy and should reflect rationale that meets the planned schedule and offers the best value to the customer. [2.3.1.Q5]
2.3.1.C6: (Customer & Developer) The developer ensures that adequate T&E infrastructure and resources (ranges, targets, data collection/reduction/analysis, and test participants) and T&E facilities are available. [2.3.1.Q6]

Sample Questions/Requests for Information:
2.3.1.Q1: (Developer) Discuss how labor standards were considered when developing facilities and equipment requirements. [2.3.1.C1]
2.3.1.Q2: (Developer) Describe the safety, health, and environmental standards considered in the analysis of facilities and equipment requirements, and how these considerations factored into the facilities and equipment plans for the TD. Explain how these standards comply with federal, state, and contractor requirements, and the cost impact on the TD Strategy (TDS). [2.3.1.C2]
2.3.1.Q3: (Customer & Developer) Provide a list of existing contractor and Government-owned resources including facilities, tooling and equipment that is available and will be used for the TD. Explain procedures used to assure accountability of government owned resources. [2.3.1.C3]
2.3.1.Q4: (Developer) Explain how scheduled and unscheduled maintenance on facilities, equipment, and tools is addressed in the TDS. [2.3.1.C4]
2.3.1.Q5: (Developer) Explain the contractor make-buy policy for test equipment. Provide the status of make/buy for all major tools and test equipment. What percent of tooling and test equipment requirements are already available to the program? [2.3.1.C5]
2.3.1.Q6: (Customer & Developer) Describe the process used to ensure that adequate T&E infrastructure and resources (ranges, targets, data collection/reduction/analysis, and test participants) and T&E facilities are available. [2.3.1.C6]

<u>Sample Observations: (???)</u>
2.3.1.O1: Program schedules are delayed due to unforeseen conflicts of resource availability to conduct testing on time.

Factor 2.3.2 – Infrastructure

<u>Criteria:</u>
2.3.2.C1: The TDO receives technical and programmatic support from the government organizations that include laboratories, R&D centers, FFRDC and contractors. [2.3.2.Q1]
2.3.2.C2: Government and contractor's facility space are adequate to perform the TD activities without interruption [2.3.2.Q2]
2.3.2.C3: If new facilities are required, new facility plans are part of the overall management plan. [2.3.2.Q3]
2.3.2.C4: A facilities schedule exists and is consistent with the TD activities. Facilities are not on the program critical path. [2.3.2.Q4]
2.3.2.C5: Existing test and training facilities are adequate to support the TD test program. [2.3.2.C5]

<u>Sample Questions/Requests for Information:</u>
2.3.2.Q1 Describe the government infrastructure that support the TD effort. Identify the organizations that support this TD effort and describe their roles and responsibilities. [2.3.2.C1]
2.3.2.Q2: Are there additional facility space needed to execute the program? Please explain. [2.3.2.C2]
2.3.2.Q3: If new facilities are required, what are they? [2.3.2.C3]
2.3.2.Q4: Show the master schedule for new and existing facilities relative to program milestones. [2.3.2.C4]
2.3.2.Q5: Are the existing test and training ranges adequate to support the planned TD test program? [2.3.2.C5]

<u>Sample Observations:</u>
2.3.2.O1: New technologies and complex test requirements often drive contractors toward new vs. converted facilities, and thereby increases technical risks.

Sub-Area 2.4 – Engineering Tools

<u>Scope:</u>
Assess the range of system engineering tools, techniques, methods, etc., to support the TD efforts.

<u>Perspective:</u>
Customer: The TDO has system engineering tools that define and manage requirements changes, and have real-time management access to contractor's TD activities.
Developer: The contractor has in-depth knowledge and experience in working with system engineering and modeling and simulation tools.

Factor 2.4.1 – Systems Engineering (SE) Tools

<u>Criteria:</u>
2.4.1.C1: (Customer & Developer) Dynamic requirements are carefully managed and traced both backward to the operational capabilities and forward to product design and execution. Useful tools for requirements management include but are not limited to DOORS, RTM, and Requisite Pro. [2.4.1.Q1, Q2, and Q3]
2.4.1.C2: (Customer & Developer) Program management tools such as Project, Outlook, and Excel should be linked to other SE tools. [2.4.1.Q4]
2.4.1.C3: (Customer & Developer) Engineering analysis and designs are supported by appropriate diagramming tools such as Visio, Power point, RDD100, and UML design tools, e.g. Rational, CoolJex, Rhapsody, etc. [2.4.1.Q5]

2.4.1.C4: (Customer & Developer) Engineering design is supported by the use of automated tools including CAD, UML, Matlab, etc. [2.4.1.Q6]
2.4.1.C5: (Developer) Design analysis must be conducted at the lowest level possible and as early as possible to avoid costly "discoveries" during later test and evaluation. Commonly used analysis tools include CAD (ProE, CATIA), Matlab, ModSaf, OneSaf, Janus, legacy code, excel, Vega, UML (rational, CoolJex, Rapsody), etc. [2.4.1.Q7]
2.4.1.C6: (Customer & Developer) Test strategies and test design begin with a matrix identifying the verification method to be used for each requirement and design element identified in the SE process. It is essential that the verification matrix be linked to the requirement management and design tools. Commonly used tools include Excel, DAQ, LabView, etc. [2.4.1.Q8]

Sample Questions/Requests for Information:
2.4.1.Q1: (Customer & Developer) What SE tool(s) are used to capture and manage requirements? Provide a sample of the output of that tool. [2.4.1.C1]
2.4.1.Q2: (Customer & Developer) Does the requirements management tool support requirements flow-down? Does the tool support capture of allocation rationale, accountability, test/validation, criticality, issues, etc? If so, how and what mechanism does it use? [2.4.1.C1]
2.4.1.Q3: (Customer & Developer) Does the requirements management tool support traceability analysis? Please explain. [2.4.1.C1]
2.4.1.Q4: (Customer & Developer) What tools are used to support project management planning and execution? What linkages exist between the management tool(s) and other SE tools? [2.4.1.C2]
2.4.1.Q5: (Customer & Developer) What tool(s) are used to capture system element structure? How does the tool graphically and textually capture system element structure? [2.4.1.C3]
2.4.1.Q6: (Developer) Describe the automated design tools used on the program. How are interfaces managed when different tools are used for different systems elements? Do the tools support multiple system views? [2.4.1.C4]
2.4.1.Q7: (Developer) What tools and techniques are used to force early verification of designs and interfaces at the part, component or module level? Are independent QA processes used at this level of verification? What tools are used to ensure low-level designs meet standards referenced at the requirements definition level? [2.4.1.C5]
2.4.1.Q8: (Customer & Developer) Are SE and T&E fully integrated activities? Do tools used to trace requirements to test/verification events also perform the reverse function of tracing test/verification events back to all related requirements? [2.4.1.C6]

Sample Observations:
2.4.1.O1: SE tools that are not fully integrated with one another provide a good indication that the program does not have an effective SE program, but rather, has several stove-pipe activities operating under a "SE" umbrella.
2.4.1.O2: Many programs start with a good requirements flow-down and initial traceability, but as requirements change, (changing operational capabilities, delayed technology, threat updates, etc) total system impacts are not fully analyzed and updated.

Factor 2.4.2 – Modeling & Simulation (M&S) Tools

Criteria:
2.4.2.C1: (Developer) M&S is used for design and analysis purposes. To the extent practicable, simulation modules are integrated, and hardware-in-the-loop is planned for the integration and test facilities, to ensure high fidelity results. [2.4.2.Q1, and Q6]
2.4.2.C2: (Customer & Developer) There is a simulation development plan complete with milestones. For SoS/Fos, the plan describes interoperability and CONOPS demonstrations. [2.4.2.Q1]
2.4.2.C3: (Customer & Developer) Simulations are used to evaluate design and support options and changes including configuration change evaluations and test readiness reviews. [2.4.2.Q2]
2.4.2.C4: (Customer & Developer) A structured simulation-based approach is used for failure analyses and/or problem diagnostics based on test sensor output matched to simulation models. [2.4.2.Q2]
2.4.2.C5: (Customer & Developer) Life cycle simulations are used/planned to derive reliability criteria, material needs, optimized support work, and logistical arrangements. [2.4.2.Q2 and Q13]

2.4.2.C6: (Developer) Delivery schedules, in-factory material movement, work station and test flow simulations are used, as appropriate, to evaluate impact of design changes, predict production build time and manpower needs, and relocations or restructuring of facilities. [2.4.2.Q2 and Q3]
2.4.2.C7: (Customer & Developer) Simulations used beyond Milestone A are validated. A formal or structured validation process is important and is managed as a key watch item. [2.4.2.Q9]
2.4.2.C8: (Customer & Developer) If appropriate, Government and contractor use common M&Ss to support both development and test and evaluation. Simulations used to evaluate program performance as part of the test and evaluation process are verified independently from contractor simulations and undergo the same verification and validation (V&V) rigor. [2.4.2.Q8 and Q14]
2.4.2.C9: (Developer) Simulations are netted with interface system simulations to help demonstrate interoperability. Real time simulations exist to evaluate performance of dynamic netted systems, and dynamic hardware in the loop,. [2.4.2.Q7 and Q12]
2.4.2.C10: (Developer) CAD/CAM is used for the design of subsystems and the integration of complex systems. Personnel can readily identify these tools, their readiness, and past uses. [2.4.2.Q4]
2.4.2.C11: (Developer) M&S tools and products are based on MOSA design principles to easily integrate different hardware and software products. All subsystems, as developed, should be pre-certified to avoid integration "unknowns" [2.4.2.Q5]
2.4.2.C12: (Customer & Developer) M&S support strategy is documented in a M&S support plan. [2.4.2.Q10]
2.4.2.C13: (Customer & Developer) The TDS encompasses the M&S support strategy, and is aligned with the M&S support plan, and the TDS must address the means to support such use. [2.4.2.Q11]
2.4.2.C14: (Customer & Developer) The M&S support strategy leverages expertise as required, from other government sources, to assist in support planning and training of program office personnel. [2.4.2.Q12]
2.4.2.C15: (Customer & Developer) A common repository or archive should be maintained for M&S data management. This will prevent duplication of effort and will make M&S results available to all users of that information. [2.4.2.Q19]
2.4.2.C16: (Customer & Developer) M&S efforts include use of common standards. This will make models developed for component or system development to be easily integrated into more complex System-of-systems M&S efforts. [2.4.2.Q20]

Sample Questions/Requests for Information:
2.4.2.Q1: (Customer & Developer) Describe M&S used in the design and support planning. If available, provide a copy of the M&S development plan. [2.4.2.C1 and C2]
2.4.2.Q2: (Customer & Developer) Provide a detailed presentation of all the M&S to be used on the program. Describe their functionality. [2.4.2.C3 through C6]
2.4.2.Q3: (Developer) Describe the computer aids used in the workstations. [2.4.2.C6]
2.4.2.Q4: (Developer) Provide a description of the tools used by the design team(s) (e.g. CAD/CAM). [2.4.2.C10, and C11]
2.4.2.Q5: (Developer) Are M&S tools open systems design? Please explain. [2.4.2.C11]
2.4.2.Q6: (Developer) Describe the extent to which hardware-in-the-loop testing will be incorporated in the planned simulations. [2.4.2.C1]
2.4.2.Q7: (Developer) Explain how the contractor development team provides connectivity and compatibility in the use and sharing of development tools, modeling and test results to benefit an integrated design approach. [2.4.2 C9]
2.4.2.Q8: (Customer) Are Government simulations planned to be used? Describe how these will be used and verified. [2.4.2 C8]
2.4.2.Q9: (Customer & Developer) Describe how M&S used during TD will be validated. [2.4.2.C7]
2.4.2.Q10: (Customer & Developer) Has a modeling & simulation support plan been developed for the program? Please describe. [2.4.2.C12]
2.4.2.Q11: (Customer & Developer) How is the plan aligned with the acquisition strategy? [2.4.2.C13]
2.4.2.Q12: (Customer & Developer) Does the M&S Support Strategy address systems-of SE requirements, and how M&S will enable those processes? [2.4.2.C9]
2.4.2.Q13: (Customer & Developer) Does the M&S Support Strategy address M&S Requirements across the entire life cycle? [2.4.2.C5]

2.4.2.Q14: (Customer & Developer) Does the M&S Support Strategy address both government and contractor M&S? [2.4.2 C8]
2.4.2.Q15: (Customer & Developer) Does M&S planning include data management, such as a common data repository or archive? [2.4.2.C15]
2.4.2.Q16: (Customer & Developer) Does M&S planning call for common standards, such as HLA? [2.4.2.C16]
2.4.2.Q17: (Customer & Developer) Does the plan/strategy intend to pre-certify all subsystems (including software) to prevent integration “unknown unknowns”? [2.4.2.C11]
2.4.2.Q18: (Customer & Developer) For a SoS/FoS, explain the plan to demonstrate system interoperability? [2.4.2.C2]

Sample Observations:
2.4.2.O1: Most programs have excellent support tools and generally make good use of them.
2.4.2.O2: Evaluation simulations are the same as design simulations.
2.4.2.O3: Contractors cannot readily address CAD/CAM tools (existence and readiness)

3.0 Management Assessment Area

Sub-Area 3.1 – Technology Development Strategy (TDS)

Scope:
Assesses the current status of the TDS.

Perspective:
Customer: The TDS reflects the plan to demonstrate the feasibility of developing and integrating new technologies with existing ones to form a new capability.
Developer: The TDS is robust and incorporates the Modular Open Systems Architecture (MOSA) design approach for all key interfaces within the system concept. Supportability is addressed and technology maturity is assessed and verified.

Factor 3.1.1 – Acceptability

Criteria:
3.1.1.C1: (Customer) Adequate funding and realistic schedule are allocated to meet the technology maturation goals of the TDS objectives. If time and funding are constrained, the goals should be adjusted with those constraints. [3.1.1.Q1]
3.1.1.C2: (Customer) The TDS addresses all elements, including supportability, of the ICD. [3.1.1.Q2]
3.1.1.C3: (Developer) The TD concept incorporates MOSA features and Commercial Off the Shelf (COTS) hardware and software consistent with DoD acquisition policy. [3.1.1.Q3]
3.1.1.C4: (Customer & Developer) The TDS considers competition and other means to select alternatives to be considered for further development to optimize for Total Ownership Cost (TOC). [3.1.1.Q4]
3.1.1.C5: (Customer) The TDS is structured so as to serve the TD phase as an Acquisition Strategy Report (ASR) serves the System Development and Demonstration (SDD) phase. [3.1.1.Q5]
3.1.1.C6: (Customer) The TDS addresses the TDM’s responsibility for total life cycle management in accordance with DoD Policy. [3.1.1.Q]
3.1.1.C7: (Developer) The TDS addresses Performance Based logistics supportability requirements. [3.1.1.Q7]

Sample Questions/Requests for Information:
3.1.1.Q1: (Customer) Explain how the current TDS objectives fully support and are traceable to the ICD. [3.1.1.C1]
3.1.1.Q2: (Customer) Describe how the TDS addresses the supportability requirements of the ICD. [3.1.1.C2]
3.1.1.Q3: (Developer) Describe how the MOSA design enables the use of COTS technology. Are commercial standards used for internal and external interfaces? Please explain. [3.1.1.C3]

3.1.1.Q4: (Customer & Developer) Explain how the TDS addresses TOC and how the approach taken will provide best value to the government. [3.1.1.C4]
3.1.1.Q5: (Customer) Describe how the TDS supports the TD phase. [3.1.1.Q5]
3.1.1.Q6: (Customer) Describe how the TDO satisfies the DoD requirement to provide total life cycle management. [3.1.1.C6]
3.1.1.Q7: (Developer) Explain how TDS provides for Performance Based logistics support. [3.1.1.C7]

Factor 3.1.2 – Feasibility

Criteria:
3.1.2.C1: (Developer) The feasibility to achieve the required technological maturity is a key issue for entering MS A. Feasibility is confirmed during the hardware build, integration and test activities of the TD phase and performance at Technology Readiness Level (TRL) Six or higher has been demonstrated. [3.1.2.Q1]
3.1.2.C2: (Customer & Developer) The TDS describes a feasible approach to continue technology maturation in support of development beyond the TD phase, given that the objectives of the TD phase are achieved. [3.1.2.Q2 and Q3]
3.1.2.C3: (Customer) Technology obsolescence is factored into the TDS. Electronic components likely to become obsolete, including COTS, are considered during concept design. Plans include a process to determine when technology-refresh actions should be performed. [3.1.2.Q4]

Sample Questions/Requests for Information:
3.1.2.Q1: (Developer) Explain how TD will verify the selected technologies for follow-on activity. Describe the critical technologies used in the concept and provide an assessment of their maturities using accepted technology readiness level Standards (i.e., levels 1 through 9). For any assessed below level 5, describe what is being done to mature those technologies. [3.1.2.C1]
3.1.2.Q2: (Customer) Explain how the incorporation of advanced technologies for capability improvements to the system is factored into the TDS . [3.1.2.C2]
3.1.2.Q3: (Customer & Developer) Describe the continuous evolution of the capability under an evolutionary or spiral approach to incorporate deferred or evolving capability requirements into subsequent TD. [3.1.2.C2]
3.1.2.Q4: (Customer) Explain how the TDS addresses technology obsolescence. [3.1.2.C3]

Sample Observations:
3.1.2.O1: Some selected technologies are unlikely to be matured during the TD phase.
3.1.2.O4: Technology obsolescence of electronic components is accommodated by reliance on Commercial Off-the-Shelf (COTS) components to reduce risk. Product is designed to commercial specifications where possible.

Sub-Area 3.2 – Technology Development Planning

Scope:
Assesses the effectiveness of the TD planning approach, including scheduling, funding, program planning and management control.

Perspective:
Customer: The TDM plans to manage the risks to an acceptable level to proceed with TD. Program cost estimates are of high fidelity.
De*veloper:* Management and tracking processes are in place to control risks during TD.

Factor 3.2.1 – Schedule Tracking

Criteria:
3.2.1.C1: (Developer) The functional equivalent of an integrated master schedule is in place to define the critical path and identify schedule variances, and is linked to an Earned Value Management System (EVMS). [3.2.1.Q1]

3.2.1.C2: (Developer) Monitoring of the critical path for deviations includes development subcontractors' activities and all external dependencies. [3.2.1.Q2 and 3.2.1.Q4]
3.2.1.C3: (Developer) The program schedule includes all program activities. Critical path events are clearly annotated and technical risk areas are highlighted. [3.2.1.Q1]

Sample Questions/Requests for Information:
3.2.1.Q1: (Developer) Explain the relationship between the TD schedule and the EVMS schedules. [3.2.1.C1]
3.2.1.Q2: (Developer) Identify the critical path and risk areas associated with the transition to SDD. [3.2.1.C2]
3.2.1.Q3: (Developer) Describe the process for managing the schedule to accommodate changes in critical events during TD. [3.2.1.C3]
3.2.1.Q4: (Developer) Explain how variances from the critical path will be analyzed and communicated to all stakeholders. [3.2.1.C2]

Sample Observations:
3.2.1.O1: The TD phase often requires inclusion of technologies not adequately analyzed during the CR phase.
3.2.1.O2: The schedule is not used as an effective management tool to track progress.

Factor 3.2.2 – Feasibility

Criteria:
3.2.2.C1: (Customer) Funding and schedules account for anticipated technology risks [3.2.2.Q1]
3.2.2.C2: (Customer) Funding allocation is reasonable and is based on experience and sound estimating/modeling methods. [3.2.2.Q2]

Sample Questions/Requests for Information:
3.2.2.Q1: (Customer) How will the TD contract funding and schedule accommodate anticipated technology lead times? [3.2.2 C1]
3.2.2.Q2: (Customer) Does the funding profile include appropriate management reserve? [3.2.2.C2]

Sample Observations:
3.2.2.O1: No cost estimates based on similar programs exist. Bottom-up estimates are required.
3.2.2.O2: Past experience is limited and not fully relevant to the current TD.

Factor 3.2.3 – Suitability

Criteria:
3.2.3.C1: (Developer) Appropriate processes are in place to manage the TD effort and control changes to the plan.
3.2.3.C2: (Developer) The management team has sufficient insight into subcontractors' programs to manage changes to TD plans. [3.2.3.Q2]

Sample Questions/Requests for Information:
3.2.3.Q1: (Developer) What is the process for maintaining/updating program planning activities? Who has the authority to change the planning process? [3.2.3.C1]
3.2.3.Q2: (Developer) How is the prime contractor involved in and cognizant of its subcontractors' planning processes? [3.2.3.C2]

Sample Observations:
3.2.3.O1: Subcontractor schedule performance is not effectively integrated with the prime contractor's schedule performance.
3.2.3.O2: Program planning activities are effectively considered through the Integrated Product Team process when a good system engineering approach is followed.

Sub-Area 3.3 – Management of Technology Development

Scope:
Assesses the capability of the Technology Development Office (TDO) organization and the implementation of sound management practices across the cost, schedule, technical, and quality aspects of the program.

Perspective:
Customer: The TDO must be staffed with qualified personnel who possess acquisition-certified credentials, and have the requisite experience in system development, test, and production in the right mix to oversee contractor activities in all functional areas.
Developer: Success of the program depends on maintaining a qualified staff and leveraging the tools and resources of the company. Effective risk management includes integrated team management and reporting, a strong quality assurance program, and visibility by senior management, in order to provide resources necessary to maintain critical path schedules throughout TD phase.

Factor 3.3.1 – Organization

Criteria:
3.3.1.C1: (Customer) The TDO is organized to execute all functions in preparation for Milestone A review and TD activities, including the formation of appropriate Integrated Product Teams (IPTs) or their equivalents. Roles and responsibilities are clearly defined and consistent with achieving the TD objectives. [3.3.1.Q1]
3.3.1.C2: (Developer) The contractor development team is organized to perform assigned TD functions. Appropriate IPTs are formed, including subcontractors. Roles, responsibilities, and lines of authority are clearly defined and consistent with achieving the TD objectives. [3.1.2.Q2, Q3 & Q4]
3.3.1.C3: (Customer & Developer) OSD Test and Evaluation personnel are viewed as partners in the development and execution of the Test & Evaluation Master Plan (TEMP). [3.1.2.Q5]

Sample Questions/Requests for Information:
3.3.1.Q1: (Customer) Provide TDO organizational charts and describe how the TDO is organized, supported and staffed to execute the TD activities. Describe how roles and responsibilities are defined and assigned. [3.3.1.C1]
3.3.1.Q2: (Customer) Have charters been developed and approved for the IPTs. [3.3.1.C2]
3.3.1.Q3: (Developer) Provide the contractor and major subcontractor organization charts and describe how the organization is staffed to execute TD. [3.3.1.C2]
3.3.1.Q4: (Developer) Describe the contractor SE organization for the TD effort and how it supports decision making for risk reduction efforts. [3.3.1.C2]
3.3.1.Q5: (Customer) Has the TDM embraced OSD involvement in test program development and execution? Describe the degree of access by OSD personnel for test events, test plans, review meetings, etc. [3.3.1.C3]

Sample Observations:
3.3.1.O1: Requirements change management and change control are not coordinated between the customer and the developer.
3.3.1.O2: The Modeling and Simulation Advisory Group operates autonomously and is not part of the decision-making process.

Factor 3.3.2 – Suitability of Program Staff Experience

Criteria:
3.3.2.C1: (Customer) The TDO staff has the requisite experience and training to perform TD management efforts effectively. [3.3.2.Q1]

3.3.2.C2: (Customer) The TDM has relevant senior level experience in the management of TD. [3.3.2.Q1]
3.3.2.C3: (Developer) The contractor staff has the requisite experience and training to execute TD efforts. [3.3.2.Q1]

Sample Questions/Request for Information:
3.3.2.Q1: (Customer) Describe the relevant experience of the TDM and TDO staff to manage CR and TD efforts. [3.3.2.C1 & C2]
3.3.2.Q2: (Developer) Describe the relevant experience of the contractor staff to execute TD. [3.3.2.C3]

Sample Observations:
3.3.2.O1: The TDO staff needs have not been fully addressed.

Factor 3.3.3 – Risk Management

Criteria:
3.3.3.C1: (Customer & Developer) Risks that have a potential impact on cost, schedule, and performance thresholds are formally tracked by a Risk Management Working Group or like organization. [3.3.3.Q1]
3.3.3.C2: (Customer & Developer) A risk management process manages program risks in an ongoing fashion during TD. This process and methodology includes risk identification, risk assessment, risk mitigation, and tracking risks to closure. [3.3.3.Q2, Q3, Q4, Q5 and Q6]
3.3.3.C3: (Customer & Developer) Risk management methodologies are applied to contain and mitigate programmatic and technical risk. These risk management activities are integrated with other TD processes. [3.3.3.Q2]
3.3.3.C4: (Customer) TDO establishes and maintains a risk mitigation reporting system for data collection and feedback. [3.3.3.Q7]
3.3.3.C5: (Customer) TDO weighs the impact of significant technical risk issues on the hierarchical systems and/or programs. [3.3.3.Q8]

Sample Questions/Requests for Information:
3.3.3.Q1: (Developer) Describe the contractor risk management procedures. Explain how both routine and unplanned changes are risk managed. Who is responsible to implement risk management on the program? [3.3.3.C1]
3.3.3.Q2: (Developer) Identify and describe the formal tool(s) and mechanism(s) that are in-place to manage the risks on this program? [3.3.3.C2 and C3]
3.3.3.Q3: (Customer & Developer) Identify any commonly accepted risks that the program is not formally tracking. Provide a list of the top five risks on the program. [3.3.3.C2]
3.3.3.Q4: (Customer & Developer) Describe the risk management plan including descriptions of identified risks, quantitative risk assessment, risk mitigation, and tracking risks to closure. [3.3.3.C2]
3.3.3.Q5: (Customer & Developer) Describe how the risk items identified, analyzed, and included in the program risk assessment. [3.3.3.C2]
3.3.3.Q6: (Customer & Developer) Describe how risks are mitigated to closure. Explain the risk management process is integrated with the management process. [3.3.3.C2]
3.3.3.Q7: (Customer & Developer) Explain how the risk mitigation activity is reported and tracked during TD. [3.3.3.C4]
3.3.3.Q8: (Customer & Developer) Describe how the risk management process include a link with the hierarchical systems and/or programs to examine risk alternatives and program impacts? [3.3.3.C5]

Sample Observations:
3.3.3.O1: The contractor has a token effort at risk management; but it is not used in making key program decisions.
3.3.3.O2: Risk management for software is given less visibility as hardware issues are encountered.

Factor 3.3.4 – Techniques and Methods

Criteria:
3.3.4.C1: (Customer & Developer) Appropriate management techniques, methods, and tools are used to

manage TD. These techniques, methods, and tools enable management to access timely information and status, mitigate risks, and facilitate timely decisions to keep the TD on track with the Integrated Master Schedule. [3.3.4.Q1 and Q9]
3.3.4.C2: (Customer & Developer) The health of a program is commonly gauged in terms of cost, schedule, and performance. In addition to the Technical Performance Measures (TPMs), metrics are identified and used to cover other performance-related requirements/capabilities such as test success criteria, as well as cost and schedule performance using Earned Value Management (EVM) methodology. Metrics identified are well defined, and data are readily available, collected, documented and acted upon. For those metrics not being met, a plan of action should be developed. [3.3.4.Q5, Q8 and Q11]
3.3.4.C3: (Customer & Developer) It is important that programs are able to establish an efficient data collection and management process. These data need to be well defined and readily available. The key is being able to answer the questions, “Where are you?” “How do you know?” and “Show me.” [3.3.4.Q5 and Q8]
3.3.4.C4: (Customer & Developer) The TDO initially approves the TD metrics and then periodically, e.g., monthly, the metrics should be reported and reviewed. These metrics should include many, if not all of the following:

- Development status S curves
- Processor throughput utilization
- Processor memory utilization
- Input/output utilization
- Software Engineering Staffing
- Software Work Packages Summary
- Schedule Performance Index
- Cost performance Index
- Problem/Deficiencies /Discrepancies Status
- Requirements Stability
- Software Size
- Reuse Status (planned vs. ‘actuals’)
- Reliability Growth Curve
- Development test status
    - DAES Reporting (For MDAPS)
    - Milestone B entrance criteria

[3.3.4.Q2 through Q8 and Q10]

<u>Sample Questions/Requests for Information:</u>
3.3.4.Q1: (Customer & Developer) Describe the program management techniques, methods, and tools used to manage TD. [3.3.4.C1]
3.3.4.Q2: (Customer & Developer) Describe program metrics, including software metrics, used to manage the TD. [3.3.4.C4]
3.3.4.Q3: (Customer & Developer) Describe how metric thresholds are used to track development progress. [3.3.4.C4]
3.3.4.Q4: (Customer & Developer) Explain who in the organization generates the metrics and who in the organization reviews the metrics. Explain how often the metrics are updated and presented to senior management. [3.3.4.C4]
3.3.4.Q5: (Customer & Developer) Describe how the metrics are interrelated and integrated with other management tools such as TPMs, Test Success Criteria, risk management, EVM and cost reporting. [3.3.4.C2, C3 and C4]
3.3.4.Q6: (Customer & Developer) Describe how metrics are structured and maintained to capture and track trend data. [3.3.4.C4]
3.3.4.Q7: (Customer & Developer) Describe how the program metrics are initially approved and then periodically reviewed by and reported to the TDO. [3.3.4.C4]
3.3.4.Q8: (Customer & Developer) Explain the process for determining current TD status and for updating this information. [3.3.4.C2, C3 and C4]
3.3.4.Q9: (Customer & Developer) Describe any other management tools that are used during TD. [3.3.4.C1]

3.3.4.Q10: (Customer & Developer) Describe other forms of monitoring the TD program status and health (e.g., internal audits). Explain how such reporting is used in managing the program. [3.3.4.C4]
3.3.4.Q11: (Customer & Developer) Describe how the EVMS is used for resource projections and critical path analyses? [3.3.4.C2]
3.3.4.Q12: (Customer) Is the program prepared to implement Defense Acquisition Executive Summary (DAES) reporting after MS A? (MDAPs only) [3.3.4.C4]

Sample Observations:
3.3.4.O1: The TDO does not properly analyze contractor status reports.
3.3.4.O2: The contract status reports do not allow the TDO to track status.
3.3.4.O3: Essential review and oversight activities are not performed.

Factor 3.3.5 – Management Information Systems

Criteria:
3.3.5.C1: (Customer & Developer) State-of-the-art information system techniques, tools, computing equipment and software applications are used to manage TD. [3.3.5.Q1]
3.3.5.C2: (Customer & Developer) A new management information system (MIS) is treated as a deliverable. It conforms to Information Technology (IT) regulatory and statutory requirements such as Clinger-Cohen Act (CCA) compliance. [3.3.5.Q1]

Sample Questions/Requests for Information:
3.3.5.Q1: (Customer & Developer) Describe the MIS that will be used during TD. [3.3.5.C1]
3.3.5.Q2: (Customer & Developer) For any new MIS, explain how it complies with the IT regulatory and statutory requirements such as CCA compliance. [3.3.5.C2]
3.3.5.Q3: (Customer & Developer) Describe all MIS tools to be used during TD. [3.3.5.C1]

Sample Observations:
3.3.5.O1: (Customer & Developer) TDO and contractor use up-to-date and state-of-the-art MIS tools.

Factor 3.3.6 –Configuration Management

Criteria:
3.3.6.C1: (Customer & Developer) Configuration control and authority for managing requirements management is clearly defined and understood by all parties. The state-of-the-art requirements management tools are used by both DTO and the contractor. [3.3.6.Q1]
3.3.6.C2: (Customer & Developer) Configuration management (CM) is integral to the SE processes in managing hardware and software including supplier base during TD. [3.3.6.Q4]
3.3.6.C3: (Developer) The contractor has a formal CM system that sets the baseline, tracks and controls changes, and maintains integrity of the process via formal audits. The TDO has an instant access to the contractor CM system. [3.3.6.Q2]
3.3.6.C4: (Customer & Developer) TDO and the contractor evaluate and document the impact of proposed changes (i.e., requirement or technical), and track the changes. [3.3.6.Q3]
3.3.6.C5: (Customer & Developer) The CM process also addresses obsolescence and technology refreshment. [3.3.6.Q5]

Sample Questions/Requests for Information:
3.3.6.Q1: (Customer & Developer) Describe how the requirements management process addresses configuration control and authority. [3.3.6.C1]
3.3.6.Q2:. (Customer & Developer) Describe how the CM process is used to mange requirements changes, and how it is connected to SE process and program management tools such as Earned Value Management System (EVMS). [3.3.6.C3]
3.3.6.Q3: (Customer & Developer) Describe the contractor CM system and how it is related to the SE process. [3.3.6.C4]
3.3.6.Q4: (Developer) How does the CM process include the supplier base? [3.3.6.C2]

3.3.6.Q5: (Customer & Developer) Explain how the CM process addresses obsolescence and technology refreshment. [3.3.6.C5]

Sample Observations:
3.3.6.O1: Requirements changes are not often managed or evaluated thoroughly. The impacts of changes are not well understood, causing technical problems later in development.
3.3.6.O2: CM of requirements is required, but not often practiced.
3.3.4.O3: Requirement changes are not resulted or adequately reflected in system changes.

Sub-Area 3.4 – Contracting and Subcontracting

Scope: Assesses how the contract is structured to serve the needs of the TD.

Perspective:
Customer: The TDO works with government contract specialists and lawyers to structure the TD contracts that provide the best values to the program that will follow the TD efforts.
Developer: The contracting strategy provides the best values for the government's TD efforts and also for the overall acquisition program that will follow the TD efforts.

Factor 3.4.1 – Conditions/Constraints

Criteria:
3.4.1.C1: (Customer & Developer) TD and risk reduction requirements are defined in a contract, and specifically flowed down to the subcontractors. [3.4.1.Q1]
3.4.1.C2: (Developer) The contractor requires a connectivity of management processes with subcontractors and suppliers to provide compatibility in managing and reporting. [3.4.1.Q2]
3.4.1.C3: (Customer & Developer) Contract types (e.g., cost plus or fixed price) are commensurate with the TD risk at each contracting level. [3.4.1.Q3]
3.4.1.C4: (Customer & Developer) The contract and subcontracts have provisions to obtain rights to data, software, and property consistent with the planned life-cycle support strategy. The contract and subcontracts have provisions for data verification and warranties. [3.4.1.Q5]
3.4.1.C5: (Developer) The contractor and major subcontractors utilize their infrastructure and internal processes to establish program-specific plans, such as systems engineering, software development, risk mitigation, and test & evaluation, that are required for TD efforts. [3.4.1.Q2]
3.4.1.C6: (Customer & Developer) Incentives exist to motivate the contractor to achieve TD objectives, that include DoD-wide initiatives, such as MOSA, net-readiness, etc. [3.4.1.Q4]

Sample Questions/Requests for Information:
3.4.1.Q1: (Customer & Developer) Describe how TD and risk reduction requirements are identified in the contracts. Explain how these requirements are flowed down to the development subcontractors. [3.4.1.C1]
3.4.1.Q2: (Developer) Explain how the contractor has established management process compatible with major subcontractors to provide the customer with an integrated development efforts. [3.4.1.C2 & C5]
3.4.1.Q3: (Customer & Developer) Identify the types of contracts used by the prime and subcontractors, and explain how the selected approach best suits the TD effort. [3.4.1.C3]
3.4.1.Q4: (Customer & Developer) Explain how the contractor is provided with incentives for achieving DoD-wide initiatives, such as MOSA, net-readiness, etc., during TD. [3.4.1.C6]
3.4.1.Q5: (Customer & Developer) Describe contractual provisions to obtain government rights to technical data. Explain how these provisions flowed down to major subcontractors. [3.4.1.C4]

Sample Observations:
3.4.1.O1: The contract contains provisions that specifically call for implementation of MOSA and net-readiness.
3.4.1.O2: Not all subcontractors are practicing Integrated Product and Process Development.

Factor 3.4.2 – Cost/Schedule Accounting

Criteria:
3.4.2.C1: (Developer) An approved Earned Value Management System (EVMS) is used by the contractor to measure progress relative to the allocated budget and schedule for the TD efforts. The EVMS conforms to a commercial or DOD standard. It includes discrete work packages for all elements of the TD efforts, with the appropriate test/verification activities included. [3.4.2.Q1 & Q3]
3.4.2.C2: (Developer) Cost and schedule performance status is reported to senior management and line executives in a timely manner. [3.4.2.Q2]
3.4.2.C3: (Developer) EVMS reporting is used as a management tool to trigger management actions when necessary. Senior program managers review work packages to gain more timely insight into program status. [3.4.2.Q2]
3.4.2.C4: (Developer) The planned cost and schedule of work packages are estimated on past experience of similar TD works. [3.4.2.Q4]
3.4.2.C5: (Developer) Subcontractor cost reporting is current and uses methods and practices consistent with the contractor's cost reporting system. [3.4.2.Q5]
3.4.2.C6: (Customer) A reserve fund is set aside to cover unforeseen risks during TD. [3.4.2.Q6 & Q7]
3.4.2.C7: (Customer & Developer) The master schedule for the TD effort includes an Integrated Baseline Review(IBR) to establish the Performance Measurement Baseline (PMB). [3.4.2.Q8]

Sample Questions/Requests for Information:
3.4.2.Q1: (Customer & Developer) Provide the latest EVM reports and explain how program cost and schedule performance is reported. Explain how the report provides a timely and accurate measure of progress. [3.4.2.C1]
3.4.2.Q2: (Customer & Developer) Who receives these reports, and how are they used in managing TD? [3.4.2.C2 & C3]
3.4.2.Q3: (Developer) Describe the EVMS reporting chain for the work packages. Identify the standard that the contractor EVMS conforms to? [3.4.2.C1]
3.4.2.Q4: (Developer) Identify those involved in the baseline estimating process. [3.4.2.C4]
3.4.2.Q5: (Developer) Explain how subcontractor's data are included in the contractor EVMS. [3.4.2.C5]
3.4.2.Q6: (Customer & Developer) Explain how risk reduction activities are reflected in EVM reporting. [3.4.2.C6]
3.4.2.Q7: (Developer) Explain the circumstances in which the reserve fund is used. [3.4.2.C6]
3.4.2.Q8: (Customer & Developer) Describe the schedule and plan for conducting IBRs during the TD effort. [3.4.2.C7]

Sample Observations:
3.4.2.O1: Unreliable cost and schedule estimates are forcing schedule slips.
3.4.2.O2: Cannot track program status using the EVMS.
3.4.2.O3: EVM data is not used as a management tool, yet is one of the deliverables in the contract.

Factor 3.4.3 – Cooperative Agreements

Criteria:
3.4.3.C1: (Developer) The contractor has identified and contacted all organizations and program offices that are required for such efforts as interoperability, MOSA, net-centric environment, etc. [3.4.3.Q1]
3.4.3.C2: (Developer) All cooperative agreements, including international cooperative arrangements, must be well documented. [3.4.3.Q2]
3.4.3.C3: (Developer) Open and honest communications exist among all stakeholders. Issues are raised early and resolved expeditiously. [3.4.3.Q3]

Sample Questions/Requests for Information:
3.4.3.Q1: (Developer) How have teaming agreements been documented, defined, and communicated among all relevant parties? [3.4.3.C1]
3.4.3.Q2: (Developer) What is process for making changes to agreements, and who is involved? Explain how teaming agreements are working. [3.4.3.C2]

3.4.3.Q3: (Developer) How are program issues raised among the stakeholders? [3.4.3.C3]

Sample Observations:
3.4.3.O1: The contractor is too busy to meet contractual obligations. In the absence of a formal agreement, cooperation with other stakeholders is not often realized.
3.4.3.O2: Cooperative agreements are often not documented, or too general to be enforced.

Sub-Area 3.5 – Communication

Scope:
This Sub-Area assesses the communication processes, the level of openness, the trust among stakeholders, and how communication among stakeholders influences the TD effort.

Perspective:
Customer: The TDO communicates through formal and informal communication means among the stakeholders and contractors. The communication methods include periodic meetings, reviews, and reports as well as electronic and telephone communications.
Developer: The contractor communicates internally and externally through periodic meetings, reviews and reports. The TDO and other government customers as well as suppliers are considered as part of contractor team.

Factor 3.5.1 – Interfaces

Criteria:
3.5.1.C1: (Customer) The TDO communicates and interfaces closely and openly with the contractor as well as other stakeholder organizations. The TDO leverages other government organizations for added benefit to the TD effort. [3.5.1.Q1]
3.5.1.C2: (Developer) The contractor communicates and interfaces closely and openly with the TDO. The contractor organization infrastructure is fully utilized to assist the TD effort. [3.5.1.Q2]
3.5.1.C3: (Developer) The contractor communicates internally and externally in a timely and accurate manner. This is accomplished with periodic meetings, electronic communication media, and through periodic reporting. Representatives of the TDO, as well as subcontractors, form an integral team with the prime contractor team for the TD effort. [3.5.1.Q3]
3.5.1.C4: (Customer) The TDO communicates internally and externally in a timely and accurate manner. This is accomplished with periodic meetings, electronic communication media, and periodic reporting. [3.5.1.Q4]

Sample Questions/Requests for Information:
3.5.1.Q1: (Customer) How does the TDO relate with the contractor and other program stakeholders? How does the TDO leverage the supporting infrastructure in executing the program? [3.5.1.C1]
3.5.1.Q2: (Developer) How does the contractor relate with the TDO organization, including major subcontractors and other program stakeholders? How does the contractor leverage the supporting infrastructure organization to benefit the TD effort? [3.5.1.C2]
3.5.1.Q3: (Developer) Explain how the contractor communicates internally and externally (e.g., TDO, subcontractors, etc). Explain the contractor reporting systems in place to ensure that the communication is both timely and accurate. Describe the periodic means used to communicate internally. [3.5.1.C3]
3.5.1.Q4: (Customer) Explain how the TDO communicates internally and externally. Are there any problems with sharing information on the program? What is causing the problems? [3.5.1.C4]

Sample Observations:
3.5.1.O1: Communications between the TDO and the contractor are inadequate.
3.5.1.O2: Program information is compartmentalized, filtered, and disseminated slowly.
3.5.1.O3: Representatives of the various development organizations are reluctant to share information necessary for contract execution.

Factor 3.5.2 – Teamwork

Criteria:
3.5.2.C1: (Customer & Developer) Successful programs are attributable to a cohesive, team-like atmosphere that requires open information sharing, coordination, and mutual support. [3.5.2.Q1]
3.5.2.C2: (Customer & Developer) Application of proven organizational constructs, such as Integrated Product/Process Teams (IPTs), are used as effective tools. [3.5.2.Q2]
3.5.2.C3: (Customer & Developer) The morale of the organization espouses a 'success oriented' approach to the execution of the TD effort, with healthy cooperation among stakeholders. [3.5.2.Q3]

Sample Questions/Requests for Information:
3.5.2.Q1: (Customer & Developer) How are the various Integrated Product Teams (IPTs) organized on this program? [3.5.2.C1]
3.5.2.Q2: (Customer & Developer) Explain how the IPTs have experienced and responsible staff, and authority to speak for their organizations within the decision making process of the IPT. [3.5.2.C2]
3.5.2.Q3: (Customer & Developer) Explain how the morale of the organization and contributes to a 'success oriented' approach to the execution of the TD effort, as well as cooperation among stakeholders. [3.5.2.C3]

Sample Observations:
3.5.2.O1: There is lack of information sharing, i.e., uncoordinated plans and activities between organizations.
3.5.2.O2: Use of IPTs is not contributing to communications and decision-making.
3.5.2.O3: The customer's hands-off approach negatively impacts contract performance.

4.0 Technical Process Assessment Area

Sub-Area 4.1 – Technology Selection Assessment

Scope:
Assesses how the Systems Engineering (SE) process is used to identify and select technologies for the TD effort.

Perspective:
Customer & Developer: Technology assessments and AoA of performance, cost, and supportability form the basis of the TDS and are essential for selection of feasible technologies for the TD phase.

Criteria:
4.1.C1: (Customer) An iterative approach is taken and tradeoff studies are performed between a capabilities concept (similar to concept of operations) and technology potential along with cost and schedule constraints.
4.1.C2 (Customer) An AoA or equivalent is employed to select the preferred concept and provide input to the TDS.
4.1.C3: (Customer) Appropriate technology readiness metrics are applied to determine the new technologies to be developed during the TD phase.
4.1.C4: (Customer) An Alternative System Review (ASR) was conducted to validate the results of the AoA and support the selected system concept for the TD effort. [4.1.Q8]

Sample Questions/Requests for Information:
4.1.Q1: (Customer) What was the scope of the capability tradeoff studies and what is the relationship between the result of the trades and the AoA?.
4.1.Q2: (Customer & Developer) For a SoS and FoS, explain what process is used to assess the impact

of incorporating a new capability within the hierarchy of systems. [4.1.C2]
4.1.Q3: (Customer) Describe the extent of alternatives considered in the AoA. Did it include non-materiel solutions? If not, why not?
4.1.Q.4 (Customer) How was the AOA conducted (e.g., simulation, war gaming or other method)?. Were the AoA tools used previously for other purposes, and if so, were they validated or accepted credible?
4.1Q.5 (Customer) Were the assumptions of the AoA and scenarios based on the approved concept of operations (CONOPs) and what is the relationship between the ICD and the CONOPs?
4.1.Q.6 (Customer & Developer) How was technology risk factored into the AoA for the various components of technology?
4.1.Q7 (Customer & Developer) What are the metrics for determining the level of maturity required to incorporate the new technology into the system design? Were TRLs applied to this process? Please explain. [4.1.C3]
4.1.Q8: (Customer) Provide the results of ASR that were used to support the selected system concept to be demonstrated in TD. [4.1.C4]

Sample Observations:
4.1.O1: Alternatives considered in the AoA are not comprehensive or too restrictive to address the capability requirements.

Sub-Area 4.2 – Requirements Development

Scope:
Assesses how system-level requirements are derived from the ICD, TD is selected through the SE process, and how they are documented in the TDS.

Perspective:
Customer & Developer: The SE process must be applied, documented, and traceable to reflect total consideration of life cycle attributes in establishing capability specifications for entry to SDD. Engineering tools are rigorously applied to trace the applicability of all ICD requirements to all WBS elements in the TD effort. Complete functional interface collaboration among the WBS elements is required.

Criteria:
4.2.C1: (Developer) For given capabilities, requirements are identified and defined by applying the SE process. This includes market analysis, technology assessment, and M&S to support tradeoff studies. This also includes life cycle cost, identification of measurable technical specifications, and approach to verify performance. [4.2.Q1]
4.2.C2: (Developer) The use of SE process optimizes system performance against cost, schedule, and risk. [4.2.Q1]
4.2.C3: (Developer) Appropriate stakeholders are included in the requirements process steps. [4.2.Q1]
4.2.C4: (Developer) The SE process during TD includes a description of how specifications are developed at each level of allocation, and defined as an input to the design process. A complete architecture links the various levels of performance with allocations and specifications. [4.2.Q2]
4.2.C5: (Developer) The SE process during TD includes development of specifications with appropriate verification requirements. Critical technical parameters are incorporated into the TEMP. Implementation of high-risk technologies are deferred and addressed through pre-planned product improvement or an evolutionary acquisition strategy. [4.2.Q2, Q3, and Q4]
4.2.C6: (Developer) The SE process during TD is disciplined in documenting and tracking specifications at all levels and structured to manage changes. Configuration control is integrated within the SE process. [4.2.Q2]
4.2.C7: (Developer) The SE process during TD is supported by automated tools that provide for the automatic identification of relationships between requirements. When changes are made, all impacted requirements are identified and accounted for in the updated system. [4.2.Q2]
4.2.C8: (Developer) Requirements development encompasses refinement of system-level functional and performance requirements and external interfaces to facilitate design of open systems in reducing life cycle costs. [4.2.Q5]
4.2.C9: (Developer) Definition of logistics support requirements is established concurrent with the product

design. The SE process considers the DoD publication: “Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint.” [4.2.Q6]

Sample Questions/Requests for Information:
4.2.Q1: (Developer) Describe the SE process used during TD for translating required operational capabilities into technical specifications. Identify the relevant stakeholders involved in the process and discuss their roles and how conflicts are resolved. [4.2.C1, C2, and C3]
4.2.Q2: (Developer) Describe the SE process used during TD for allocating, verifying and managing specifications (including change management and control) from the system level to the lowest level. [4.2.C4, C5, C6 and C7]
4.2.Q3: (Developer) Describe the method of defining requirements to verify performance. [4.2.C5]
4.2.Q4: (Developer) Explain how follow-on capability improvements are addressed in a Pre-Planned Product Improvement or an evolutionary acquisition strategy. [4.2.C5]
4.2.Q5: (Developer) How does open systems are considered during TD in reducing life cycle costs? Describe the analyses performed to determine the extent of open systems application. [4.2.C8 and C9]
4.2.Q6: (Developer) Describe the SE process used during TD for determining the logistics support requirements. [4.2.C10]

Sample Observations:
4.2.O1: Translation of requirements into specific engineering tasks and design elements is not functionally traceable.

Sub-Area 4.3 – Functional Analysis and Allocation

Scope:
Assess the SE processes that define key functions of the capability and decompose them down to the lowest definitions that can be translated into performance requirements that must be demonstrated during TD. Assesses how system level requirements are derived from the capability requirements and described in the technical requirements document.

Perspectives:
Developer: The contractor has the SE process in place to perform functional analysis and allocate functional requirements for the TD efforts.

Criteria:
4.3.C1: (Developer) Analyses provide a clear, detailed description of the technical approach resulting from functional analysis and allocation. [4.3.Q1, and Q2]
4.3.C2: (Developer) The SE process partitions a system into self-contained, groupings of interchangeable and adaptable modules. The process enables identification of key T&E requirements to verify sub-assembly performance during the TD effort. [4.3.Q5]
4.3.C3: (Developer) The SE process uses rigorous and disciplined definitions of interfaces, and defines the key interfaces that require test verification within the system. Modular Open Systems Architecture (MOSA) requirements are addressed in the design interfaces. [4.3.Q3 & Q4]

Sample Questions/Requests for Information:
4.3.Q1: (Developer) Describe the function-related processes that will be used to allocate the capability requirements to lower level operational functions. [4.3.C1]
4.3.Q2: (Developer) Provide and explain the internal “design rules” that are used to partition the proposed system into its functional elements. [4.3.C1]
4.3.Q3: (Developer) How does the program’s functional analysis and allocation include MOSA in the design approach? Please explain. [4.3.C3]
4.3.Q4: (Developer) In partitioning the system into modules, does the program use standardized definitions of modular interfaces? Define the key interfaces within the system. [4.3.C2]

4.3.Q5: (Developer) Based on the interface definitions, have the requirements for data extraction and collection to be used in the test program been defined? How will the key interfaces be tested during TD? [4.3.C3]

Sample Observations:
4.3.O1: The TD effort has applied MOSA to the selected design approach.
4.3.O2: External interfaces are not well understood. There are no provisions for changes to external interfaces (outside program control).

Sub-Area 4.4 – Design Synthesis

Scope:
Assesses how the SE process is applied to the design process (this includes an assessment of methodologies, tool use, and application), and how the requirements, functional architecture, and system constraints are considered in system design.

Perspective:
Developer: The contractor has the SE process in place to design and integrate hardware and software for the TD efforts.

Criteria:
4.4.C1: (Developer) A design process is defined and applied to all design activities, including subcontractors', during TD. The design process is being implemented with proven methods and tools. [4.4.Q1]
4.4.C2: (Developer) Software code and unit test follow a specific process that is described in the software development plan. This process includes reviews, methods, and tools. [4.4.Q2]
4.4.C3: (Developer) Hardware implementation follows a defined process that is described in an engineering document. Prototypes are part of the TD process as are reviews, methods, and tools. [4.4.Q3]
4.4.C4: (Developer) An internal review process is used during design to include both hardware and software design. The schedule, scope, organization, and coordination of this SE process between the engineering disciplines, ensures an integrated design. [4.4.Q4]
4.4.C5: (Developer) By following the MOSA principles in design synthesis, TD ensures that the selected physical architecture will remain robust and adaptable throughout the system life cycle. [4.4.Q5]
4.4.C6 (Developer) To reduce risk and employ MOSA where it makes sense, all interfaces are grouped based on module characteristics such as criticality of function, ease of integration, change frequency, interoperability, and commonality. [4.4.Q6]
4.4.C7: (Developer) The feasibility of using open interface standards for key interfaces is addressed during TD. [4.4.Q7]
4.4.C8: (Developer) Programs should use a standard selection process that gives preference to open interface standards. [4.4.Q8]
4.4.C9: (Developer) Criteria to select the most appropriate standards for key interfaces are established during TD. [4.4.Q9]

Sample Questions/Requests for Information:
4.4.Q1: (Developer) Describe the design process, including analysis and synthesis. Identify where the process is defined/tailored for TD use. Is the same process used by subcontractors? Please explain. Identify methods and tools used to support the process. Is previous experience from similar programs used in the process? Please explain. [4.4.C1]
4.4.Q2: (Developer) Describe the process used during TD to implement the software design in terms of code and unit test. Identify and provide the process description. Describe the methods and tools used to support this process. Describe the reviews involved in code and unit test. [4.4.C2]
4.4.Q3: (Developer) Describe the SE process used during TD to implement the hardware design and related supportability factors. Does your process involve prototypes? Please explain. Identify and provide the hardware implementation process description. Describe the methods and tools used to support this process. [4.4.C3]

4.4.Q4: (Developer) Describe the internal review process used during design. Address both hardware and software design. Include the schedule, scope, organization, and coordination process between the engineering disciplines that ensure an integrated system design. [4.4.C4]
4.4.Q5: (Developer) Describe how the design solutions to be produced during TD are to verify the application of MOSA principles (i.e., modular design, key interfaces designation, and use of open standards) during the design synthesis? Describe features of the design architecture to assure it remain robust and adaptable throughout the system life cycle. [4.4.C5]
4.4.Q6: (Developer) What module characteristics (e.g., criticality of function, ease of integration, change frequency, interoperability, commonality, etc.) were used to identify key interfaces? [4.4.C6]
4.4.Q7: (Developer) Explain how the feasibility of using open interface standards are assessed for key interfaces. [4.4.C7]
4.4.Q8: (Developer) What criteria are used in selecting standards for key interfaces (e.g., DoD mandate, industry consensus, market support, prime contractor recommendation, etc.)? [4.4.C8]
4.4.Q9: (Developer) What criteria are established during TD to select the most appropriate standards for key interfaces? [4.4.C9]

Sample Observations:
4.4.O1: Programs have satisfactory tools and skill to perform SE tasks. However, inadequate time and resources hamper progress in programs.
4.4.O2: MOSA considerations are not made during TD.

Sub-Area 4.5 – System Integration, Test, and Verification

Scope:
Assesses how system integration, testing, and verification measures that are required during TD are reflected in the Test & Evaluation Strategy (TES).

Perspective:
Customer & Developer: The contractor has the SE process in place to design, integrate and test the hardware and software for the TD effort.

Criteria:
4.5.C1: (Developer) The system integration, test, and verification process is defined in the TDS and includes analysis, reviews, inspections, demonstrations, testing, and M&S to validate the requirements baseline. The TES describes an iterative verification process that allocated specifications are met by lower level components, assemblies, subsystems and then at the system level. Requirements are traceable to specific test/verification events. [4.5.Q1, Q2 and Q3]
4.5.C2: (Developer) TD testing requirements are defined in the TES to demonstrate performance against allocated and derived specifications in as realistic an environment as possible. Software coding and unit testing, and successive levels of software testing follow a specific process that should be well documented. [4.5.Q1, Q2, & Q3]
4.5.C3: (Developer) Test requirements for the hierarchical system are included in the TES, including component, subsystem, system, and SoS/FoS level tests when applicable. [4.5.Q7 & Q8]
4.5.C4: (Developer) Facilities are available to support TD testing requirements. [4.5.Q9]
4.5.C5: Integration test facilities that allow demonstration of hardware and software operation at progressively higher levels of integration are used/planned during TD. [4.5.Q9]
4.5.C6: (Developer) Test plans derived from the TES describe detailed test and evaluation activities that take place during TD. Sufficient time is allotted for test, analyze, fix, and re-test at each level of integration. [4.5.Q5 & Q6]
4.5.C7: (Developer) Test environment is as close to the anticipated operational environment as possible. [4.5.Q6]
4.5.C8: (Developer) The standards implemented for key interfaces are verifiable and their implementations are evaluated during testing. [4.5.Q7]
4.5.C9: (Customer & Developer) A Failure Reporting, Analysis and Corrective Action System (FRACAS) has been initiated. The SE process provides tracking between test activities and technical requirements.

[4.5.Q4]

Sample Questions/Requests for Information:
4.5.Q1: (Developer) Describe the contractor SE process from lower level components up through system level integration and test. How are requirements traced to specific test/verification events? [4.5.C1 and C2]
4.5.Q2: (Developer) Describe the process to implement and verify the software design, including the methods and tools, testing, and facilities used to support this process. Include a description of the process followed to test the software, starting with code and unit test. Is there buy-in among all stakeholders as to these test approaches? [4.5.C1 & C2]
4.5.Q3: (Developer) Describe the process to implement and verify the hardware design and whether this process involves prototypes and/or modeling and simulation. Include a description of the methods and tools, testing, and facilities used to support this process. [4.5.C1 & C2]
4.5.Q4: (Developer) Has a FRACAS been initiated? Describe the planned time for root cause analysis and corrective action for hardware and software deficiencies. Describe how the FRACAS provides tracking the deficient test activity back to the requirement for impact assessment.[4.5.C9]
4.5.Q5: (Developer) Does the test program schedule incorporate time for test, analyze, and fix from components to the all-up system? Explain the basis for allocating this time. [4.5.C6]
4.5.Q6: (Developer) Describe the level of detail of the test planning in the TES as it reflects the test requirements during TD. [4.5.C6]
4.5.Q7: (Developer) Explain how the standards implemented for key interfaces are verified during testing. [4.5.C3]
4.5.Q8: (Developer) Are SoS/FoS-level tests addressed within the TES? [4.5.C3]
4.5.Q9: (Developer) Describe the facilities planned to support the integration and test activities, including plans to have these facilities in place when needed. Explain how TES exploits T&E synergies with the other SoS/FoS members. [4.5.C4 & C5]
4.5.Q10: (Developer) Is the test program event driven and guided by interim test measures? Please explain. [4.5.C2]

Sample Observations:
4.5.O1: Interoperability and net-readiness requirements are documented and incorporated into the requirements and verification processes.
4.5.O2: Inadequate early testing of components.
4.5.O3: T&E schedules do not provide adequate fix and retest time and resources.
4.5.O4: SoS integration testing occurs too late in the program.

Sub-Area 4.6 – Transition to System Development and Demonstration (SDD)

Scope:
Assesses the plan for managing the TD phase and preparation to enter the SDD phase.

Perspective:
Customer: The TD phase is fully resourced to mature the technologies selected for demonstration of key capabilities of the system concept.

Criteria:
4.6.C1: (Customer) The TDO identifies a full complement of qualified, specialized technical resources and SE tools to manage the contractual TD effort.[4.6.Q1]
4.6.C2: (Customer) Key capabilities for demonstration during the TD effort are prioritized according to those that require technology maturation. Additional capabilities are included in the verification process. A risk assessment supports the order of priority. [4.6.Q2]
4.6.C3: (Customer) The TDO will establish IPTs to support the contractor in systems engineering and technical risk management. The TDO requires an integrated database with the contractor to support management and performance reporting of the TD effort. The TDO plans frequent periodic reporting of risk management activities. [4.6.Q3]
4.6.C4: (Customer) All performance and environmental constraints of the selected system concept are

clearly documented in the system specification. The level of detail of the constraints provides traceability to the allocated design as well as test verification considerations. [4.6.Q4]
4.6.C5: (Customer) The TDO has identified a technical staff that will be matrixed to manage the TD effort. The TDO has commitments from Command technical staff, Service laboratories, etc. to augment the limited resources within the TDO (TDM, administrative staff, and a technical director). Additional stakeholder resources identified by the TDO include the user, Service test & evaluation, logistics and joint service representation as appropriate. [4.6.Q5]
4.6.C6: (Customer) The TD program plan describes the essential capabilities of the ICD that relate to the scope of the technology maturation effort, and the schedule to demonstrate selected capabilities of the concept design. The TDS management process reflects critical path planning to manage risk and assess the potential outcomes of the TD effort. the acquisition strategy will be adjusted as necessary to demonstrate essential capabilities of the ICD and proceed to the SDD phase with an acceptable level of risk. Entrance criteria have been established as technology maturity metrics. [4.6 .Q6]
4.6.C7: (Customer) The level and allocation of funding for the TD effort appears reasonable. Management reserve funding will be set aside each year of the program schedule to support limited risk mitigation efforts. [4.6.Q7]
4.6.C8: (Customer) The TDS integrates performance based supportability concepts for the selected system concept. Selection of technologies for the TD effort includes technologies that require demonstration of user-requested support concepts during TD. [4.6.Q8]

Sample Questions/Requests for Information:
4.6.Q1: (Customer) Describe the SE process established by the TDO to manage the execution of the TD phase and plan the strategy to enter SDD. [4.6.C1]
4.6.Q2: (Customer) Describe key requirements of the ICD that have been selected for capability demonstration during TD. Explain how the technologies selected for maturation relate to the capabilities to be demonstrated. [4.6.1.C2]
4.6.Q3: (Customer) Describe how the risk management process will be integrated with the contractor Systems Engineering process to ensure the successful maturation of the selected technologies during TD. [4.6.3.C3]
4.6.Q4: (Customer) Describe all the known constraints that will influence the execution of the TD effort, and how these constraints will influence the allocation of capabilities to the functional design. [4.6.C4]
4.6.Q5: (Customer) Describe the roles and responsibilities of the stakeholders who will support the TDO in managing the TD effort. [4.6.C5]
4.6.Q6: (Customer). Describe how the TDS will be managed, including the key decision points (e.g., Technology Readiness Assessment (TRA)) during the TD effort for assessing TRLs of the selected technologies. What is the process for incorporating the TD results into the SDD planning documentation, i.e., CDD, AS, SEP, TEMP, acquisition strategy, etc.? [4.6.C6]
4.6.Q7: (Customer) Provide the funding allocation profile to support the TD effort. How will allocated funds support risk mitigation activities required to successfully demonstrate the maturity of the selected technologies? [4.6.C7]
4.6.Q8: (Customer) Describe the supportability concept that will be incorporated into the selected system concept, and discuss the demonstration requirements needed to validate these concepts. [4.6.C8]

Sample Observations:
4.6.O1: Intense focus on managing TD detracts from management planning to prepare for SDD.
4.6.O2: Support concepts desired by the user are discounted due to unbudgeted cost impact in demonstrating their associated technologies.

Sub-Area 4.7 – Process Improvement

Scope:
Assesses the contractor’s approach to continuous process improvement to include process evaluation and plan of implementation.

Perspective:
Customer: The contractor's approach to concurrent product and process development is integrated in the Systems Engineering process. Cost reporting will reflect proposed cost savings from producibility trades that are coupled with fabrication and assembly of the system concept. Company policies embrace continuous improvement as evidenced in past program performance.
D*eveloper:* Selected manufacturing, assembly, and test processes will be evaluated during TD hardware build and test, in order to identify and validate producibility benefits for the future build of SDD hardware.

Criteria:
4.7.C1: (Developer) Process improvement is an ongoing activity within the prime contractor organization. Processes to be used to support the TD effort will be assessed for maturity and improvement. [4.7.Q1]
4.7.C2: (Developer) Programmatic data on process execution and effectiveness, including metrics, will be collected and provided to the contractor organizational process improvement group. [4.7.Q2]
4.7.C3: (Developer) Quality goals and objectives, responsibilities and authority for implementing quality are clearly defined and understood by all employees. The contractor provides the necessary resources for maintaining and improving quality. [4.7.Q3 and Q4]
4.7.C4: (Customer & Developer) The costs and benefits of quality will be identified for producibility trade analyses as they are monitored and reported. [4.7.Q5]
4.7.C5: (Developer) Input and output of each system engineering process (e.g., requirements definition, requirements flow-down, design activities, test and integration, modeling and simulation, etc) are measured for quality. [4.7.Q6]
4.7.C6: (Developer) Documented procedures exist and are adequate to identify process control capability and to verify the relationship between process control variables and final product characteristics for existing programs. [4.7.Q7]
4.7.C7: (Developer) Management is aware of work center productivity, and act on the information to support continuous improvement. [4.7.Q8]

Sample Questions/Requests for Information:
4.7.Q1: (Developer) Describe process improvement activities (planned and on-going) both internal to the TD effort and on other programs across the company. Have processes to be used during TD been assessed by any independent assessors relative to any established process models? Please explain. [4.7.C1]
4.7.Q2: (Developer) Describe the processes used to collect data to support process improvement. [4.7.C2]
4.7.Q3: (Developer) What are the specific quality goals and objectives assigned to technical supervisors within the organization? What are the metrics and time frame allotted to achieve them? [4.7.C3]
4.7.Q4: (Developer) What amount of funds are set aside for quality on the program, and how are the funds allocated? [4.7.C3]
4.7.Q5: (Customer & Developer) Provide any quality reports that depict the cost and benefits of process and product improvement initiatives (prior programs included). [4.7.C4]
4.7.Q6: (Developer) Explain what quality metrics are used for each system engineering process and how they are measured. [4.7.C5]
4.7.Q7: (Developer) Describe quality-engineering and quality assurance tools and methods (e.g., design of experiments, house of quality, statistical analysis tools, modeling & simulation, etc.) used for improving quality of products and processes. [4.7.C6]
4.7.Q8: (Developer) Describe the metric(s) that enable management to review the productivity of different work centers that support the program. [4.7.C7]

Sample Observations:
4.7.O1: Process improvement and continuous improvement are widely accepted as useful approaches but the operational tempo is so intense that they are relegated to "nice-to-haves."

5.0 Technical Product Assessment Area

Scope:
Technical product is concerned with the characteristics of the product(s)/services (i.e., maturity, performance, and support) being developed or maintained by the program. This includes hardware and software elements, production process capabilities, and logistics.

Sub-Area 5.1 – System Description

Scope:
Assesses technical system descriptions in the form of systems requirements specifications, including a set of lower level, allocated product specifications, and of the definition(s) of technical systems/subsystems architecture(s).

Perspective:
Customer & Developer: The Systems Engineering process is effective in defining system requirements, functionality, and allocated physical architecture. Technology maturity requirements are appropriately scoped for demonstration during TD.

Factor 5.1.1 – Requirements/Specifications

Criteria:
5.1.1.C1: (Customer & Developer) System specifications are directly traceable to user requirements (i.e., ICD) using established SE methods and tools. [5.1.1.Q1 and Q3]
5.1.1.C2: (Customer & Developer) System specifications are completely defined, including subcontractor development specifications. [5.1.1.Q2].
5.1.1.C3: (Customer & Developer) Specifications are allocated and defined to the appropriate level consistent with the TD phase objectives. [5.1.1.Q3]
5.1.1.C4: (Customer & Developer) Verification requirements are defined for each performance requirement. [5.1.1.Q4]

Sample Questions/Requests for Information:
5.1.1.Q1: (Customer & Developer) Describe system specifications including both the performance and verification requirements. Include traceability to user requirements. [5.1.1.C1]
5.1.1.Q2: (Customer & Developer) Describe contractor's requirements definition and allocation process. Is the same process used across the program, including subcontractors? Please explain. [5.1.1.C2 and C3]
5.1.1.Q3: (Customer & Developer) Identify the methods and tools used to support requirements definition and design baseline process. [5.1.1.C1]
5.1.1.Q4: (Customer & Developer) Describe your process that define verification requirements for each performance requirement. [5.1.1.C4]

Sample Observations:
5.1.1.O1: Programs are relatively "connected" to the users and stakeholders and hence are able to effectively relate user requirements to the TD activities.
5.1.1.O2: There is a lack of requirements traceability to all design components.

Factor 5.1.2 – Architecture

Criteria:
5.1.2.C1: (Customer & Developer) The system architecture is defined using standardized methods, such as the DOD Architecture Framework, and widely accepted tools-sets, such as those that employ the Unified Modeling Language (UML), which meets the system requirements, including open-system requirements and benefits. [5.1.2.Q1 and Q5]
5.1.2.C2: (Customer & Developer) Ease of change, growth, upgrade, and lifecycle support is facilitated with this architecture. [5.1.2.Q1 and Q3]

5.1.2.C3: (Customer & Developer) The system architecture descriptions use mandated OV, SV, and TV products, and are integral to the system design. [5.1.2.Q2]
5.1.2.C4: (Customer & Developer) A disciplined process exists to ensure that the technical system descriptions are integrated such that changes to any one that impact others is identified and tracked to conclusion. [5.1.2.Q2]
5.1.2.C5: (Customer & Developer) The system will be designed based on modular design principles. The interfaces are identified with application of open standards for key system interfaces where possible, and the MOSA address and provide benefits in the following areas:

- System performance capabilities
- Commercial-Off-The-Shelf (COTS) products
- System growth capability
- Obsolescence/Diminished Manufacturing Sources (DMS)
- Technology Refresh
- Interoperability
- Built-In-Test (BIT)
- Life Cycle Cost Reduction
- Compatibility with hierarchical system(s) (for system of systems)
- Compatibility with support systems. [5.1.2.Q3]

5.1.2.C6: (Customer & Developer) The MOSA should provide system life cycle operational and sustainment benefits that are verifiable and add value to the system, including R&M and built in test. [5.1.2.Q3, Q4, and Q7].
5.1.2.C7: (Customer & Developer) The MOSA employed in the system should satisfy the specified performance and support requirements. [5.1.2.Q2 and Q4]
5.1.2.C8: (Customer & Developer) The design architecture should evaluate all required material properties to meet design requirements, including resistance to corrosion, and minimize the use of exotic materials. [5.1.2.Q6]
5.1.2C9: (Customer & Developer) The system architecture should lead to modular design for the system. [5.1.2.Q8]

<u>Sample Questions/Requests for Information:</u>
5.1.2.Q1: (Customer & Developer) Provide and describe your system architecture, subsystem architecture, and hardware/software implementation architecture. [5.1.2.C1]
5.1.2.Q2: (Customer & Developer) Explain and illustrate how your technical architecture system design descriptions address the total system performance requirements to include the end item, production, and support systems. [5.1.2.C3 and C7]
5.1.2.Q3: (Customer & Developer) Describe your approach to implement a design that is modular and incorporates open standards for the key interfaces implementing open system architectures throughout the system. Describe how these resulting architectures will:

- Reduce logistics footprint
- Reduce life cycle costs and development cycle time
- Meet system performance capabilities
- Leverage COTS products
- Provide growth capability over the life of the system
- Mitigate obsolescence/DMS
- Enable technology refresh
- Achieve interoperability
- Achieve compatibility with the hierarchical system(s) (for a system of systems)
- Achieve compatibility with support systems [5.1.2.C1, C5, and C6]

5.1.2.Q4: (Customer & Developer) Identify and describe any other system operational and sustainment benefits your open architecture provides. Describe how these benefits will be verified. [5.1.2.C6 and C7]
5.1.2.Q5: (Customer & Developer) Describe how the systems architectures are open. Explain how these meet the specified performance requirements. [5.1.2.C1]
5.1.2.Q6: (Customer & Developer) Have all required material properties for the design been considered in material selection? Are exotic materials required in the design? If so, please identify. [5.1.2.C8]
5.1.2.Q7: (Customer & Developer) Have reliability, maintainability, and Built-In-Test (BIT) been addressed in the design? [5.1.2.C6]

5.1.2.Q8: (Customer & Developer) Does your system architecture lead to modular design for the system? Please explain. [5.1.2.C9]

Sample Observations:
5.1.2.O1: MOSA principles (e.g., modular design) have been used in developing the system architecture.

Factor 5.1.3 - Technology Maturity

Criteria:
5.1.3.C1: (Customer & Developer) Technology Readiness Levels (TRLs) are established according to acceptable quantification methods. [5.1.3.Q1]
5.1.3.C2: (Customer & Developer) The technologies proposed for the system should have measurable metrics that demonstrate their level of maturity. [5.1.3.Q1]
5.1.3.C3: (Customer & Developer) The results of a demonstration/validation of new or advanced technologies quantify risk elements, and support the design strategy. A risk mitigation plan addresses the attendant risks, including adequate resources and schedule to accomplish planned mitigation activities. [5.1.3.Q2]

Sample Questions/Requests for Information:
5.1.3.Q1: (Customer & Developer) Describe the technologies chosen for incorporation in potential system solutions and identify the corresponding TRLs. [5.1.3.C1 & C2]
5.1.3.Q2: (Customer & Developer) Provide the plan for the demonstration and validation of the proposed technologies and the quantifiable risks that remain to mature the technologies for system development and integration. Include the risk mitigation plan and the resources required to validate (i.e., verification testing, modeling and simulation, etc). [5.1.3.C3]

Sample Observations:
5.1.3.O1: Archaic processing platforms constrain design and growth.
5.1.3.O2: Software development is driven by hardware availability and capability versus true system requirements.

Factor 5.1.4 - Government/Supplier-Furnished Products

Criteria:
5.1.4.C1: (Customer & Developer) Government furnished items (equipment, software, or data) will be confirmed by the TDO to meet system requirements and to be available, complete, and supportable. [5.1.4.Q1]
5.1.4.C2: (Customer & Developer) Planned Non-Developmental Items (NDI) or Commercial Off-The-Shelf (COTS) items have been determined to meet program system performance and sustainment requirements through defined verification process. Open systems architectures enable the use of COTS and NDI. [5.1.4.Q2]
5.1.4.C3: (Customer & Developer) Planned reuse software has been confirmed through a defined process designed to verify the software is complete, will meet the allocated system performance requirements, and is supportable. [5.1.4.Q3]

Sample Questions/Requests for Information:
5.1.4.Q1: (Customer & Developer) If government furnished items, equipment, software, or data is being provided to the contractor what process is /was used to assure these are complete, available, meet the requirements, and are supportable? Please explain. . *{This question should be addressed to the government office}* [5.1.4.C1]
5.1.4.Q2: (Customer & Developer) Identify any NDI, or COTS items being used in the TD, and the sources of these items. Explain How these items have been determined to meet intended program performance requirements?. [5.1.4.C2]
5.1.4.Q3: (Customer & Developer) Identify planned reuse software. Describe your process to confirm that this reuse software is complete and functional, will meet the system performance requirements, and is supportable. [5.1.4.C3]

Sample Observations:
5.1.4.O1: No COTS refresh strategy is considered during TD.

Sub-Area 5.2 – System Performance

Scope: Assesses development maturity and current and projected system performance as measured by various means.

Perspective:
Customer & Developer: The Systems Engineering process is effective in defining system requirements, functionality, allocated physical architecture. Technology maturity requirements are appropriately scoped for demonstration duringTD.

Factor 5.2.1 – Technical Performance

Criteria:
5.2.1.C1: System specifications, including Key Performance Parameters (KPPs) have been established for TD and are directly traceable to user requirements using established systems engineering methods and tools. [5.2.1.Q1]
5.2.1.C2: System technical performance requirements should be compatible i.e. executable within the program cost, schedule, and risk. [5.2.1.Q2]
5.2.1.C3: A technical performance baseline is in place, from which the system performance thresholds can be compared and tracked. [5.2.1.Q4]
5.2.1.C4: A "how-to" test matrix are developed to identify verification (inspection, analysis, demonstration, test) methods for each performance requirement written in section 3 of the system specification, and key tests summarized in the TES. [5.2.1.Q3 & Q5]

Sample Questions/Requests for Information:
5.2.1.Q1: (Customer & Developer) Describe system specifications of the performance and verification requirements. Include traceability to user requirements. [5.2.C1]
5.2.1.Q2: (Customer & Developer) Explain how it has been determined that the technical performance requirements are executable within the schedules. [5.2.1.C2]
5.2.1.Q3: (Customer & Developer) Describe the process for ensuring timely verification that the system meets requirements/specifications. [5.2.1.C4]
5.2.1.Q4: Provide the technical performance baseline of the current system design. Include the supporting data used to establish the baseline. [5.2.1.C3]
5.2.1.Q5: (Customer & Developer) Provide the specified verification requirements and the current verification test matrix that depicts the planned test methods vs. the verification requirements identified in the system specifications. Is this described in the TES? Please explain. [5.2.1.C4]

Sample Observations:
5.2.1.O1: Technical performance baseline requires new technologies to achieve threshold requirements. The risks associated with these technologies are not fully quantified.

Sub-Area 5.3 –System Attributes

Scope: Assesses the planning and considerations given to produce and support the system to be developed during TD.
Perspective:
Customer & Developer: The Systems Engineering process provides for analysis of producibility alternatives concurrent with the allocation of components of the system design concept.

Factor 5.3.1 - Producibility

Criteria:
5.3.1.C1: (Developer) Preliminary producibility analyses, coordinated with manufacturing engineering, will be conducted in parallel with and influence design trades. [5.3.1.Q1]
5.3.1.C2: (Customer & Developer) Producibility planning is consistent with cost and schedule constraints and pose an acceptable level of technical and schedule risk. [5.3.1.Q2]

Sample Questions/Requests for Information:
5.3.1.Q1: (Developer) Provide the status/results of preliminary producibility analyses as reflected in the proposed system design. [5.3.1.C1]
5.3.1.Q2: (Customer & Developer) Describe the system engineering process pertaining to design trades to address producibility. Include a description of the expected engineering activities needed to address producibility issues, along with their impact on cost and schedule. [5.3.1.C2 and C3]

Sample Observations:
5.3.1.O1: Producibility is not considered during TD and later becomes a cost driver.

Factor 5.3.2 - Supportability/Maintainability

Criteria:
5.3.2.C1. (Customer & Developer) The AoA considers the performance options, maintenance environment, hardware complexity, and usage on projected maintenance capabilities available during system IOC (e.g., support equipment, manpower/skills availability, and cost). [5.3.2.Q1, Q2 and Q3]
5.3.2.C2: (Customer & Developer) The proposed technology addresses supportability requirements. [5.3.2.Q1 and Q2]
5.3.2.C3: (Customer & Developer) The TES includes supportability of the TD test programs. [5.3.2.Q4]

Sample Questions/Requests for Information:
5.3.2.Q1. (Customer & Developer) Provide a detailed description of the Analysis of Alternatives (AOA) operating and support (O&S) concepts based on the performance-based options of the system, and the selected O&S approach. As a minimum, the following should be addressed:
- Key system support parameters that drive the system design to meet reliability, availability, and maintainability requirements.
- Projected manpower and deployment footprint and the impact on the projected support system environment.
- System support and maintenance concepts and the technologies required. [5.3.2.C1]

5.3.2.Q2: (Customer & Developer) Describe the risk factors associated with the proposed support concept and how these risks will be mitigated, and the potential cost and schedule impact. [5.3.2.C2]
5.3.2.Q3: (Customer & Developer) Identify the major cost drivers associated with the selected life-cycle support concept. [5.3.2. C1]
5.3.2.Q4: (Customer & Developer) Describe how the TES include verification of support requirements. [5.3.2.C3]

Sample Observations:
5.3.2.O1: Supportability is not considered during TD and later becomes a cost driver.

6.0 Environment Assessment Area

Scope: Environment is concerned with the external influences/constraints under which the government sponsor (customer) and the developer must abide during execution of the TD effort that precedes program initiation. This environment encompasses government oversight, and statutory/regulatory requirements imposed on the government and the developing contractors in the form of deliverable documents as well as local and federal government ordinances that might affect industrial operations.

Perspective:
Customer: The government sponsor must comply with the acquisition-related reporting requirements, both regulatory and statutory as cited in DoD Instruction 5000.2 and highlighted in Appendix B to this document.
Developer: Execution of the TD phase, where use of developmental and industrial facilities, complies with all Federal, State, and Local Regulations and Statutes for environmental and safety compliance.

Sub-Area 6.1 – Statutory and Regulatory Environment

Scope: Assesses the statutory and regulatory constraints under which the program operates, and the audit process. Most of the following criteria and questions are appropriately addressed to the government program office.

Factor 6.1.1 – Requirements/Specifications

Criteria:
6.1.1.C1: The statutory and regulatory report requirements for initiating the TD phase of the program are complete, and are consistent with the end results of the concept refinement phase (or exit criteria if established). [6.1.1.Q1 and Q3]
6.1.1.C2: Source selection results have considered all known environmental statutes and regulations imposed on the contractor (federal, state, and local) under full disclosure, and considered the cost implications to be consistent with the funding profile to execute the TD phase of the program. [6.1.1.Q1 and Q2]

Sample Questions/Requests for Information:
6.1.1.Q1: What is the status of reporting requirements for initiating the TD phase of the program? Are these requirements included in established exit criteria? What is the status of compliance with the exit criteria? [6.1.1.C1 and C2]
6.1.1.Q2: Provide a summary of the environmental statutes and regulations that require compliance by the prime contractor and all supporting suppliers. Describe how they impact the execution of the current and future phases of the program and whether they have an identifiable cost impact. [6.1.1.C2]
6.1.1.Q3: Provide specific detail on the status of compliance with the Clinger Cohen Act [6.1.1.C3]

Sample Observations:
6.1.1.O1: Most statutory and regulatory requirements are adequately complied with.

Factor 6.1.2 - Policy

Criteria:
6.1.2.C1: The Government sponsor should have a clear and concise understanding of all DoD and Service-level policies and statutes that the program must comply with. [6.1.2.Q1]
6.1.2.C2: The Government sponsor should resolve conflicts in applicability of policy, and obtain and document the appropriate waivers, to establish the official baseline under which the program is executed. [6.1.2.Q2 and Q3]

Sample Questions/Requests for Information:
6.1.2.Q1: What are the applicable DoD or Service-level policies that pertain to the program? [6.1.2.C1]
6.1.2.Q2: Is the acquisition policy consistent with the program requirements? Please explain. [6.1.2.C2]
6.1.2.Q3: How does the program resolve policy conflict when executing the program plan? [6.1.2.C2]

Sample Observations:
6.1.2.O1: The dynamics of policy adherence, change, and interpretation are rarely synchronous with program development activities.

6.1.2.O2: Rapid (and/or poorly promulgated) policy changes can have substantial deleterious impact on programs.
6.1.2.O3: Increased direction from oversight agencies limits sponsor's authority, which in turn can slow progress, weaken the ability to meet goals and satisfy requirements, and often both.

Appendix 1
Statutory and Regulatory Information and Milestone Requirements (MS A)

Table 1 - Statutory Information Requirements

Information Required	Applicable Statute
Consideration of Technology Issues	10 U.S.C. 2364, ref. (q)
Market Research	10 U.S.C. 2377, ref. ® 15 U.S.C. 644(e)(2), ref. (s)
CCA Compliance (All IT including NSS) (Ref. DODI 5000.2, Encl 4) (MAIS only)	40 U.S.C. Subtitle III, ref. (l) Sec. 8088, Public Law 107-248, ref. (t)
Registration of mission-critical and Mission-essential information systems (Ships only)	Sec. 8088(a), Public Law 107-248, ref. (t)
Programmatic Environment Safety and Occupational Health Evaluation (PESCHE) (Ships only)	42 U.S.C. 4321, ref. (x)
Selected Acquisition Report (SAR) (Ships only)	10 U.S.C. 2432, ref. (ac)
Independent Cost Estimate (CAIG) and Manpower Estimate (Ships O	10 U.S.C. 2434, ref. (ah)
Selected Acquisition Report (SAR) (MDAP only)	10 U.S.C. 2432, ref. (ac)
Industrial Capabilities (part of Acquisition Strategy) (Ships only)	10 U.S.C. 2440, ref. (af)
Core Logistics Analysis/Source of Repair Analysis (part of acquisition strategy) (Ships only)	10 U.S.C. 2460, ref. (aj) 10 U.S.C. 2464, ref. (ak) 10 U.S.C. 2466, ref. (al)
Competition Analysis (Depot-level Maintenance $3M rule) (part of Acquisition Strategy) (Ships only)	10 U.S.C. 2469, ref. (am)
Technology Development Strategy (TDS)	Sec. 803, Public Law 107-314, ref. (an)
Acquisition Program Baseline (APB) (Ships only)	10 U.S.C. 2435, ref. (ao)
Cooperative Opportunities (part of Acquisition Strategy) (Ships only)	10 U.S.C. 2350a, ref. (ap)
Clinger-Cohen Act Certification (MAIS Only)	Sec. 8088, Public Law 107-248, ref. (t)
Financial Management Entreprise Architecture Certification (MAIS Only)	Sec. 8088, Public Law 107-248, ref. (t)

Table 2 - Regulatory Information Requirements

Information Required	Source
Initial Capabilities Document (ICD)	CJCSI 3170.01, ref. (g)
Capability Development Document (CDD) (Ships only)	CJCSI 3170.01, ref. (g)
Acquisition Strategy (Ships only)	DODI 5000.2
Analysis of Alternatives (AoA)	DODI 5000.2
System Threat Assessment (validated by DIA for ACAT 1D programs) (Ships only)	DODD 5105.21, ref. (aq)
Technology Readiness Assessment (TRA) (Ships only)	DODI 5000.2
Independent Technology Assessment (ACAT 1D only) (if req'd by DUSD (S&T)	DODI 5000.2
Command, Control, Communications, Computers, and Intelligence Support Plan (C4ISP) (also summarized in Acquisition Strategy) (Ships only)	DODI 4630.8: DODD 4630.5, refs. (ar) and (as)
Component Cost Analysis (mandatory for MAIS; as requested for MDAP) (Ships only)	DODI 5000.2
Cost Analysis Requirements Description (CARD) (Ships only)	DODI 5000.2
Test and Evaluation Strategy	DODI 5000.2
Acquisition Decision Memorandum (ADM)	DODI 5000.2
Program Protection Plan (PPP) (for programs with critical technology information) (also summarized in Acquisition Strategy) (Ships only)	DODD 5200.39, ref. (au)
Exit Criteria	DODI 5000.2
Earned Value Management Systems (EVMS) Planning (RDT&E > $73M and procurement or O&M > $315M (FY 2000 constant dollars)	OMB Circular A-11, Part 7, ref. (d)

Chapter 2
Pre-Milestone B Focus

1.0 Mission Capabilities/Requirements Assessment Area

Scope: The review of mission capabilities/requirements is concerned with their clarity, completeness, reasonableness, testability, and stability, and their implication for the resulting system operational requirements, and constraints by which the development program is structured and executed. This includes interdependencies on interoperability and supportability requirements with other systems.

Perspective: *Customer:* Although this Assessment Area views the mission capabilities and operational requirements as the starting point of the program, the evolutionary JCIDS concept of 'Capability-Based' acquisition programs directly impacts the Mission Assessment Area, and necessitates the Assessment Team to also examine the requirements as they relate to meeting the mission capability needs. Further, as these requirements are usually the basis for evaluating actual capability as well as program progress, it is important for them to be well understood by the sponsors and developers, *as well as the Assessment Team*. The relative position of the program in the hierarchy of a system of systems also dictates the perspective of the assessment.

Sub-Area 1.1 Mission Capabilities/Requirements

Scope: Assessment of key factors that address the manner in which the system can be expected to perform in its intended operational setting.

Perspective:
Customer & Developer: The Capability Development Document (CDD) is clear, complete, reasonable, testable and stable. It describes joint concepts, interface and interoperability requirements.

Factor 1.1.1 - Reasonableness

Criteria:
1.1.1.C1: (Customer) Operational capabilities/requirements are clearly stated, are testable, and can be implemented within the scheduled time and budget (dollars) established to execute the program, i.e. within the program baselines. The required technology is sufficiently mature to support the development within the program baselines. [1.1.1 Q1]
1.1.1.C2: (Customer) The user must address the operational environment including corrosion considerations, threat, force composition, concept of operations, geography, RF conditions, etc., in formulating the operational requirements of the system. [1.1.1Q2]
1.1.1.C3: (Customer) There should be a user/developer interface to clarify concepts of operation. [1.1.1.Q3].
1.1.1.C4: (Customer) There should be active participation by the requirements and support community in the design development process such as representation on Integrated Product Teams (IPTs) or similar groups. [1.1.1.Q3]
1.1.1.C5: (Customer) Operational requirements should not impose proprietary, design-specific solutions from a particular vendor. Such practices limit a PM's flexibility to develop a system based on open architecture and will limit program access to multiple sources of supply over the life of the system. [1.1.1.Q4
1.1.1.C6: (Customer) In developing a system that meets operational requirements, priority should be always placed on the most cost-effective solution over the system's life cycle rather than on maximizing the short term benefits. [1.1.1.Q5]
1.1.1.C7: (Customer) Supportability requirements, focusing on affordable system operational effectiveness, are prominent. [1.1.1.Q6]
1.1.1.C8: (Customer) The design threat(s) (near, mid, and far term) that the system is expected to counter needs to be defined. [1.1.1.Q7]

1.1.1.C9: (Customer) The T&E strategy reflects all requirements and capabilities [1.1.1.Q8]

Sample Questions/Requests for Information:
1.1.1.Q1: (Customer) Explain how the operational capabilities/requirements can be implemented within the proposed schedule, time, resources (cost), and technology, allocated and budgeted to execute the program. [1.1.1.C1]
1.1.1.Q2: (Customer) Explain how the program will address operational environment including corrosion prevention, threat, force composition, concept of operations, geography, RF conditions, etc., during system development, production, and life cycle support. [1.1.1.C2]
1.1.1.Q3: (Customer) Discuss the role of the user community, support community, and other relevant stakeholders in the system engineering process used to execute the program. [1.1.1.C3 and C4]
1.1.1.Q4: (Customer) Identify and describe any operational requirement that imposes design-specific solutions. [1.1.1.C.5]
1.1.1.Q5: (Customer) Regarding user requirements is there priority consideration given to the most cost-effective solution over the system's planned life cycle? Explain. [1.1.1.C6]
1.1.1.Q6: (Customer) Explain how the program has addressed supportability in a manner that increases system reliability, reduces logistic footprint, and minimizes life cycle cost. [1.1.1.C7]
1.1.1.Q7: (Customer) What is/are the design threat(s) (near, mid and far term) that the system is expected to counter? [1.1.1.C8]
1.1.1.Q8: (Customer) Does the strategy in the Test and Evaluation Strategy document and proposed Test and Evaluation Master Plan (TEMP) reflect all requirements and capabilities? [1.1.1.C9]
1.1.1.Q9: (Customer) Are all requirements and capabilities testable? Please explain. [111.1.1.C1]

Sample Observations:
1.1.1.O1: Operational capabilities/requirements are often unreasonable due to reliance on insufficiently matured technologies at the end of the Technology Development phase.
1.1.1.O2: Operational capabilities/requirements are often unreasonable due to feasible technical solutions being expected in unreasonably short periods of time.
1.1.1.O3: Lack of adequate supportability consideration in systems engineering process to determine product support requirements or capability.
1.1.1.O4: Lack of adequate funding and unrealistic schedules are commonly reasons for program delays.

Factor 1.1.2 – Stability

Criteria:
1.1.2.C1: (Customer) Stable operational capabilities/requirements are documented in an approved Capability Development Document (CDD). [1.1.2.Q1]
1.1.2.C2: (Customer) Operational capabilities/requirements should be flexible enough to adjust and accommodate evolution of the design maturity, including incremental capability improvements. But, at the same time, there should be little or no "requirements creep" during the execution of each phase of the program. [1.1.2.Q2]
1.1.2.C3: (Customer) System and subsystem level requirements should be stable with minimal change in requirements. [1.1.2.Q3]
1.1.2.C4: (Customer) Controls should be in place to prevent requirements creep and force new requirements to be defined through an engineering change proposal (ECP) process. [1.1.2.Q4]
1.1.2.C5: (Customer) Incremental performance requirements should be defined for programs using an evolutionary acquisition strategy. [1.1.2.Q5]

Sample Questions/Requests for Information:
1.1.2.Q1: (Customer) Provide and discuss the content of the CDD with respect to the stability of the operational requirements. Is the CDD signed/approved? [1.1.2.C1]
1.1.2.Q2: (Customer) Describe how the program will accommodate capability improvements as the design matures, with respect to the breadth and scope of available design trades. Include a description of the planned capability improvements and how they exceed the baseline requirements. [1.1.2.C2]
1.1.2.Q3: (Customer) What level of requirements change has the program experienced since contract award? How do you know? How do you measure and track this requirements change? [1.1.2.C3]

1.1.2.Q4: (Customer) Describe the controls in place to preclude requirements creep? What control prevents well-intentioned stakeholders in working group meetings and reviews from expanding the requirements? [1.1.2.C4]
1.1.2.Q5: (Customer) How does the T&E Strategy support verifying incremental performance requirements? [1.1.2.C5]

Sample Observations:
1.1.2.O1: Operational requirements change quickly with little warning and often without program office opportunity to evaluate the impact or the viability of fulfilling the requirement and to influence the change(s).
1.1.2.O2: Operational requirements stabilize at a slower pace than the program development cycle (typical in system of systems development programs).

Factor 1.1.3 – Dependencies/External Interfaces

Criteria:
1.1.3.C1: (Customer & Developer) For a system of systems, the dependencies, i. e., hierarchical flow, must be clearly defined. This includes interface control specifications that should be definitive early on and placed under strict configuration control. Compatibility with other interfacing systems and common architectures must be maintained through the development /design process. [1.1.3.Q1, Q3, and Q4, Q6, Q7, and Q8]
1.1.3.C2: (Customer) If there is no explicit dependency or hierarchy of systems, the operational capabilities/requirements may require that the proposed system rely on interface(s) with other systems. In this case, the nature of these known interfaces should be well defined early enough to enable the program to adequately address them during system design. [1.1.3.Q1]
1.1.3.C3: (Customer & Developer) Complex and dynamic operational capabilities/requirements that drive capability improvements must be considered as to their potential impact on the system design requirements. Corresponding supportability factors must also be considered. [1.1.3.Q2]
1.1.3.C4: (Customer & Developer) Responsibility for development of interfaces in a System-of-Systems should be defined early. [1.1.3.Q7]

Sample Questions/Requests for Information:
1.1.3.Q1: (Customer & Developer) Provide and describe operational capabilities/requirements as they relate to dependencies (e.g. system of systems) on or interface with other systems. Describe how these dependencies and interfaces are identified, defined and controlled. [1.1.3.C1 and C2]
1.1.3.Q2: (Customer) Describe the risk associated with possible changes or modifications to operational requirements and their impact on system requirements. How are these changes managed within the program baselines? [1.1.3.C3]
1.1.3.Q3 (Customer & Developer) (If system of systems): Describe the requirements flow down and flow up process for the program. [1.1.3.C1]
1.1.3.Q4: (Customer & Developer) Describe how compatibility of the system with other interfacing systems is addressed in developing and maturing the system design. [1.1.3.C1]
1.1.3.Q5: (Customer & Developer) Describe how external interfaces impact (enhance or hamper) supportability. [1.1.3.C3]
1.1.3.Q6: (Customer & Developer) What common interfaces must the system design be compliant with? [1.1.3.C1]
1.1.3.Q7: (Customer) Are there any developing complimentary systems that are critical to the success of the proposed system (i.e., the need for JITRS radio support)? Please explain. [1.1.3.C1]
1.1.3.Q8: (Customer) How is the proposed program responsible or responsive toward funding and developing the interfaces to other interfacing systems (e.g., system of systems or family of systems)? Please explain. [1.1.3.C4]

Sample Observations:
1.1.3.O1: Hierarchical dependencies are not clearly defined or become definitive too late for the program to easily accommodate them.

1.1.3.O2: External interfaces are identified after the system design has been finalized, requiring a Pre-Planned Product Improvement (P3I) program to be initiated to run concurrently with the development program.
1.1.3.O3: External interfaces do not facilitate system supportability.

Factor 1.1.4 – Interoperability / Net-readiness

Criteria:
1.1.4.C1: (Customer & Developer) The interoperability and Net-readiness of the system with the context of the current and projected Global Information Grid (GIG) architecture should be clearly defined and reflected in the technical requirements, and should be tracked as an integral part of the system design. [1.1.4.Q1, Q4, and Q8 and Q12]
1.1.4.C2: (Customer & Developer) There should be an active technical interchange, such as an overall configuration control board among the interoperability /net-readiness “players.” [1.1.4.Q2, and Q10]
1.1.4.C3: (Customer & Developer) Programs should use standardized architectural products and conventions, data formats and open interface standards and protocols to enable interoperability. [1.1.4.Q3, Q5 and Q9]
1.1.4.C4: (Customer & Developer) Affordable interoperability is achieved when the interoperable systems can fully participate in the GIG in accordance with its intended role in applicable Joint architectures and the GIG, without major redesign and/or modifications, and are supportable in the fielded environment. [1.1.4.Q6, Q7, Q8, and Q9]
1.1.4.C5: (Customer & Developer) Interoperability of systems designed outside of the GIG must be clearly defined (i.e., some systems must interface in the Navy’s legacy Links and Distribution Systems}. [1.1.4.Q11]

Sample Questions/Requests for Information:
1.1.4.Q1: (Customer & Developer) Describe how the interoperability capabilities/requirements are documented and how they are addressed in the overall system design and development process on the program. [1.1.4.C1]
1.1.4.Q2: (Customer & Developer) Describe how the various other members of the community who have a stake in the interoperability capabilities/requirements communicate with the program. [1.1.4.C2]
1.1.4.Q3: (Customer & Developer) Describe the program approach to facilitate interoperability. [1.1.4.C3 and 1.1.4.C4]
1.1.4.Q4: (Customer & Developer) Describe the interoperability capabilities/requirements of the system in terms of the mission requirements with other platforms, both within the command structure and with other US and foreign defense forces. [1.1.4.C1]
1.1.4.Q5: (Customer & Developer) Explain the relationship between open systems architecture and interoperability. [1.1.4.C3]
1.1.4.Q6: (Customer & Developer) Describe how interoperability capabilities/requirements impact (enhance or hamper) supportability. [1.1.4.C4]
1.1.4.Q7: (Customer & Developer) Describe how technical standards in the TV products were identified and how they interoperate with the GIG Enterprise Services identified for the system’s net-centric roles. [1.1.4.C4]
1.1.4 Q8: (Customer & Developer) Describe how the system interfaces with and uses GIG NCES Core-enterprise services. [1.1.4.C1]
1.1.4 Q9: (Customer & Developer) Provide architecture view products (OV, SV, TV) that comply with the product definitions in the DODAF. [1.1.4.C3]
1.1.4 Q10: (Customer & Developer) Explain how the program’s data that can and should be shared externally is visible to all potential consumers, and consumers are able to locate your data. [1.1.4.C2]
1.1.4.Q11: (Customer & Developer) For systems not required to be GIG compliant, are interoperability requirements with legacy systems clearly defined? Please explain. [1.1.4.C5]
1.1.4.Q12: (Customer & Developer) What are the plans for developing Software-in-the-Loop (SIL) Simulation to test a System of Systems or other required interfaces before developing the hardware? [1.1.4.C1]

Sample Observations:
1.1.4.O1: Vague interoperability capabilities/requirements result in programs failing to achieve expected interoperability capabilities.
1.1.4.O2: Interoperability requirements are expressed in terms of a Service-specific doctrine or protocol making it difficult for a different Service to accommodate.
1.1.4.O3: Lack of an overarching configuration control board across concurrently developed systems of systems or systems desired to be interoperable, results in ineffective change control, and ineffective interoperability.
1.1.4.O4: Interoperability capabilities/requirements do not facilitate supply chain integration.
1.1.4.O5: Fragmented teams developed architectural products in isolation and were thus unable to achieve timely identification of interoperability trade-space and risk remediation.
1.1.4 O6 Architectural view (OV-N, SV-N) fails to account for interface to existing GIG Core Service

Factor 1.1.5 – Testability

Criteria:
1.1.5.C1: (Customer & Developer) Operational capabilities and requirements are clearly stated in testable terms, i.e., realistically measurable and demonstration is not precluded due to safety restraints. [1.1.5.Q1, and Q2]
1.1.5.C2: (Customer & Developer) Performance metrics clearly describe the necessary degree of mission accomplishment. [1.1.5.Q3]
1.1.5.C3: (Customer & Developer) Measures of effectiveness and suitability, key performance parameters (KPP), and critical technical parameters are stated as quantifiable parameters. [1.1.5.Q4]
1.1.5.C4: (Customer & Developer) Measures of effectiveness and suitability are clearly defined, i.e., operating condition or scenario of when the metric is applicable is defined. [1.1.5.Q5]
1.1.5.C5: (Customer & Developer) Test strategy is clearly defined and addresses all required resources and test methods. [1.1.5.Q6 and Q7]

Sample Questions/Requests for Information:
1.1.5.Q1: (Customer & Developer) Are the operational capabilities and requirements clearly stated in realistically measurable terms? [1.1.5.C1]
1.1.5.Q2: (Customer & Developer) Are there safety restrictions that would preclude demonstrating the described operational capabilities and requirements? [1.1.5.C1]
1.1.5.Q3: (Customer & Developer) Do performance metrics clearly describe the necessary degree of mission accomplishment expected? [1.1.5.C2]
1.1.5.Q4: (Customer & Developer) Are the measures of effectiveness and suitability stated as quantifiable parameters? [1.1.5.C3]
1.1.5.Q5: (Customer & Developer) Is the expected environment and operating condition of the system clearly stated in the definitions of the measure of effectiveness and suitability? [1.1.5.C4]
1.1.5.Q6: (Customer & Developer) Do all resources for the test strategy exist? [1.1.5.C5]
1.1.5.Q7: (Customer & Developer) Can data be collected without impacting the system under test? [1.1.5.C5]

Sample Observations:
1.1.5.O1: Documented measures of effectiveness of some KPPs are open to interpretation.

2.0 Resources Assessment Area

Scope: Resources are concerned with the adequacy of the assets available to meet the program's objectives, including but not limited to personnel, facilities, T&E resources, training, etc.

Perspective: This Assessment Area allows for all required resource inputs to the program including funding, to be assessed. There are additional, unique perspectives that apply to resources and transcend substantively to the supplier sector where the prime contractor may only **be the system integrator and** not the developer or builder of any of the system components. The focus of the assessment needs to adjust according to the specifics of the program.

Sub-Area 2.1 – Program Planning and Allocation

Scope: Assess the amount of funding available for the effort, the funding profile and timeline, and how funding is allocated to execute the program.

Perspective:
Customer: Allocated funds are adequately phased to complete the SDD program.
Developer: Allocated program funding and expenditure rates track with planned SDD work packages. All technology integration, demonstrations, analysis, simulation, experimentation, and testing needs along with support activities are accounted for.

Factor 2.1.1 – Sufficiency

Criteria:
2.1.1.C1: (Customer & Developer) The funding (amount and profile) and schedule duration to perform all the planned activities (including PM reviews) should be determined by systematic estimating methods which may include past completed program cost and schedule 'actuals' (history), independent cost estimates, etc. [2.1.1.Q1, Q2, Q3, and Q4]

Sample Questions/Requests for Information:
2.1.1.Q1: (Customer & Developer) How do you determine that the planned and allocated funding and schedule are adequate to accomplish the system development and support effort? Does the type of funding match the planned scope of work? [2.1.1.C1]
2.1.1.Q2: (Customer & Developer) Identify what is covered by the funding and accommodated within the schedule. Are all elements of projected operation and support costs addressed? [2.1.1.C1]
2.1.1.Q3: (Customer & Developer) Does planned funding include reserve funding to cover development test contingencies, engineering changes, T&E infrastructure and asset needs (ranges, targets, data collection/reduction/analysis, and test participants operating costs) and Operational Test Support? Please explain. [2.1.1.C1]
2.1.1.Q4: (Customer) Is your T&E program fully funded in the POM/FYDP? Please explain. [2.1.1.C1]

Sample Observations:
2.1.1.O1: Insufficient program funding has resulted from poor cost estimating practices, as well as ignoring the cost estimates developed to support the funding and scheduling realism decision. Funding profiles have been planned which are not realistically aligned with the program profile fiscal years needs.
2.1.1.O2: The inability to adequately identify and manage risk in the program leads to unexpected or unplanned cost growth.

Factor 2.1.2 - Continuity/Stability

Criteria:
2.1.2.C1: (Customer & Developer) It is important that a program obtains and sustains funding to support its core program of work. This flow of funding needs to be stable and steady. [2.1.2.Q1]

Sample Questions/Requests for Information:
2.1.2.Q1: (Customer & Developer) Describe how program funds have been allocated (by fiscal year) against the Integrated Master Plan. Has the funding for this program been stable and steady so as to meet program needs? Please explain. [2.1.2.C1]

Sample Observations:
2.1.2.O1: Inconsistent and constrained funding is a common occurrence.
2.1.2.O2: Funding profile and timeliness are often insufficient for planned program phasing

Sub-Area 2.2 - Personnel

Scope: Assess the technical expertise available to the program both the government acquisition program office and the contractor development program office.

Perspective:
Customer: The program office staff is the right mix of qualified personnel to manage the SDD program.
Developer: Workforce management and training programs are high priority to ensure a stable, qualified work force to complete development and transition to production.

Factor 2.2.1 - Qualifications

Criteria:
2.2.1.C1: (Customer & Developer) Key contractor and government program technical personnel Chief Systems Engineer, head logistician, section chiefs, etc. have worked successfully on projects of similar complexity and have had significant work experience. [2.2.1.Q1]
2.2.1.C2: (Customer & Developer) The experience of the personnel is relevant to the current project in terms of both domain (e.g. system application) and complexity. [2.2.1.Q2]
2.2.1.C3: (Customer) Program office government personnel in acquisition-critical positions must be trained to the appropriate certification levels in accordance with their acquisition career assignments. [2.2.1.A3]

Sample Questions/Requests for Information:
2.2.1.Q1: (Customer & Developer) What is the experience level of each of the key technical personnel? [2.2.1.C1]
2.2.1.Q2: (Customer & Developer) How is the experience of the key technical personnel relevant to the current program? [2.2.1.C2]
2.2.1.Q3: (Customer) Are the government personnel in acquisition-critical positions (e.g. program management, contracting, oversight, etc.) trained to the appropriate certification levels in accordance with their acquisition career assignments? Please explain. [2.2.1.C3]

Sample Observations:
2.2.1.O1: Some desired/needed expertise is not readily available to the program, both government and contractor.

Factor 2.2.2 – Staffing

Criteria:
2.2.2.C1: (Customer & Developer) Adequate staffing must be in place to execute both the acquisition and development responsibilities within the program baselines. [2.2.2.Q1]
2.2.2.C2: (Customer & Developer) Software development staffing should be consistent with published estimating model(s) estimates. [2.2.2.Q2]
2.2.2.C3: (Customer & Developer) Staffing must be in place at the contract startup consistent with the needs and planned staffing ramp up and profiles. [2.2.2.Q3]
2.2.2.C4: (Customer & Developer) Turnover of technical personnel should be low, (e.g., less than 10%) in a development phase of a program. [2.2.2Q4]

Sample Questions/Requests for Information:
2.2.2.Q1: (Customer & Developer) How was required staffing determined across the program to successfully execute the program within the baselines? How is staffing tracked and controlled? [2.2.2.C1]
2.2.2.Q2: (Customer & Developer) How is required software development staffing determined, to execute the effort within the program schedule? [2.2.2.C2]
2.2.2.Q3: (Customer & Developer) How will staffing ramp up to execute the SDD program? Please explain. [2.2.2.C3]

2.2.2.Q4: (Customer & Developer) What are the estimated turnover rates of the various groups? (Include in-house shifting of the work force, i.e. resources lost to the program.) Explain how the turnover rates have impacted the program schedule. [2.2.2.C4]

Sample Observations:
2.2.2.O1: Lack of timely document review due to lack of government personnel availability.
2.2.2.O2: Negative program impacts caused by inter-program resource dependencies.
2.2.2.O3: Excessive critical personnel turnover (e.g. software) was resulted in program delays and overruns,

Factor 2.2.3- Training

Criteria:
2.2.3.C1: (Customer & Developer) Policies and standards should be in-place to ensure the thorough and continual training of technical personnel. [2.2.3.Q1]
2.2.3.C2: (Customer & Developer) Training programs should use interactive tools and techniques, formal classroom or on-the-job training and be of duration commensurate with the type of job. [2.2.3.Q2]

Sample Questions/Requests for Information:
2.2.3.Q1: (Customer & Developer) Describe any in-house training programs, continuous education and/or affiliations with academic centers. What are the standard requirements for training for technical personnel? [2.2.3.C1]
2.2.3.Q2: (Customer & Developer) How long does it take to train new technical personnel in the tools and methods needed to execute the program position duties? Discuss the training methods used and the job positions and duration of training required for each. [2.2.3.C2]

Sample Observations:
2.2.3.O1: Unit Training rate exceeds expected turnover rate.

Sub-Area 2.3 - Facilities

Scope: Assess the organizational support capability, (e.g., facilities, equipment, and test infrastructure) required for supporting the program.

Perspective:
Customer: Government-owned resources are available and adequate to support development, manufacture, and test activities.
Developer: To plan and schedule the acquisition of equipment and facilities, which are accurately forecast, cost effective, and meet the needs of the SDD program.

Factor 2.3.1 - Equipment

Criteria:
2.3.1.C1: (Developer) The fundamental development tools are in place and integrated to support the development effort. This includes the software engineering integrated tool set. [2.3.1.Q1]
2.3.1.C2: (Developer) The integration and test benches and laboratories are in place or planned to be in place consistent with the I&T schedule. [2.3.1.Q2]
2.3.1.C3: (Developer) Tooling and test equipment such as those used for environmental stress testing, screening, and qualification are available and qualified to support prototype testing. [2.3.1.Q3]
2.3.1.C4: (Developer) Equipment that has been used before such as environmental chambers is desirable. [2.3.1.Q4]
2.3.1.C5: (Developer) Shared test equipment can be scheduled without conflict. [2.3.1.Q5]
2.3.1.C6: (Developer) Progress of tooling and test equipment plans should be on track with the critical path of the hardware build and test. [2.3.1.Q6]
2.3.1.C7: (Developer) Test instrumentation for the planned open air testing is adequate to measure and collect the data needed to evaluate the system's performance, suitability and survivability. [2.3.1.Q7]

2.3.1.C8: (Developer) Test resources (M&S, HWIL test beds, targets, simulator or stimulators, data collection/reduction/analysis tools, etc.) are identified and available or their development is funded. [2.3.1.Q8]

Sample Questions/Requests for Information:
2.3.1.Q1: (Developer) Describe the development tools, including software development tools needed and in place to accomplish the development effort. [2.3.1.C1]
2.3.1.Q2:(Developer) Describe the integration and test benches, laboratories and facilities planned or in place to support I&T. [2.3.1.C2]
2.3.1.Q3: (Developer) What tooling and test equipment is required to support the program? To what extent will new tooling and/or test equipment be required? What are your specific plans and provisions to ensure that new tooling and / or test equipment is in place when required? [2.3.1.C3]
2.3.1.Q4: (Developer) Describe the existing test equipment that will be used on the program. [2.3.1.C4]
2.3.1.Q5: (Developer) Describe the extent to which test equipment will be shared with other programs, and how this equipment will be allocated and managed. [2.3.1.C5]
2.3.1.Q6: (Developer) Describe how tooling and test equipment being developed/built on the program will be in place when needed. [2.3.1.C6]
2.3.1.Q7: (Developer) Is the accuracy and availability of test instrumentation adequate to measure and collect the data needed to evaluate the system's performance, suitability and survivability? [2.3.1.C7]
2.3.1.Q8: (Customer & Developer) Are identified test resources (M&S, HWIL test beds, targets, simulator or stimulators, data collection/reduction/analysis tools, etc.) available or is their development funded? [2.3.1.C8]

Sample Observations:
2.3.1.O1: It is not uncommon for a program to be developed in a facility designed for other activities that are late to need, or cancelled.
2.3.1O2: Test equipment development is put off "till later" leading to potential schedule slips.
2.3.1.O3: Improvements needed to the test infrastructure are outside the control of the Program Manager and may impact on where and how his system will be evaluated in development, operational and live fire testing.

Factor 2.3.2 - Infrastructure

Criteria:
2.3.2.C1: (Developer) Contractor's shared facilities can be scheduled without conflict. [2.3.2.Q1]
2.3.2.C2: (Developer) Existing facility space is adequate. [2.3.2.Q2]
2.3.2.C3: (Developer) New facility plans are part of the overall management plan. [2.3.2.Q3]
2.3.2.C4: (Developer) A facilities schedule exists consistent with the program. Facilities are on the program critical path. [2.3.2.Q4]
2.3.2.C5: (Customer & Developer) Existing test and training ranges are adequate to support the planned test program. [2.3.2.C5]

Sample Questions/Requests for Information:
2.3.2.Q1 (Developer) Are shared facilities planned for program use and how will these be allocated so as to avoid conflict? Please explain. [2.3.2.C1]
2.3.2.Q2: (Developer) How much additional facility space is needed to execute the program? [2.3.2.C2]
2.3.2.Q3: (Developer) What new facilities and equipment must be developed? [2.3.2.C3]
2.3.2.Q4: (Developer) Show the master schedule for new/modified facilities relative to program milestones. [2.3.2.C4]
2.3.2.Q5: (Customer & Developer) Are the existing test and training ranges adequate to support the planned test program? [2.3.2.C5]

Sample Observations:
2.3.2.O1: New technologies and complex test requirements often drive contractors toward new vs. converted facilities.

Sub-Area 2.4 - Engineering Tools

Scope: Assess the range of engineering tools, techniques, etc., required for supporting the program.

Perspective:
Customer: The Program Office utilize systems engineering tools that define and manage requirements changes, and have real-time management access to the development contractors' SDD activities and electronic data base.
Developer: The contractor has in-depth knowledge and experience in working with systems engineering, and modeling and simulation tools.

Factor 2.4.1 – Systems Engineering Tools

Criteria:
2.4.1.C1: (Customer & Developer) Evolutionary acquisition and spiral development support changes to requirements to meet operational capabilities. Dynamic requirements must be carefully managed and traced both backwards to the operational capabilities and forward to project design and execution. Useful tools for requirements management include but are not limited to DOORS, RTM, and RequisitePro. [2.4.1.Q1, Q2, and Q3]
2.4.1.C2: (Developer) Program management tools such as Project, Outlook, and Excel should be linked to other SE tools. [2.4.1.Q4]
2.4.1.C3: (Developer) Systems Engineering analysis and System designs should be supported by appropriate diagramming tools such as Visio, Power point, RDD100, and UML design tools, e.g. Rational, CoolJex, Rapsody, etc. [2.4.1.Q5]
2.4.1.C4: (Developer) Engineering Design is supported by the use of automated tools including CAD, UML, Matlab, etc. [2.4.1.Q6]
2.4.1.C5: (Developer) Design analysis must be conducted at the lowest level possible and as early as possible to avoid costly "discoveries" during later test and evaluation. Commonly used analysis tools include CAD (ProE, CATIA), Matlab, ModSaf, OneSaf, Janus, legacy code, excel, Vega, UML (rational, CoolJex, Rapsody), etc. [2.4.1.Q7]
2.4.1.C6: (Developer) Test strategies and test design begin with a verification matrix identifying the verification method to be used for each requirement and design element identified in the SE process. With evolutionary acquisition, it is essential that the verification matrix be linked to the requirement management and design tools. Commonly used tools include Excel, DAQ, LabView, etc. [2.4.1.Q8]

Sample Questions/Requests for Information:
2.4.1.Q1: (Customer & Developer) What systems engineering tool(s) are used to capture and manage requirements? Provide a sample of the output of that tool. [2.4.1.C1]
2.4.1.Q2: (Customer & Developer) Does the requirements tool support requirements flow-down? Does the tool support capture of allocation rationale, accountability, test/validation, criticality, issues, etc? If so, how and what mechanism does it use? [2.4.1.C1]
2.4.1.Q3: (Developer) Does the requirements tool support traceability analysis? Please explain. [2.4.1.C1]
2.4.1.Q4: (Developer) What tools are used to support project management planning and execution? What linkages exist between the management tool(s) and other systems engineering tools? [2.4.1.C2]
2.4.1.Q5: (Developer) What tool(s) are used to capture system element structure? How does the tool graphically and textually capture system element structure? [2.4.1.C3]
2.4.1.Q6: (Developer) Describe the automated design tools used on the program. How are interfaces managed when different tools are used for different systems elements? Do the tools support multiple system views? [2.4.1.C4]
2.4.1.Q7: (Developer) What tools and techniques are used to force early verification of designs and interfaces at the part, component or module level? Are independent QA processes used at this level of verification? What tools are used to ensure low-level designs meet standards referenced at the requirements definition level? [2.4.1.C5]

2.4.1.Q8: (Developer) Are Systems Engineering and T&E fully integrated activities? Do tools used to trace requirements to test/verification events also perform the reverse function of tracing test/verification events back to all related requirements? [2.4.1.C6]

<u>Sample Observations</u>
2.4.1.O1: Systems engineering tools that are not fully integrated with one another provide a good indication that the program does not have an effective Systems Engineering program, but rather, has several stove-pipe activities operating under a “SE” umbrella.
2.4.1.O2: Many programs start with a good requirements flow-down and initial traceability, but as requirements change, (changing operational capabilities, delayed technology, threat updates, etc) total system impacts are not fully analyzed and updated.

Factor 2.4.2 – Modeling & Simulation Tools

<u>Criteria:</u>
2.4.2.C1: (Developer) Modeling and simulation is used for design and analysis purposes. To the extent practicable, simulation modules are integrated, and hardware-in-the-loop is planned for the Integration and test facilities, to ensure high fidelity results. [2.4.2.Q1, and Q6]
2.4.2.C2: (Developer) For major programs, there should be a simulation development plan complete with milestones. For SoS/Fos, the plan should describe interoperability and CONOPS demonstrations. [2.4.2.Q1]
2.4.2.C3: (Developer) For major programs, simulations should be used to evaluate design and support options and changes including configuration change evaluations and test readiness reviews. [2.4.2.Q2]
2.4.2.C4: (Developer) For major programs, a structured simulation-based approach should be used for failure analyses and/or problem diagnostics based on test sensor output matched to simulation models. [2.4.2.Q2]
2.4.2.C5: (Developer) For major programs, life cycle simulations should be used/planned to derive reliability criteria, material needs, optimized support work, and logistical arrangements. [2.4.2.Q2 and Q13]
2.4.2.C6: (Developer) As applicable, delivery schedules and in-factory material movement and work station and test flow simulations should be used/planned to predict assembly/ production build time and manpower needs and to evaluate impact of design changes or relocations or restructuring of facilities. . [2.4.2.Q2 and Q3]
2.4.2.C7: (Developer) Simulations used beyond milestone B CDR should be validated. A formal or structured validation process is important and should be managed as a key watch item. [2.4.2.Q9]
2.4.2.C8: (Customer & Developer) If appropriate, Government and contractor may use common models and simulations to support both development and test and evaluation. Simulations used to evaluate program performance as part of the test and evaluation process should, be verified independently from contractor simulations that are used for design of the system and undergo the same V&V rigor. [2.4.2.Q8 and Q14]
2.4.2.C9: (Developer) Simulations are netted with interface system simulations to help demonstrate interoperability. To evaluate performance of dynamic netted systems, and dynamic hardware in the loop, simulations should be real time. [2.4.2.Q7 and Q12]
2.4.2.C10: (Developer) CAD/CAM is used for the design of subsystems and the integration of complex systems. Personnel can readily identify these tools, their readiness, and past uses. [2.4.2.Q4]
2.4.2.C11: (Developer) Programs should use modeling and simulation tools and products that are based on modular open systems design principles to easily integrate different hardware and software products and incrementally upgrade them. All subsystems, as developed, should be pre-certified to avoid integration “unknowns” [2.4.2.Q5]
2.4.2.C12: (Developer) Modeling & Simulation support strategy is documented in a modeling and simulation support plan. [2.4.2.Q10]
2.4.2.C13: (Developer) The acquisition strategy encompasses the modeling & simulation support strategy, and is aligned with the modeling & simulation support plan (i.e. if modeling & simulation strategy calls for common use (both govt. and contractor) of models and/or data, the acquisition strategy must address the means to support such use. [2.4.2.Q11]

2.4.2.C14: (Customer & Developer) The modeling & simulation support strategy leverages expertise as required, from other government sources, to assist in support planning and training of program office personnel. [2.4.2.Q12]
2.4.2.C15: (Developer) M&S Data management: A common repository or archive should be maintained for M&S data. This will prevent duplication of effort and will make M&S results available to all users of that information. [2.4.2.Q19]
2.4.2.C16: (Developer) M&S Standards: M&S efforts should include use of common standards such as HLA. This will make models developed for component or system development to be easily integrated into more complex System-of-systems M&S efforts. [2.4.2.Q20]

Sample Questions/Requests for Information:
2.4.2.Q1: (Developer) Describe any modeling and/or simulation used in the design and support planning. If available, provide a copy of the modeling and simulation development plan. [2.4.2.C1 and C2]
2.4.2.Q2: (Developer) Provide a detailed presentation of all the modeling and simulations to be used on the program. Describe their functionality. [2.4.2.C3 through C6]
2.4.2.Q3: (Developer) Describe the computer aids used in the workstations. [2.4.2.C6]
2.4.2.Q4: (Developer)Provide a description of the tools used by the design team(s) (e.g. CAD/CAM). [2.4.2.C10, and C11]
2.4.2.Q5: (Developer) Are modeling and simulation tools open systems design? Please explain. [2.4.2.C11]
2.4.2.Q6: Describe the extent to which hardware-in-the-loop testing will be incorporated in the planned simulations. [2.4.2.C1]
2.4.2.Q7: (Developer) Explain how the contractor development team provides connectivity and compatibility in the use and sharing of development tools, modeling and test results to benefit an integrated design approach. [2.4.2 C9]
2.4.2.Q8: (Customer & Developer) Are Government simulations planned to be used? Describe how these will be used and verified. [2.4.2 C8]
2.4.2.Q9: (Developer) Describe your plan to validate models and simulations used during integration and test. [2.4.2.C7]
2.4.2.Q10: (Customer & Developer) Has a modeling & simulation support plan been developed for the program? Please describe. [2.4.2.C12]
2.4.2.Q11: (Customer & Developer) How is the plan aligned with the acquisition strategy? [2.4.2.C13]
2.4.2.Q12: (Developer) Does the M&S Support Strategy address systems-of systems engineering requirements, and how M&S will enable those processes? [2.4.2.C9]
2.4.2.Q13: (Developer) Does the M&S Support Strategy address M&S Requirements across the entire life cycle? [2.4.2.C5]
2.4.2.Q14: (Developer) Does the M&S Support Strategy address both government and contractor M&S? [2.4.2 C8]
2.4.2.Q15: (Developer) Does M&S planning include data management, such as a common data repository or archive? [2.4.2.C15]
2.4.2.Q16: (Developer) Does M&S planning call for common standards, such as HLA? [2.4.2.C16]
2.4.2.Q17: (Developer) Does the plan/strategy intend to pre-certify all subsystems (including software) to prevent integration “unknown unknowns”? [2.4.2.C11]
2.4.2.Q18: (Developer) For a SoS/FoS, is there a plan to demonstrate system interoperability and joint CONOPS via JDEP during SDD? [2.4.2.C2]

Sample Observations:
2.4.2.O1: Most programs have and develop excellent support tools and generally make good use of them.
2.4.2.O2: Evaluation simulations are the same as design simulations.
2.4.2.O3: Contractors cannot readily address CAD/CAM tools (existence and readiness)

3.0 Management Assessment Area

Scope: Management is concerned with the capability and implementation of planning, resource allocation, and the effective application of tools and techniques to monitor and control the program.

Perspective: Both the program office and the contractor need to have competent and motivated staffs in order to be able to successfully manage complex system development programs. Skills, experience, and tools and techniques should be applied and managed in an integrated, seamless fashion. Management transcends the entire spectrum of the program with particular emphasis on risk, financial, technology, engineering, logistics, configuration, contract, and personnel management (see Sub-Area *2.2* above). Additionally important is the level of effective communication among program office personnel as well as across the spectrum of stakeholders, including contractor, user, test community, customer, sponsor, and operator.

Sub-Area 3.1 – Acquisition Strategy/Process

Scope: Assesses the effectiveness of the effort's acquisition strategy and the process for implementing and sustaining the strategy.

Perspective:
Customer: The acquisition strategy reflects the execution plan for the SDD phase of the program in sufficient detail and describes the management planning, programmatic, and technical risks. The strategy also considers the maturity of the technologies need to develop, test, and produce the system to meet the requirements of the CDD.
Developer: The development strategy is robust and incorporates the Modular Open Systems Architecture (MOSA) design approach for all key interfaces within the system concept. Supportability is addressed and technology maturity is assessed and verified.

Factor 3.1.1 – Acceptability

Criteria:
3.1.1.C1: (Customer) The acquisition strategy and specific acquisition approaches should be consistent with operational capabilities/requirements and available resources, and appropriate to fully develop a system that meets the program objectives. The acquisition strategy should also include a life-cycle sustainment strategy. The strategy, including specific approaches, competition, contract types, etc needs to be well documented and promulgated to all participants in the program. [3.1.1.Q1, Q2, Q4 and Q5]
3.1.1.C2: (Customer) The proposed acquisition strategy including the product support strategy, should be rationalized as the preferred approach based on quantitative criteria (e.g. lowest risk, best value, etc.), and a comparison of alternative approaches that verifies the selected approach as the optimal solution. [3.1.1.Q1and Q6]
3.1.1.C3: (Customer) DoD policy requires the maximum use of a digital environment throughout the acquisition life cycle of the program. The Program Manager is required to establish a data management system with the appropriate digital environment to allow stakeholders in the program to readily access program data, based on need to know (this would provide useful status tracking capability for a system of systems program). This should be addressed in the acquisition strategy document. [3.1.1.Q3]
3.1.1.C4: (Customer) The acquisition strategy should describe the program's approach for applying Modular Open Systems Architecture (MOSA), characterized by the following attributes:

- Modular hardware and software design
- Incremental system improvements without total redesign
- Standard-based, robust architecture to accommodate new technology for improved capability and extended service life
- Commercially supported specifications and standards for selected interfaces, products, practices, and tools
- Planned validation of open systems implementation
- Planned migration of closed system hardware to open system design with capability upgrades.
- Supportability of the system.
- COTS technology refreshment plans
- COTS logistics/sparing plan [3.1.1.Q7, Q8, Q9, and Q10]

3.1.1.C5: (Customer) The acquisition strategy should address provisions to deal with obsolescence and diminishing suppliers. [3.1.1.Q5]

<u>Sample Questions/Requests for Information:</u>
3.1.1.Q1: (Customer) Provide and describe the system acquisition strategy and provide specific examples of how it is being applied/implemented on the program. [3.1.1.C1]
3.1.1.Q2: (Customer) How is the acquisition strategy documented and where is it held and in what form? [3.1.1.C1]
3.1.1.Q3: (Customer) Explain how the program will use the digital database environment to enable stakeholder access to program data during the execution of the program. Will OSD staff members of the IPT process have access to the risk management database? [3.1.1.C3]
3.1.1.Q4: (Customer) Explain how the acquisition strategy relates to the operational requirements of the system and/or system of systems. [3.1.1.C1]
3.1.1.Q5: (Customer) Describe your acquisition strategy for system life-cycle sustainment, including provisions to deal with obsolescence and diminishing suppliers. [3.1.1.C1 and C5]
3.1.1.Q6: (Customer) Provide a comparison of the proposed strategy to alternative approaches and explain the basis of the selected approach. [3.1.1.C2]
3.1.1.Q7: (Customer) Has the program documented its approach for using open Modular Open Systems Architecture (MOSA)? If so, what specific operational capability (e. g., ease of integration, interoperability, supportability, etc.) and acquisition objectives (e. g., affordability, ease of change, leveraging commercial investment in new technology, etc.) are enabled by the use of open systems in your program? [3.1.1.C4]
3.1.1.Q8: (Customer) Describe your approach for modular design for both hardware and software. [3.1.1.C4]
3.1.1.Q9: (Customer) Does the design use commercially supported specifications and standards for selected interfaces (external, internal, functional, and physical), products, practices, and tools? Please Explain. [3.1.1.C4]
3.1.1.Q10: (Customer) Identify the key selected interfaces and whether MOSA will be used. [3.1.1.C4]

<u>Sample Observations:</u>
3.1.1.O1: The contract has a provision for open systems upgrade to avionics, but is dependent on another acquisition program to mature the technology and is forced to implement the current design and consider the upgrade in production.
3.1.1.O2: The contract contains provisions to validate open systems implementation support, and conformance to selected profiles.
3.1.1.O3: Ongoing programs are not likely to actively embrace new, emerging, and/or innovative approaches such as open systems, etc.

Factor 3.1.2 - Feasibility of the Acquisition Strategy

<u>Criteria:</u>
3.1.2.C1: (Customer) The acquisition strategy should be consistent with the maturity of the planned technology to be used in the program development. [3.1.2.Q1]
3.1.2.C2: (Customer) Program risks are identified and documented, and progress is tracked via established metrics that should be invariant with time. The end result should be that the overall risk of implementing the acquisition strategy is manageable within available time and resources. [3.1.2.Q2].
3.1.2.C3: (Customer) In selecting its acquisition strategy, the program should assess the feasibility of using widely supported commercial interface standards in developing the system. [3.1.2.Q3]
3.1.2.C4: (Customer) The acquisition strategy should ensure access to cutting-edge technologies and products from multiple suppliers. [3.1.2.Q4]
3.1.2.C5: (Customer) The acquisition strategy should enable reasonable mitigation of the risks associated with technology obsolescence, being locked into proprietary technology, and reliance on a single source of supply over the life of a system. [3.1.2.Q5]

<u>Sample Questions/Requests for Information:</u>
3.1.2.Q1: (Customer) Identify and explain the technical considerations, including technology maturity, in

selecting your acquisition strategy. [3.1.2.C1]
3.1.2.Q2: (Customer) Identify and describe the development risks considered in selecting your acquisition strategy. [3.1.2.C2]
3.1.2.Q3: (Customer) Has the program assessed the feasibility of using widely supported commercial interface standards in developing the system? [3.1.2.C3]
3.1.2.Q4: (Customer) Does the program acquisition strategy maintain continued access to cutting-edge technologies and products from multiple suppliers? Please give examples. [3.1.2.C4]
3.1.2.Q5: (Customer) Describe how you apply your acquisition strategy to mitigate the risks associated with technology obsolescence, being locked into proprietary technology, and reliance on a single source of supply over the life of a system? [3.1.2.C5]

Sample Observations:
3.1.2.O1: Acquisition strategies have been structured along the lines of a software-intensive acquisition since software integration is often the primary source of delays.
3.1.2.O2: The program has a documented process/approach for modular, open systems implementation but is not making effective use of it.
3.1.2.O3: The program has unrealistic expectations for the level of maturity of critical technologies.

Sub-Area 3.2 – Project Planning

Scope: Assesses the effectiveness of the effort's planning approach to include funding, management, program control, and scheduling.

Perspective:
Customer: The program office has the necessary management tools to effectively execute the SDD program. This includes the management and control of program risks to an acceptable level. Program cost estimates are of high fidelity.
De*veloper:* Management and tracking processes are in place to control risks during SDD.

Factor 3.2.1 – Schedule Tracking

Criteria:
3.2.1.C1: (Developer) The program has appropriate development activities planned and scheduled, e.g. Integrated Master Plan/Integrated Master Schedule (IMP/IMS), and implements these activities to execute the program. These planned and scheduled activities include completion criteria. The IMS is integrated with program technical risk management. [3.2.1.Q1 and Q3]
3.2.1.C2: (Developer) The Integrated Master Plan identifies interim DT&E measures as addressed in the TEMP. [3.2.1.Q1]
3.2.1.C3: (Developer) The program is following the program management plans in executing the program. The program has accomplished/is accomplishing the planned activities with minimal schedule impact and is proceeding to execute within the program baselines. Schedule performance is reported through an Earned Value Management System (EVMS). [3.2.1.Q4]
3.2.1.C4: (Developer) Subcontractor performance reviews are conducted with the appropriate frequency and schedule performance is integrated with prime contractor reporting and tracking. [3.2.1.Q5]
3.2.1.C5: (Developer) An IMS critical path analysis is performed and maintained [3.2.1.Q2]
3.2.1.C6: (Developer) The development and test schedules are event driven and guided by the use of success criteria. [3.2.1.Q6]
3.2.1.C7: (Developer) The test schedules are reasonable, accommodate all required testing, and include a test, analyze, and fix methodology. [3.2.1.Q7 and Q8]

Sample Questions/Requests for Information:
3.2.1.Q1: (Developer) Provide and describe top-level integrated program plans and schedules that define and schedule the appropriate development activities to execute the program. Describe the method used to allocate times for the scheduled activities, e.g., systems engineering analyses, detailed design, component testing, etc. Include identification of completion criteria and DT&E interim test measures for

the planned and scheduled activities. How are these plans and schedules used to manage the program? [3.2.1.C1]
3.2.1.Q2: (Developer) Describe how you use an Integrated Master Schedule (or equivalent) to identify a critical path. [3.2.1.C5]
3.2.1.Q3: (Developer) Describe how you use an Integrated Master Schedule to reflect the known technical risks in your program? [3.2.1.C1]
3.2.1.Q4: (Developer) Provide evidence that you are implementing your program management plans in executing the program. Also provide evidence that the program is on schedule to complete within the program baselines/expectations. [3.2.1.C3]
3.2.1.Q5: (Developer) Describe the process for subcontract performance tracking and the schedule performance status of each. [3.2.1.C4]
3.2.1.Q6: (Developer) Describe how the development and test schedules are event driven, and the success criteria that comprise the metrics for schedules. [3.2.1.C6]
3.2.1.Q7: (Developer) Discuss the reasonableness of the test schedules, and whether they incorporate at test, analyze, and fix methodology. [3.2.1.C7]
3.2.1.Q8: (Developer) Describe the time frame for preparing draft tactics, techniques, and procedures or CONOPS and demonstrating them in a SIL or intended environment in SDD? [3.2.1.C7]

Sample Observations:
3.2.1.O1: Although the relationship between the program within the overarching system of systems is tenuous and not well defined, the program has been asked to accelerate their schedule by 18 months to coincide with the system of systems release date.
3.2.1.O2: Critical paths are either not identified effectively, or programs have something they call critical path but cannot substantiate how it was identified nor justify that it is in fact a true critical path.
3.2.1.O3: Most program Integrated Master Schedules are a compendium of schedules provided by participating parties on the program and there is no attempt to either integrate these nor dictate such an integration of subordinate schedules devolving from the central program objectives.

Factor 3.2.2 – Feasibility of Project Planning

Criteria:
3.2.2.C1: (Customer & Developer) Program funding and schedules are sufficient to accommodate technical complexity and identified program risks. Sufficient resources are allocated and available to the program to successfully develop the system within the program baseline. [3.2.2.Q1]
3.2.2.C2: (Customer & Developer) The program funding is based on a Contractor Work Breakdown Structure (CWBS) with well-defined work packages, schedules, and performance criteria. [3.2.2.Q2]

Sample Questions/Requests for Information:
3.2.2.Q1: (Customer & Developer) How do your program planning, funding, and schedules accommodate technical complexity, program risks, and critical path planning? How do you know the schedules are sufficient to accommodate the development effort? [3.2.2.C1]
3.2.2.Q2: (Customer & Developer) How are work defined and resources allocated to the program to execute the development effort within the program baselines? [3.2.2.C2]

Sample Observations:
3.2.2.O1: Poor program planning regarding IPT structures and usage has led to poor communications and an infeasible project plan.
3.2.2.O2: Program plans are not executable within given time and resources.

Factor 3.2.3 – Suitability of Project Planning

Criteria:
3.2.3.C1: (Developer) The program has an appropriate process in place to manage a program plan and control changes to the plan. [3.2.3.Q1]
3.2.3.C2: (Developer) The management team has sufficient insight into subcontractor status to make realistic changes to the program plan. [3.2.3.Q2]

3.2.3.C3: (Developer) A key attribute of effective program planning is a solid foundation of strategic planning that occurred at the earliest point in the program and that is kept current as the program evolves. [3.2.3.Q3]

Sample Questions/Requests for Information:
3.2.3.Q1: (Developer) What is the process for keeping current the project/program planning activities? Who has the authority to change the planning process? [3.2.3.C1]
3.2.3.Q2: (Developer) As a stakeholder in successful performance of subcontractors, how is the prime contractor involved in/cognizant of its major subcontractors' re-planning processes? [3.2.3.C2]
3.2.3.Q3: Describe how you perform strategic planning on the program. [3.2.3.C3]

Sample Observations:
3.2.3.O1: The management team is not experienced in dealing with troubled programs, and consequently, is having difficulties in re-establishing a feasible program plan.
3.2.3.O2: Strategic planning is not performed at all or it was performed mid-course in order to respond to OMB PART queries (or the like such as from GAO) and hence has no direct effect on the success of the program.
3.2.3.O3: Leadership is not dealing well with program complexities.

Sub-Area 3.3 – Program and Project Management

Scope: Assesses the capability of the program management organizational structure and implementation of sound management practices across the cost, schedule, and technical aspects of the program.

Perspective:
Customer: The program office must be staffed with qualified personnel who possess acquisition-certified credentials, and have the requisite experience in system development, test, and production in the right mix to oversee contractor activities in all functional areas.
Developer: Success of the program depends on maintaining a qualified staff and leveraging the tools and resources of the company. Effective risk management includes integrated team (including supplier base) management and reporting, a strong quality assurance program, and visibility by senior management, in order to provide resources necessary to maintain critical path schedules throughout the program.

Factor 3.3.1 – Organization

Criteria:
3.3.1.C1: (Customer) The Government Program Office is organized to execute all acquisition functions. Integrated Product Teams (IPTs) or equivalent are formed and include all appropriate program stakeholders. The organization includes support from the acquisition organization infrastructure, agencies like DCMA, OSD, and from contracted support personnel, as required. The roles and responsibilities are clearly defined and consistent with achieving program objectives. [3.3.1.Q1]
3.3.1.C2: (Developer) The contractor development team is organized with assigned development functions. IPTs or equivalent are formed and include representatives from all appropriate stakeholders. The team includes support from the development organization infrastructure, subcontractors and contracted support personnel, as required. Roles, responsibilities, and lines of authority are clearly defined and consistent with achieving program objectives. [3.3.1.Q1 through Q7]
3.3.1.C3: (Customer) The government program office views the OSD test staff personnel as a partner in the development test program. Full access to program test events, reports, review meetings, etc., is planned through IOT&E. [3.3.1.Q8]

Sample Questions/Requests for Information:
3.3.1.Q1: (Customer) Provide government program office organizational charts and describe how the program is organized, supported and staffed to execute the program acquisition functions. Identify and describe how roles and responsibilities are defined. [3.3.1.C1]
3.3.1.Q2: (Customer) Has a charter been developed to form an Integrated Test/Combined Test Team? Does it address a strategy to include user involvement and reduce the scope of the IOT&E? [3.3.1.C1]

3.3.1.Q3: (Developer) Provide the contractor organizational charts, major development subcontractor organizational charts, and describe how the organization is staffed to execute the program. [3.3.1.C2]
3.3.1.Q4: (Developer) How does the contractor program organization leverage the Company supporting infrastructure organization in executing the program? [3.3.1.C2]
3.3.1.Q5: (Developer) Describe the contractor participants and their roles in the program's Systems Engineering processes and decisions. [3.3.1.C2]
3.3.1.Q6: (Developer) Describe the relationship between the contractor software development teams and Systems Engineering organization on the program. [3.3.1.C2]
3.3.1.Q7: (Developer) Has a corrective action and review team been established to trace corrective actions? [3.3.1.C2]
3.3.1.Q8 (Customer) Is the Government Program Manager embracing full OSD (DT&E/DOT&E) insight into the test program? Describe the access intended for test events, test plans, review meetings, etc., by OSD test staff personnel. [3.3.1.C3]

<u>Sample Observations:</u>
3.3.1.O1: Systems Engineering functions are often performed 'by committee', and consequently, decisions are not made in a timely manner.
3.3.1.O2: There are entities such as a Modeling and Simulation Advisory Group which operate autonomously but really should function more like an IPT, with decision-making authority.

Factor 3.3.2 – Suitability of Program Staff Experience

<u>Criteria:</u>
3.3.2.C1: (Customer) The Government program and supporting organization staff should have sufficient relevant engineering, software, contracting, financial, management, integration and test, logistics, and other participating disciplines experience and expertise in the acquisition of similar defense systems. [3.3.2.Q1]
3.3.2.C2: (Developer) The development contractor Program Manager should have sufficient relevant management experience in the development of similar defense systems. [3.3.2.Q2]
3.3.2.C3: (Developer) The development contractor program management staff should have sufficient participation of program management, systems engineering, software engineering, subcontract management, integration and test, logistics, modular, open systems and other relevant disciplines experience and expertise in the development of similar defense systems. [3.3.2.Q3]

<u>Sample Questions/Requests for Information:</u>
3.3.2.Q1: (Customer) Describe the relevant experience and qualifications of the government program office staff to successfully develop the program. Include: engineering, software, contracting, financial, integration and test, logistics, modular, open systems, and other participating disciplines. [3.3.2.C1]
3.3.2.Q2: (Developer) Describe the relevant experience of the development contractor Program Manager to manage the program. [3.3.2.C2]
3.3.2.Q3: (Developer) Describe the relevant management experience and qualifications of the development contractor program staff to successfully execute and manage the program. Include all disciplines relevant to manage the SDD program.. [3.3.1.C3]

<u>Sample Observations:</u>
3.3.2.O1: The Government program staff does not have sufficient expertise to manage a program of this magnitude.

Factor 3.3.3 – Risk Management

<u>Criteria:</u>
3.3.3.C1: (Customer & Developer) Risks that have a potential impact on system cost, schedule, and technical performance thresholds are formally tracked by a Risk Management Working Group or like organization. [3.3.3.Q1]
3.3.3.C2: (Developer) An established, documented risk management process is applied to manage program risks in an ongoing fashion across the life of the program, addressing supportability risks such as

obsolescence. This process and methodology includes risk identification, risk assessment, risk mitigation, and tracking risks to closure. [3.3.3.Q2, Q3, Q4, Q5 and Q6]
3.3.3.C3: (Developer) An established risk management methodology is applied to contain and mitigate programmatic and technical risk. This risk management activity should be integrated with other program management processes applied to manage the program. [3.3.3.Q2]
3.3.3.C4: (Developer) The Program Manager establishes and maintains a corrosion prevention and mitigation reporting system for data collection and feedback and uses it to address logistic considerations and readiness issues. [3.3.3.Q7]
3.3.3.C5: (Developer) If the program is a system of systems, the Program Manager should weigh the impact of significant technical risk issues on the hierarchical program(s) [3.3.3.Q8]

Sample Questions/Requests for Information:
3.3.3.Q1: (Customer & Developer) Describe your risk management procedures. Explain how both routine and unplanned changes are risk managed. Who is responsible to implement risk management on the program? [3.3.3.C1]
3.3.3.Q2: (Developer) Identify and describe the formal tool(s) and mechanism(s) that are in-place to manage the risks on this program? [3.3.3.C2 and C3]
3.3.3.Q3: (Developer) Identify any commonly accepted risks that the program is not formally tracking Provide a list of the top five risks on the program. [3.3.3.C2]
3.3.3.Q4: (Developer) Provide and describe your risk management plan. Include descriptions of identified risks, quantitative risk assessment, risk mitigation, and tracking risks to closure. [3.3.3.C2]
3.3.3.Q5: (Developer) Please identify the logistics risk items identified, analyzed, and included in the program risk assessment. [3.3.3.C2]
3.3.3.Q6: (Developer) How do you mitigate risks to closure? How is the risk management process integrated with the program management process? Explain how the risk management process is used to manage programmatic and technical risks. Does this process address the risk associated with schedule concurrency? [3.3.3.C2]
3.3.3.Q7: (Developer) Describe your obsolescence and corrosion prevention risk mitigation program and explain how the program is being reported and tracked for the life cycle of the system. [3.3.3.C4]
3.3.3.Q8: (Developer) (For a system of systems): Does the risk management process include a link with the hierarchical program(s) to examine risk alternatives and program impacts? [3.3.3.C5]

Sample Observations:
3.3.3.O1: Technical risks are tracked using the program's risk management process, however the important management-level risks are not being addressed.
3.3.3.O2: Program has a token effort at risk management; risk management process is not used in making key program decisions.

Factor 3.3.4 – Techniques and Methods

Criteria:
3.3.4.C1: (Developer) Appropriate management techniques, methods, and tools are used to manage the program. These techniques, methods, and tools enable management to access timely information and status, mitigate risks, and facilitate timely decisions to keep the program on track with the Integrated Master Schedule. [3.3.4.Q1 and Q9]
3.3.4.C2: (Developer) The health of a program is commonly gauged in terms of cost, schedule, and performance. In addition to the Technical Performance Measures (TPMs) that address key performance parameters (KPP), metrics are identified and used to cover other performance-related requirements/capabilities such as Developmental Test success criteria, Operational Test entrance criteria, as well as cost and schedule performance using Earned Value Management (EVM) methodology. Metrics identified are well defined, and data are readily available, collected, documented and acted upon. For those metrics not being met, a plan of action should be developed. [3.3.4.Q5, Q8 and Q11]
3.3.4.C3: (Developer) It is important that programs are able to establish an efficient data collection and management process. These data need to be well defined and readily available. The key is being able to answer the questions, "Where are you?" "How do you know?" and "Show me." [3.3.4.Q5 and Q8]
3.3.4.C4: (Customer) The Government Program Office should initially approve the program metrics and

then periodically, e.g., monthly, the metrics should be reported and reviewed. These metrics should include many, if not all of the following:

- Development status S curves
- Processor throughput utilization
- Processor memory utilization
- Input/output utilization
- Software Engineering Staffing
- Software Work Packages Summary
- Schedule Performance Index
- Cost performance Index
- Problem/Deficiencies /Discrepancies Status
- Requirements Stability
- Software Size
- Reuse Status (planned vs. 'actuals')

Reliability Growth Curve
Logistics Footprint Reduction
Planned Operational Effectiveness
Product Availability Predictions
O&S Cost Projections
Development test status
DAES Reporting (For MDAPS)

…..Milestone C entrance criteria
[3.3.4.Q2 through Q8 and Q10]

<u>Sample Questions/Requests for Information:</u>

3.3.4.Q1: (Developer) Provide and describe the program management techniques, methods, and tools used to manage the program. [3.3.4.C1]

3.3.4.Q2: (Developer) Provide and describe program metrics, including software metrics, used to manage the program. [3.3.4.C4]

3.3.4.Q3: (Developer) Describe how you are using metric thresholds to track development progress. [3.3.4.C4]

3.3.4.Q4: (Developer) Explain who in the organization generates the metrics and who in the organization reviews the metrics. How often are the metrics updated and presented to the program manger and higher levels of executive management. [3.3.4.C4]

3.3.4.Q5: (Developer) How are the metrics interrelated and integrated with other management tools such as Technical Performance Measures TPMs, Key Performance Parameters, Developmental Test Success Criteria, Operational Test Entrance Criteria, risk management, EVM and cost reporting? [3.3.4.C2, C3 and C4]

3.3.4.Q6: (Developer) Describe how metrics are structured and maintained to capture and track trend data. [3.3.4.C4]

3.3.4.Q7: (Customer & Developer) How will the program metrics initially be approved and then periodically reviewed by and reported to the acquisition program office. Are the metrics documented in the TEMP and Acquisition Strategy Report? Please explain. [3.3.4.C4]

3.3.4.Q8: (Developer) Explain your process for determining current program status and for updating this information. [3.3.4.C2, C3 and C4]

3.3.4.Q9: (Developer) Describe any other management tools that may be used during the program. [3.3.4.C1]

3.3.4.Q10: (Developer) Provide and describe other forms and content of periodic program management status and health monitoring (e.g., internal audits). How is this reporting used in managing the program? [3.3.4.C4]

3.3.4.Q11: (Customer & Developer) Do the contractor and Program Office use EVM for resource projections and critical path analyses? Please explain. [3.3.4.C2]

3.3.4.Q12: (Customer & Developer) Is the program prepared to implement Defense Acquisition Executive Summary (DAES) reporting after MS B? (MDAPs only) [3.3.4.C4]

Sample Observations:
3.3.4.O1: the Program Office does not properly analyze Contractor status reports.
3.3.4.O2: The program's contract status reports do not allow the Program Office to track status.
3.3.4.O3: Essential review and oversight activities are not performed.

Factor 3.3.5 - Information Systems

Criteria:
3.3.5.C1: (Developer) State-of-the-art information system techniques, tools, and computing equipment and software applications are used to manage the program. [3.3.5.Q1 and Q3]
3.3.5.C2: (Developer) Whenever a new program Management Information System (MIS) must be developed, and is needed by the government for the program, it should be treated as a deliverable. It should be standardized to conform to new Information Technology (IT) regulatory and statutory requirements. [3.3.5.Q2]

Sample Questions/Requests for Information:
3.3.5.Q1: (Developer) Identify and describe the management information systems that will be used in the program? Explain how program progress is reported. [3.3.5.C1]
3.3.5.Q2: (Developer) For any newly developed management information system, explain how it complies with the regulations and statutes for new Information Technology (IT). [3.3.5.C2]
3.3.5.Q3: (Developer) Describe any other management information tools to be used on the program. [3.3.5.C1]

Sample Observations:
3.3.5.O1: Program offices often use up-to-date and state-of-the-art computing tools and equipment but are not doing so effectively due to lack of training and/or skill.

Factor 3.3.6: –Configuration Management

Criteria:
3.3.6.C1: (Developer) Configuration Management and Control Authority is clearly defined and is integral to the systems engineering process in managing the configuration baseline. [3.3.6.Q1]
3.3.6.C2: (Developer) There should be a Configuration Management Plan that addresses the methodology to manage the system configuration throughout the program life cycle. The Plan clearly defines the set of specifications/configuration items for both hardware and software that comprise the configuration baseline specified in the contract. The baseline should correlate with the system work breakdown structure (WBS). [3.3.6.Q2]
3.3.6.C3: (Developer) The configuration management process established by the contractor should consist of a formal methodology that sets the configuration baseline, tracks and controls changes and additions/deletions to the baseline, and maintains integrity of the process via formal audits or some other oversight mechanism. This methodology should include formal communication of the configuration to the contractor supplier base and highlight supportability issues that could impact the fielded system. [3.3.6.Q3 and Q4]
3.3.6.C4: (Developer) The change management process used by the program should document the impact(s) of a proposed change on open interfaces used within and among systems (such as a system of systems). [3.3.6.Q5]
3.3.6.C5: (Developer) Configuration management should address obsolescence and technology refreshment. [3.3.6.Q6]

Sample Questions/Requests for Information:
3.3.6.Q1: (Developer) Describe how the systems engineering applied process addresses configuration control and authority. Explain the roles and responsibilities of the configuration managers and how proposed changes are controlled and implemented. [3.3.6.C1]
3.3.6.Q2: (Developer) Provide the details of the Configuration Management Plan, including the current configuration baseline and how it was derived. Does it provide coverage throughout the system life cycle? [3.3.6.C2]

3.3.6.Q3: (Developer) Describe the configuration management process to be used on the program, the content of the current configuration baseline and how the process will manage configuration changes. Are periodic configuration audits conducted to ensure the integrity of the product and the process? Please explain. [3.3.6.C3]
3.3.6.Q4: (Developer) How does the configuration management process include the supplier base? [3.3.6.C3]
3.3.6.Q5: (Developer) Does the change management process used by the program identify the impact of change on open interfaces and supportability? Please explain. [3.3.6.C4]
3.3.6.Q6: (Developer) Explain how the configuration management process addresses obsolescence and technology refreshment. [3.3.6.C5]

Sample Observations:
3.3.6.O1: Productivity shortfalls due to forcing all changes in the program's technical requirements to go through contract negotiations.
3.3.6.O2: Configuration management and control are spoken in the program office but not practiced.

Sub-Area 3.4 – Contracting and Subcontracting

Scope: Assesses how the contract structure serves the needs of the program in terms of ensuring success in delivering the best product to the Government

Perspective:
Customer: The program office works with other government stakeholders and contract specialists to structure a proposal request that provides the best value to the Government in meeting SDD program objectives.
Developer: The contracting strategy includes the appropriate contract mechanisms (contracts, agreements, teaming, etc), and is responsive to government program objectives. The strategy integrates management, and performance and cost accountability of the supplier base.

Factor 3.4.1 – Conditions/Constraints

Criteria:
3.4.1.C1: (Customer & Developer) System performance requirements are defined in a system specification that is baselined, put on contract, and specifically flowed down to the subcontractors. If the program is a system of systems, this should include system interface control requirements. [3.4.1.Q1]
3.4.1.C2: (Developer) Development process requirements are identified by leveraging the contractor's established process requirements that are tailored in program-specific plans, such as integrated master plans, systems engineering plans, and software development plans. The prime contractor requires a level of connectivity of management processes with major subcontractors, to provide compatibility in managing and reporting an integrated system development program. [3.4.1.Q2]
3.4.1.C3: (Customer & Developer) Contract types (e.g., cost plus or fixed price) are commensurate with the program development risk at each contracting level. [3.4.1.Q3]
3.4.1.C4: (Customer & Developer) The contract is structured to require the prime contractor to assume total system integration or total system performance responsibility, including product support. [3.4.1.Q4]
3.4.1.C5: (Customer & Developer) The contract and subcontracts have provisions to obtain rights to data, software, and property consistent with the planned life-cycle support strategy. The contract and subcontracts have provisions for data verification and warranties. [3.4.1.Q5 and Q6]
3.4.1.C6: (Customer & Developer) Incentives exist in the contract to motivate contractor performance to achieve program objectives. Award fees are based on objective written criteria. [3.4.1.Q7]

Sample Questions/Requests for Information:
3.4.1.Q1: (Customer & Developer) Describe how system performance and development process requirements are identified in the contracts. Explain how these requirements are flowed down to the development subcontractors. [3.4.1.C1]
3.4.1.Q2: (Developer) Describe how the contractor (and major subcontractors) will leverage their infrastructures/internal processes to manage the program. Explain how the prime contractor has

established management process compatibility with major subcontractors to provide the customer with an integrated development program across work share efforts. [3.4.1.C2]
3.4.1.Q3: (Customer & Developer) Identify the types of contracts used with the prime and major development subcontractors and explain how the selected approach best suits the program needs. [3.4.1.C3]
3.4.1.Q4: (Customer & Developer) If the contract requires the prime contractor to assume total systems integration or performance responsibility, and product support, explain how the Government Program Office is ensuring that this responsibility is properly addressed [3.4.1.C4]
3.4.1.Q5: (Customer & Developer) Describe contractual provisions to obtain rights to the data, software, and property. Are these provisions flowed down to major subcontractors? How are proprietary data, software, and property addressed? [3.4.1.C5]
3.4.1.Q6: (Customer & Developer) Describe the warranty provisions in the contract. [3.4.1.C5]
3.4.1.Q7: (Customer & Developer) Identify and describe contractual provisions to incentivize program execution (including system supportability). How are award fees determined? How are award fees or other performance incentives set up with key development subcontractors? [3.4.1.C6]

Sample Observations:
3.4.1.O1: The contract contains provisions that specifically call for implementation of modular, open systems.
3.4.1.O2: Not all subcontractors are practicing Integrated Product and Program Development.

Factor 3.4.2 – Cost/Schedule Accounting

Criteria:
3.4.2.C1: (Developer) Timely and accurate cost and schedule performance status is reported to senior program management and line executives. [3.4.2.Q1 and Q2]
3.4.2.C2: (Developer) This status information is used to trigger management actions to keep the program executing within the program baselines. When appropriate, senior program managers should review work packages to gain more timely insight into actual status. [3.4.2.Q1]
3.4.2.C3: (Developer) An approved Earned Value Management System (EVMS) is used to quantitatively measure and status program progress (earned value) relative to the allocated budget and schedule. The system conforms to a commercial or DOD standard. The system includes discrete work packages for hardware and software, with the appropriate test/verification activities included. [3.4.2.Q3, Q8, and Q9]
3.4.2.C4: (Developer) Resources were estimated using a systematic process including consideration of past-completed program ‘actuals’. The estimates involved the disciplines tasked to perform the work. Resources were allocated to individual tasks using a systematic process to assure balanced and necessary resources to accomplish the effort. [3.4.2.Q4, Q5, and Q6]
3.4.2.C5: (Developer) Subcontractor cost reporting should be current and use methods and practices consistent with the prime contractor cost reporting system. [3.4.2.Q7]

Sample Questions/Requests for Information:
3.4.2.Q1: (Developer) Provide latest reports and explain how program cost and schedule performance is reported. Does the report provide a timely and accurate measure of progress? Please explain. [3.4.2.C1 and C2]
3.4.2.Q2: (Developer) Who receives these reports, and how is performance reporting used in managing the program? [3.4.2.C1]
3.4.2.Q3: (Developer) Provide and describe the EVM system from the lowest level work packages to the highest-level status reporting. Does the EVMS conform to any commercial or DOD standard? Include application to software development earned value. How is the EVMS used in managing and controlling the program execution within the budget and allocated schedule? [3.4.2.C3]
3.4.2.Q4: (Developer) How were resources allocated to individual tasks? [3.4.2.C4]
3.4.2.Q5: (Developer) How were baselines estimated? [3.4.2.C4]
3.4.2.Q6: (Developer) Who was involved in the baseline estimating process? [3.4.2.C4]
3.4.2.Q7: (Developer) Is the information from subcontractor’s cost monitoring and control system rolled into the prime contractor’s system to present a comprehensive picture of program status? [3.4.2.C5]

3.4.2.Q8: (Developer) Is software progress being tracked through the program's cost monitoring and control system? [3.4.2.C3]
3.4.2.Q9: (Developer) Does EVM reporting data reflect risk reduction activities for the known technical risks in the program? Please explain. [3.4.2.C3]

Sample Observations:
3.4.2.O1: Unreliable cost and schedule estimates forcing repeated program slips.
3.4.2.O2: Cannot track software status across the program using the EVMS.
3.4.2.O3: Contractors provide EVM data as a deliverable but are not effectively using the data to manage their activities.

Factor 3.4.3 – Cooperative Agreements

Criteria:
3.4.3.C1: (Developer) The quality of a teaming agreement is judged by how well it is being used and how the participants (i.e., the "team") believe in it and speak of it. [3.4.3.Q1 and Q2]
3.4.3.C2: (Developer) A program needs the teaming agreement to be well documented; otherwise it is difficult to manage. [3.4.3.Q1]
3.4.3.C3: (Developer) There should be an atmosphere of open and honest communication across all elements of a program/system. Issues should be raised early before they become a problem and resolved expeditiously with concurrence from all affected participants. [3.4.3.Q3]

Sample Questions/Requests for Information:
3.4.3.Q1: (Developer) How have the teaming agreements between relevant parties been documented, defined, and communicated between all relevant parties? Are the teaming arrangements working well? Please explain. [3.4.3.C1 and C2]
3.4.3.Q2: (Developer) What is the process for making changes to the work agreements, and who is involved? [3.4.3.C1]
3.4.3.Q3: (Developer) How are program issues raised among the stakeholders? [3.4.3.C3]

Sample Observations:
3.4.3.O1: Poor cooperation among multiple development organizations.
3.4.3.O2: The program office staff has no confidence in the program schedule.

Sub-Area 3.5 – Communication

Scope: This Sub-Area concerns the communication processes that exist; the level of openness; the trust among the effort's stakeholders; how communication among the stakeholders influences the program.

Perspective:
Customer: The program office communicates through formal and informal communication means among the stakeholders and contractors. The communication methods include integrated product teams and foster cooperation and team work among all stakeholders in the program.
Developer: The contractor communicates internally and externally through periodic meetings, reviews and reports. The government program office and other government customers as well as suppliers are considered as part of contractor team. Electronic data base tools used by the contractor are made available to all stakeholders to provide near real time data access, and create an environment of trust and cooperation.

Factor 3.5.1 – Interfaces

Criteria:
3.5.1.C1: (Customer & Developer) The government program office communicates and interfaces closely and openly with the development contractor as well as other stakeholder organizations to include operational organizations and test and evaluation organizations. The government program office leverages the government organization infrastructure in developing the system. [3.5.1.Q1]

3.5.1.C2: (Customer & Developer) The contractor organization communicates and interfaces closely and openly with the Government Program Office. The contractor program office leverages the contractor organization infrastructure in developing the system. [3.5.1.Q2]
3.5.1.C3: (Customer & Developer) The contractor program office communicates programmatic information internally and externally in a timely and accurate manner across the internal team including subcontractors. This is accomplished with defined periodic meetings and other dissemination vehicles. For large, geographically distributed system development, electronic database tools are used to support this communication. The participating groups and functions, including production and support functions, are tied into the communication channels and process. [3.5.1.Q3 and Q4]
3.5.1.C4: (Customer & Developer) The government program office communicates programmatic information internally and externally in a timely and accurate manner through the program chain of command and to external stakeholders including the operational command. Periodic reporting and other vehicles are used to accomplish the communication. Electronic database tools are used to implement and support this communication. For programs that are integral to a system of systems, communication is accomplished across their components. [3.5.1.Q3 and Q4]

<u>Sample Questions/Requests for Information:</u>
3.5.1.Q1: (Customer & Developer) How does the government program office organization interrelate with the contractor program organization and other program stakeholders, such as the operational command and the test and evaluation organizations? How does the program office leverage the supporting infrastructure organization in executing the program? [3.5.1.C1]
3.5.1.Q2: (Customer & Developer) How does the contractor organization interrelate with the Government program office organization, including major subcontractor development organizations and other program stakeholders? How does the contractor program organization leverage the supporting infrastructure organization in executing the program? [3.5.1.C2]
3.5.1.Q3: (Customer & Developer) Explain how program related information is communicated internally among the program participants, including subcontractors. Explain how the communication is both timely and accurate. Describe how participating program groups and functions, including production and support functions, participate in the communication process. Identify and describe the periodic means used to communicate internally. [3.5.1.C3 and C4]
3.5.1.Q4: (Customer & Developer) Explain how program related information is communicated externally through the program chain of command and to external program stakeholders. Explain how the communication is both timely and accurate. Identify and describe the periodic means used to communicate externally. If the program system is an integral component of a system of systems, how is communication accomplished across the systems? [3.5.1.C3, and C4]
3.5.1.Q5: (Customer & Developer) Are there any problems sharing information on the program? What is causing the problems? [3.5.1.C1, C2, C3, andC4]

<u>Sample Observations:</u>
3.5.1.O1: Communications between the program office and the contractor are inadequate.
3.5.1.O2: Program information is compartmentalized, filtered, and slowly disseminated.
3.5.1.O3: Even though contract re-competition is several years down the road, representatives of the different development organizations are reluctant to share information necessary for current contract execution.

Factor 3.5.2 – Teamwork

<u>Criteria:</u>
3.5.2.C1: (Customer & Developer) Successful programs are usually attributable to a cohesive, team-like atmosphere where there is open information sharing, coordination, and mutual support. [3.5.2.Q1, Q3, and Q4]
3.5.2.C2: (Customer & Developer) Application of proven organizational constructs, such as Integrated Product/Process Teams (IPTs), can be very effective tools provided that the rules and responsibilities of the IPT(s) are well understood. [3.5.2.Q2 and Q3]
3.5.2.C3: (Customer & Developer) The morale of the organization espouses a ‘success oriented’ approach to the execution of the program, with healthy cooperation among stakeholders. [3.5.2.Q5]

Sample Questions/Requests for Information:
3.5.2.Q1: (Customer & Developer) How are the various Integrated Product Teams (IPTs) organized on this program? [3.5.2.C1]
3.5.2.Q2: (Customer & Developer) Do the IPTs have responsibility, experience staff, and authority to make decisions on the program? Please explain. [3.5.2.C2]
3.5.2.Q3: (Customer & Developer) Are all stakeholders represented and empowered to speak for their Organizations in within the IPTs? [3.5.2.C1 and C2]
3.5.2.Q4: (Customer & Developer) Is teamwork key to successful program execution? Please explain. [3.5.2.C1]
3.5.2.Q5: (Customer & Developer) Describe the attitude of the program team (both supplier and customer perspective). Does the team feel as though they are cooperating well together and working towards a common goal? [3.5.2.C3]

Sample Observations:
3.5.2.O1: Uncoordinated plans and development activities between developer organizations.
3.5.2.O2: Lack of information sharing.
3.5.2.O3: Program's use of so many IPTs impacting communications and decision-making.
3.5.2.O4: The customer is taking a hands-off approach, which is impacting team participation.
3.5.2.O5: Loss of expertise has affected morale.
3.5.2.O6: Friction exists between management and workers.

4.0 Technical Process Assessment Area

Scope: Technical process is concerned with the identification and utilization of tools, techniques, etc. that support a successful development of the program's technical product(s).

Perspective: A successful program should be based on an articulated, stable technical process. This process should be rigorously based on proven systems engineering concepts and methods. In performing a system assessment it is useful to evaluate the quality of the technical process prior to assessing the technical product. This Assessment Area is distinct from Technical Product to enable the perspective that the quality of the product is dependent on the quality of the process that supports it. It is also distinct from the Management Assessment Area in that it focuses on the System Engineering concepts used on the program.

Sub-Area 4.1 – Technology Assessment and Transition

Scope: Assesses how the systems engineering process identifies and selects technologies for program implementation within the context of the documented Technology Development Strategy, and manages the associated risk.

Perspective:
Customer & Developer: Technology Readiness Assessments (TRA) defines the maturity of the technologies developed in the Technology Development phase of the program. This sets the stage for the SDD strategy (part of the acquisition strategy), including systems engineering planning, and test and evaluation planning to execute the SDD program.

Criteria:
4.1.C1: (Developer) The systems engineering process should consider technology maturity metrics based on sound engineering practices and prior test results as detailed in the Test and Evaluation Strategy (See DoD Acquisition Guidebook). A detailed risk assessment should also be provided. [4.1.Q1, Q2 and Q3]

Sample Questions/Requests for Information:
4.1.Q1: (Developer) Describe the iterative process for evaluating/incorporating new/advanced technologies in potential system solutions. [4.1.C1]
4.1.Q2: (Developer) For a system of systems, explain the process for assessing the impact of incorporating new technologies on interface control and system supportability, with the hierarchy of systems. [4.1.C1]
4.1.Q3: (Developer) Describe the approach taken to accomplish technical risk assessment [4.1.C1]

Sample Observations:
4.1.O1: Technology readiness is either not well understood or improperly applied to the program.

Sub-Area 4.2 – Requirements Development

Scope: Assesses the operational needs, attributes, performance parameters, and constraints that flow from the desired system capabilities. It assesses how system level requirements are derived from the required operational capabilities through the systems engineering process, and are documented in the system level specification.

Perspective:
Customer & Developer: The systems engineering process must be applied, documented, and be traceable, to reflect total consideration of life cycle attributes in establishing performance specifications during SDD. Engineering tools are rigorously applied to trace the applicability of all CDD requirements to all WBS elements during the SDD effort. Complete functional interface collaboration among the WBS elements is required.

Criteria:
4.2.C1: (Developer) At each level of specification, requirements are identified and defined applying the systems engineering process. This includes market analysis, technology assessment, and modeling and simulation, to support trade-off studies to include life cycle costs, identification of measurable technical specifications along with the approach to verify performance. [4.2.Q1]
4.2.C2: (Developer) The objective should be to optimize system performance against cost, schedule, and risk. [4.2.Q1]
4.2.C3: (Developer) Appropriate stakeholders should be included in the requirements process steps. [4.2.Q1]
4.2.C4: (Developer) The process should include a description of how specifications are developed at each level of allocation, and defined as an input to the design process. A complete architecture should be developed which links the various levels of performance with allocations and specifications. [4.2.Q2]
4.2.C5: (Developer) The process should include development of derived specifications at each level and definition of the appropriate (and testable) verification requirements to verify achievement of each requirement in the specification. Critical technical parameters for each sub-system should be incorporated into the Test and Evaluation Master Plan. Implementation of high-risk technologies should be deferred and addressed through pre-planned product improvement or an evolutionary acquisition strategy. [4.2.Q2, Q3, and Q4]
4.2.C6: (Developer) The process should be disciplined in documenting and tracking specifications at all levels and structured for handling any changes. Configuration control should be integrated with this process. [4.2.Q2]
4.2.C7: (Developer) Except for the simplest of systems, this process should be supported by automated tools which provide for the automatic identification of relationships between requirements so that when changes are made, all impacted requirements are identified and accounted for in the updated system configuration, architecture, and verification requirements. [4.2.Q2]
4.2.C8: (Customer & Developer) Requirements development should encompass the development and refinement of system-level functional and performance requirements and external interfaces to facilitate the design of open systems. [4.2.Q5]
4.2.C9: (Customer & Developer) Requirements development should encompass analysis to ensure that open systems are used to the maximum extent possible in reducing life cycle costs. [4.2.Q5]

4.2.C10: (Customer & Developer) Requirements development should consider the DoD publication: Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint. [4.2.Q6]

Sample Questions/Requests for Information:
4.2.Q1: (Developer) Describe the process for translating required operational capabilities into technical specifications. Identify the relevant stakeholders involved in the process and discuss their roles in this process and how conflicting requirements among stakeholders are resolved. [4.2.C1, C2, and C3]
4.2.Q2: (Developer) Describe the process for allocating, verifying and managing specifications, including change management and control, from the system level to the lowest level of system decomposition. [4.2.C4, C5, C6 and C7]
4.2.Q3: (Developer) Describe the method of defining verification requirements to verify performance requirements. [4.2.C5]
4.2.Q4: (Developer) Has a Pre-Planned Product Improvement program or an evolutionary acquisition strategy been identified to address follow-on capability improvements? Please explain. [4.2.C5]
4.2.Q5: (Developer) Has the program conducted a detailed analysis of requirements to ensure that open systems are used to the maximum extent possible in reducing life cycle costs? [4.2.C8 and C9]
4.2.Q6: (Developer) Describe the process for determining the product support requirements. [4.2.C10]

Sample Observations:
4.2.O1: The translation from requirements (or expectations) to specific engineering tasks and specific design elements is the most challenging part of program development.

Sub-Area 4.3 – Functional Analysis and Allocation

Scope: Defines in detail the key functions the system must perform when it is in the field, including sustainability, and decomposes the system functions into lower-level functions that are satisfied by elements of the system design- functional architecture. Assesses how system level requirements are derived from the operational requirements and are documented in the system level specification through the systems engineering process.

Perspective:
Developer: The contractor has the systems engineering process in place to perform functional analysis and allocate functional requirements for the SDD effort.

Criteria:
4.3.C1: (Developer) Analyses provide a clear, detailed description of the design approach resulting from functional analysis and allocation. [4.3.Q1, and Q2]
4.3.C2: (Developer) This effort partitions a system into self-contained, functionally cohesive, logical groupings of interchangeable, and adaptable modules to enable identification of key T&E requirements to verify sub-assembly performance, achieve technology transparency, and mitigate the risk of obsolescence. [4.3.Q5]
4.3.C3: (Developer) This effort uses rigorous and disciplined definitions of interfaces and, where appropriate, defines the key interfaces within a system by widely supported standards (including interface standards, protocols, and data interchange language and standards) that are published and maintained by recognized standards organizations. These interface definitions will drive the requirements for data extraction and collection, and key interfaces will be verified early in the test program. [4.3.Q4, Q5, and Q6]

Sample Questions/Requests for Information:
4.3.Q1: (Developer) Describe the system function-related analyses planned or completed that are being used to allocate system requirements (include risk analyses if applicable). [4.3.C1]
4.3.Q2: (Developer) Provide and explain the internal “design rules” that are used to partition the proposed system into its functional elements. [4.3.C1]
4.3.Q3: (Developer) Provide the standards that are used in the systems engineering process to establish the system design. [4.3.C3]

4.3.Q4: (Developer) Does the program's functional analysis and allocation result in application of a modular, open systems design approach? Please explain. [4.3.C3]
4.3.Q5: (Developer) How does the program's functional analysis and allocation partition the system into self-contained, functionally cohesive, decoupled groupings of interchangeable and adaptable modules to enable identification of key T&E requirements, achieve technology transparency, and mitigate the risk of obsolescence? [4.3.C2]
4.3.Q6: (Developer) In partitioning the system into modules, does the program use rigorous and disciplined definitions of modular interfaces and, where appropriate, define the key interfaces within a system by widely supported standards (including interface standards, protocols, and data interchange language and standards) that are published and maintained by recognized standards organizations? Please explain. [4.3.C3]
4.3.Q7: (Developer) Based on the interface definitions, have the requirements for data extraction and collection to be used in the test program been defined? How are key interfaces prioritized for early testing? [4.3.C3]

Sample Observations:
4.3.O1: The program has applied a modular open systems design approach in developing the system.
4.3.O2: System design is not modular.
4.3.O3: External interfaces are not well understood. There are no provisions for changes to external interfaces (outside program control).

Sub-Area 4.4 – Design Synthesis

Scope: Translates derived requirements, the functional architecture, and system constraints into alternative design solutions that address people, products, support, and process entities, and related internal and external interfaces. The output of this process is the design or physical architecture. Assesses how the system engineering process is applied to the design process (this includes an assessment of methodologies, tool use, and application).

Perspective:
Developer: The contractor has the systems engineering process in place to allocate system requirements to a design architecture, and ensure traceability and verification requirements across the entire system.

Criteria:
4.4.C1: (Developer) A design process is defined for program use and is being applied across the program, including subcontractors, in doing the design. The design process is being implemented with proven methods and tools. [4.4.Q1]
4.4.C2: (Developer) Software code and unit test follow a specific process that is described in the software development plan. This process includes reviews, methods, and tools. [4.4.Q2]
4.4.C3: (Developer) Hardware implementation follows a defined process that is described in an engineering document (plan). Prototypes are part of the development process as are reviews, methods, and tools. [4.4.Q3]
4.4.C4: (Developer) An internal review process is used during design to include both hardware and software design. The schedule, scope, organization, and coordination of this process between the engineering disciplines, ensures an integrated system design. [4.4.Q4]
4.4.C5: (Developer) By following the MOSA principles in design synthesis, programs should ensure that the selected physical architecture would remain robust and adaptable throughout the system life cycle. [4.4.Q5]
4.4.C6 (Developer) To reduce risk and employ open standards where they make sense, programs should group interfaces into key and non-key interfaces based on module characteristics such as criticality of function, ease of integration, change frequency, interoperability, and commonality. [4.4.Q6]
4.4.C7: (Developer) Programs should assess the feasibility of using open interface standards for key interfaces. [4.4.Q7]
4.4.C8: (Developer) Programs should identify which of their key system interfaces implement open standards. [4.4.Q8]

4.4.C9: (Developer) Programs should use a standard selection process that gives preference to open interface standards. [4.4.Q9]
4.4.C10: (Developer) Programs should establish criteria to select the most appropriate standards for key interfaces used within their system. [4.4.Q10]
4.4.C11: (Developer) Programs should specify any options or extensions to the interface standards selected and ensure that these options (profile) do not prevent the program from using similar components available from other programs or from the commercial sector. [4.4.Q11]

Sample Questions/Requests for Information:
4.4.Q1: (Developer) Describe your design process, including analysis and synthesis. Identify where the process is defined/tailored for program use. Is the same process used across the program, including subcontractors? Please explain. Identify methods and tools used to support your processes. Is previous experience from similar programs used in the process? Please explain. [4.4.C1]
4.4.Q2: (Developer) Describe your process to implement the software design in terms of code and unit test. Identify and provide the process description. Describe the methods and tools used to support this process. Describe the reviews involved in code and unit test. [4.4.C2]
4.4.Q3: (Developer) Describe your process to implement the hardware design and related supportability factors. Does your process involve prototypes? Please explain. Identify and provide the hardware implementation process description. Describe the methods and tools used to support this process. [4.4.C3]
4.4.Q4: (Developer) Describe the internal review process used during design. Address both hardware and software design. Include the schedule, scope, organization, and coordination process between the engineering disciplines that ensure an integrated system design. [4.4.C4]
4.4.Q5: (Developer) Has program produced design solutions that are sufficiently detailed to verify the application of MOSA principles (i.e., modular design, key interfaces designation, and use of open standards) during the design synthesis? Describe features of the design architecture to assure it remain robust and adaptable throughout the system life cycle. [4.4.C5]
4.4.Q6: (Developer) What module characteristics (e.g., criticality of function, ease of integration, change frequency, interoperability, commonality, etc.) were used to identify key system interfaces within your system? [4.4.C6]
4.4.Q7: (Developer) Does your program assess the feasibility of using open interface standards for key interfaces? Please explain. [4.4.C7]
4.4.Q8: (Developer) Which key interfaces within your system implement open standards? [4.4.C8]
4.4.Q9: (Developer) Does your program use a standards selection process that gives preference to open interface standards? Please explain. [4.4.C9]
4.4.Q10: (Developer) What criteria does your program use in selecting standards for key interfaces (e.g., DoD mandate, industry consensus, market support, prime contractor recommendation, etc.)? [4.4.C10]
4.4.Q11: (Developer) Has your program specified any options or extensions to the interface standards selected? Do these options (profile) prevent the program from using similar components available from other programs or from the commercial sector? [4.4.C11]

Sample Observations:
4.4.O1: Most programs have satisfactory tools and skill to perform systems engineering tasks. However, inadequate time and resources hamper some programs.
4.4.O2: Some programs do not account for supportability considerations.

Sub-Area 4.5 – System Integration, Test, and Verification

Scope: Assesses the use of analysis, reviews, inspections, demonstration, testing, and modeling and simulation to validate the requirements baseline and ensure that system work products meet their requirements, including supportability. Assesses the planning for the necessary integration and test activities and facilities to support system integration and verification.

Perspective:
Customer & Developer: The customer and the contractor continue the systems engineering process and plans provide for the resources needed to design, integrate and test the hardware and software during the SDD program.

Criteria:
4.5.C1: (Developer) The system integration, test, and verification process is defined in a plan and includes analysis, reviews, inspections, demonstration, testing, and modeling and simulation to validate the requirements baseline and ensure that system work products meet their requirements. The process includes an iterative verification that allocated specifications are met by lower level components, assemblies, subsystems and then at the system level. Requirements are traceable to specific test/verification events. [4.5.Q1, Q2 and Q3]
4.5.C2: (Developer) Developmental testing should be defined and executed as early as possible, to progressively demonstrate performance against allocated and derived specifications in as realistic an environment as possible. Software coding and unit testing, and successive levels of software testing follow a specific process that should be well documented in a software development plan. [4.5.Q1, Q2, Q3, and Q11]
4.5.C3: (Developer) For a system of systems (SoS)/family of systems (FoS), test requirements for the hierarchical system should be included in the test plan, including component, subsystem, system, and SoS/FoS level tests. [4.5.Q7 and Q8]
4.5.C4: (Developer) Facilities should be available or planned and developed/acquired on a schedule to support test and integration and scheduled to perform such tests. Planning should exploit the test synergies and leverage the planning of other SoS/FoS members. [4.5.Q10]
4.5.C5: (Developer) Integration test facilities that allow demonstration of hardware and software operation at progressively higher levels of integration should be used/planned. [4.5.Q10]
4.5.C6: (Developer) Time should be allotted for test, analyze, fix, and test at each level of integration. [4.5.Q5]
4.5.C7: (Developer) Test environment should be as close to the anticipated operational environment as possible. [4.5.Q6]
4.5.C8: A defined process should be utilized to determine readiness to enter into operational testing. [4.5.Q6]
4.5.C9: (Customer & Developer) While operational test is managed outside the control of the government program office and contractor program office they should be working together to provide a verified design for the best likelihood of successfully passing requirements as demonstrated by operational test. This includes working together to define where developmental test can be more realistic and simulation used to some extent to verify operational performance. [4.5.Q6]
4.5.C10: (Customer & Developer) Planning for support of operational test should be included in program test planning. Support should include logistical support of testing and a clear allocation of responsibilities by the involved parties. [4.5.Q6]
4.5.C11: (Developer) Programs should ensure that the standards implemented for key interfaces are verifiable and that their implementations are evaluated during testing. [4.5.Q7]
4.5.C12: (Developer) Programs should establish testing process or other mechanisms to verify the claims made by vendors that their products comply with certain interface standards and their respective profile. [4.5.Q9]
4.5.C13: (Developer) A Failure Reporting, Analysis and Corrective Action System (FRACAS) has been initiated. The system should provide for tracking between test activities and technical requirements. [4.5.Q4]

Sample Questions/Requests for Information:
4.5.Q1: (Developer) Describe the integration and test process from lower level components up through system level integration and test. Provide an overview of the integration and test process described in the integration and test plan. How are requirements traced to specific test/verification events? [4.5.C1 and C2]
4.5.Q2: (Developer) Describe the process to implement and verify the software design, including the methods and tools, testing, and facilities used to support this process. Include a description of the process followed to test the software, starting with code and unit test. Is there buy-in among all

stakeholders as to these test approaches? [4.5.C1 and C2]
4.5.Q3: (Developer) Describe the process to implement and verify the hardware design and whether this process involves prototypes and/or modeling and simulation. Include a description of the methods and tools, testing, and facilities used to support this process. [4.5.C1 and C2]
4.5.Q4: (Developer) Has a Failure Reporting, Analysis, and Corrective Action System (FRACAS) been initiated? Describe the planned time for root cause analysis and corrective action for hardware and software deficiencies? Describe how the System provides for tracking the deficient test activity back to the requirement for impact assessment.[4.5.C13]
4.5.Q5: (Developer) Does the integration test program schedule incorporate time for test, analyze, and fix from components to the all-up system? Explain the basis for allocating this time. [4.5.C6]
4.5.Q6: (Customer & Developer) Provide the status of the Test and Evaluation Master Plan (TEMP). Does this Plan phase in logistic support test and evaluation along with that of the hardware system test plan? Describe the level of detail of the test planning in the current document as it reflects the test strategy (i.e., test measures for key performance parameters, criteria for evaluating system effectiveness and suitability, etc.). [4.5.C7 through C11]
4.5.Q7: (Developer) Are the standards implemented for key interfaces verifiable and their implementation evaluated during testing? [4.5.C3 and C11]
4.5.Q8: (Developer) (For a system of systems): Are system of systems (SoS)/family of systems (FoS)-level tests and support requirements addressed within the TEMP? Is the test effort budgeted within the program? [4.5.C3]
4.5.Q9: (Developer) Describe the testing process or other mechanisms used by the program to verify claims made by vendors that their products comply with open interface standards and their respective profile. [4.5.C12]
4.5.Q10: (Developer) Describe the integration and test laboratories and facilities planned to support the integration and test activities, including plans to have these facilities in place when needed. Does the plan exploit the T&E synergies with the other SoS/FoS members? Please explain. [4.5.C4 and C5]
4.5.Q11: (Developer) Is the test program event driven and guided by interim test measures? Please explain. [4.5.C2]
4.5.Q12: (Customer & Developer) Discuss the planned scope of the operational assessment(s) to support a Milestone C decision: Will these assessments leverage DT&E data or reflect only OT activities? [4.5.C9]
4.5.Q13: (Customer & Developer) Discuss the planned schedule for preparing operational assessment reports? Describe how the schedule allows time for sufficient insight into program test results prior to MS C. [4.5.C9]

<u>Sample Observations:</u>
4.5.O1: Interoperability and net-ready Key Performance Parameters (KPPs) are documented and incorporated into requirements and verification processes.
4.5.O2: Inadequate early testing of components.
4.5.O3: Success-based T&E schedule does not provide adequate fix and retest time and resources.
4.5.O4: System of System integration testing occurs too late in the program.

Sub-Area 4.6 – Transition to Deployment

<u>Scope:</u> Assesses the completeness of the planning for operational support in the context of test & evaluation feedback, initial spares procurement, maintenance training, support concepts, required support facilities and equipment.

<u>Perspective:</u>
Customer & Developer: The customer and the contractor utilize a disciplined process to execute the development and operational test, and evaluation phase of the SDD program.

<u>Criteria:</u>
4.6.C1: (Customer & Developer) The results of Operational Test and Evaluation (OT&E) can have a significant impact on product design, spares, and levels of maintenance. The program should have a process in-place to provide additional resources as necessary to address the test issues in order to minimize the risk of schedule delays. [4.6.Q1 and Q2]

4.6.C2: (Customer & Developer) Detailed design analyses should provide predictive data of failure modes and reliability at the subsystem and component level to define the logistics support requirements. [4.6.Q3]
4.6.C3: (Customer & Developer) Specific maintenance support concepts should be presented early in the development phase of the program. These concepts should be supported by detailed analyses of trades related to life cycle support costs. The complexities of the system design and technology are accounted for in the decision to go with either contractor or organic support. [4.6.Q4, Q5 and Q6]
4.6.C4: (Customer & Developer) User training and concept of operations need to be designed in parallel with the system. [4.6.Q7]

Sample Questions/Requests for Information:
4.6.Q1: (Customer & Developer) Describe the process for supporting the OT&E of the system. [4.6.C1]
4.6.Q2: (Customer & Developer) Explain how the process addresses the potential outcomes of the OT&E testing in terms of the schedule for deployment and support of the system. [4.6.C1]
4.6.Q3: (Customer & Developer) Provide a description of the design analyses that have been performed to minimize the logistics support structure. [4.6.C2]
4.6.Q4: (Customer & Developer) Provide a detailed description of the projected maintenance strategy, including diagnostics, prognostics, maintenance duration targets, and other measures. [4.6.C3]
4.6.Q5: (Customer & Developer) Provide the status and/or results of the performance-based logistics product support concept analyses (organic or contractor during initial deployment and follow-on support of the system). Provide the life cycle cost estimates that support the proposed concept, including the manpower and personnel requirements. [4.6.C3]
4.6.Q6: (Customer & Developer) Identify the projected funding requirements to meet the operational support concept and explain the system and program risks that could impact the projected funding. [4.6.C3]
4.6.Q7: (Customer & Developer) How is user training and development of tactics, techniques, and procedures planned during the system development? [4.6.C4]

Sample Observations:
4.6.O1: Lack of a complete understanding and appreciation of how the system will perform and be used in the field is often a weakness in program development.
4.6.O2: Military Utility Assessment (MUA) is performed as a requirement but is not translated into meaningful guidance to program developers.
4.6.O3: Lack of an understanding of the DoD publication: Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint.

Sub-Area 4.7 – Process Improvement

Scope: Assess the program's approach to continuous process improvement, to include process evaluation and plan of implementation.

Perspective:
Customer: The contractor's approach to concurrent product and process development is integrated in the systems engineering process. Cost reporting will reflect proposed cost savings from producibility trades that are coupled with fabrication and assembly of the system. Company policies embrace continuous improvement as evidenced in past program performance.
Developer: Selected manufacturing, assembly, and test processes will be matured during hardware build and test, in order to validate manufacturing process for the transition to production.

Criteria:
4.7.C1: (Developer) Process improvement is an ongoing activity both within the program (for large extended development programs), and within the company. Company processes being applied on the program have been assessed as mature and continue to be improved. [4.7.Q1]
4.7.C2: (Developer) Programmatic data on process execution and effectiveness, including metrics, is collected and provided to the company process improvement group. [4.7.Q2]

Sample Questions/Requests for Information:
4.7.Q1: (Developer) Describe you process improvement activities both internal to your program and across your company. Have your processes been assessed by any independent assessors relative to any established process models. ? Please explain. [4.7.C1]
4.7.Q2: (Developer) Describe your process to collect data to support process improvement. [4.7.C2]

Sample Observations:
4.7.O1: Process improvement and continuous improvement are widely accepted as useful approaches but often the operational tempo is so intense that they are relegated to "nice-to-haves."

5.0 Technical Product Assessment Area

Scope: Technical product is concerned with the characteristics of the product(s)/services (i.e., maturity, performance, and support) being developed or maintained by the program. This includes hardware and software elements, production process capabilities, and logistics.

Perspective: The quality of the technical product, including support systems, is quintessential to a successful program. The maturity of the program provides differing perspectives due to the integral nature of the product maturation process that is a direct parallel to the development life cycle. This should be regarded as the most important Assessment Area and hence should never be overlooked, and should always involve the most time and scrutiny.

Sub-Area 5.1 – System Description

Scope: Assesses technical system descriptions in the form of systems requirements specifications, including a set of lower level, allocated product specifications, and of the definition(s) of technical systems/subsystems architecture(s).

Perspective:
Customer & Developer: The systems engineering process is in-place to define system requirements, functionality, and the allocated physical architecture. Technology maturity requirements and status are appropriately considered in the design process. The consideration for incorporation of commercial hardware in the system design is integrated in the design allocation process.

Factor 5.1.1 – Requirements/Specifications

Criteria:
5.1.1.C1: (Developer) System level specifications are directly traceable to user requirements using established systems engineering methods and tools. [5.1.1.Q1 and Q3]
5.1.1.C2: (Developer) System and lower-level specifications are completely defined and stable, including subcontractor development specifications. [5.1.1.Q2].
5.1.1.C3: (Developer) Specifications are allocated and defined to the appropriate level consistent with program phase. [5.1.1.Q3]
5.1.1.C4: (Developer) Verification requirements are defined for each performance requirement. [5.1.1.Q4]

Sample Questions/Requests for Information:
5.1.1.Q1: (Developer) Provide and describe your system and lower-level specifications including both the performance and verification requirements. Include traceability to user requirements. [5.1.1.C1]
5.1.1.Q2: (Developer) Describe your requirements definition and allocation process. Identify where this process is defined/tailored for program use. Is the same process used across the program, including subcontractors? Please explain. [5.1.1.C2 and C3]
5.1.1.Q3: (Developer) Identify the methods and tools used to support your requirements definition and design baseline process. [5.1.1.C1]
5.1.1.Q4: (Developer) Describe your process and show evidence that you have defined verification requirements for each performance requirement. [5.1.1.C4]

Sample Observations:
5.1.1.O1: Programs are relatively "connected" to the users and stakeholders and hence are able to effectively relate user requirements to system development activities.
5.1.1.O2: There is a lack of requirements traceability to all design components.

Factor 5.1.2 – Architecture

Criteria:
5.1.2.C1: (Developer) The system architecture and subsystem architecture, including computer system and support architectures, is defined using standardized methods, such as the DODAF, and widely accepted tools-sets, such as those that employ the Unified Modeling Language (UML), which meets the system requirements, including open-system requirements and benefits. [5.1.2.Q1 and Q5]
5.1.2.C2: (Developer) Ease of change, growth, upgrade, and lifecycle support is facilitated with this architecture. [5.1.2.Q1 and Q3]
5.1.2.C3: (Developer) The technical system architecture descriptions should use mandated OV, SV, and TV products and should be integral to the system design. There should be System Description Documents (SDDs) and System Capability Specifications (SCSs) that address those for the system and major subsystems. [5.1.2.Q2]
5.1.2.C4: (Developer) There should be a disciplined process to ensure that the technical system descriptions are integrated such that changes to any one that impact others is identified and tracked to conclusion. [5.1.2.Q2]
5.1.2.C5: (Developer) The program should ensure that the system is designed based on modular design principles. The interfaces are identified with application of open standards for key system interfaces where possible, and the open system architectures address and provide benefits in the following areas:

- System performance capabilities
- Commercial-Off-The-Shelf (COTS) products
- System growth capability
- Obsolescence/Diminished Manufacturing Sources (DMS)
- Technology Refresh
- Interoperability
- Built-In-Test (BIT)
- Life Cycle Cost Reduction
- Compatibility with hierarchical system(s) (for system of systems)
- Compatibility with support systems.

[5.1.2.Q3]
5.1.2.C6: (Developer) The open systems architecture should provide system life cycle operational and sustainment benefits that are verifiable and add value to the system, including R&M and built in test. [5.1.2.Q3, Q4, and Q7].
5.1.2.C7: (Developer) The open systems architectures employed in the system should satisfy the specified performance and support requirements. [5.1.2.Q2 and Q4]
5.1.2.C8: (Developer) The design architecture should evaluate all required material properties to meet design requirements, including resistance to corrosion, and minimize the use of exotic materials. [5.1.2.Q6]
5.1.2C9: (Developer) The system architecture should lead to modular design for the system. [5.1.2.Q8]
5.1.2.C10: (Developer) A Program Protection Plan for system security should address protection and anti-tamper schemes for information assurance security and Cryptological Systems (should also be summarized in the Acquisition Strategy and in the TEMP). [5.1.2.Q9]

Sample Questions/Requests for Information:
5.1.2.Q1: Provide and describe your system architecture, subsystem architecture, and hardware/software implementation architecture. [5.1.2.C1]
5.1.2.Q2: (Developer) Explain and illustrate how your technical architecture system design descriptions address the total system performance requirements to include the end item, production, and support systems. [5.1.2.C3 and C7]

5.1.2.Q3: (Developer) Describe your approach to implement a design that is modular and incorporates open standards for the key interfaces implementing open system architectures throughout the system. Describe how these resulting architectures will:
- Reduce logistics footprint
- Reduce life cycle costs and development cycle time
- Meet system performance capabilities
- Leverage OTS products
- Provide growth capability over the life of the system
- Mitigate obsolescence/DMS
- Enable technology refresh
- Achieve interoperability
- Achieve compatibility with the hierarchical system(s) (for a system of systems)
- Achieve compatibility with support systems

[5.1.2.C1, C5, and C6]
5.1.2.Q4: (Developer) Identify and describe any other system operational and sustainment benefits your open architecture provides. Describe how these benefits will be verified. [5.1.2.C6 and C7]
5.1.2.Q5: (Developer) Describe how the systems architectures are open. Explain how these meet the specified performance requirements. [5.1.2.C1]
5.1.2.Q6: (Developer) Have all required material properties for the design been considered in material selection? Are exotic materials required in the design? If so, please identify. [5.1.2.C8]
5.1.2.Q7: (Developer) Have reliability, maintainability, and Built-In-Test (BIT) been addressed in the design? [5.1.2.C6]
5.1.2.Q8: Does your system architecture lead to modular design for the system? Please explain. [5.1.2.C9]
5.1.2.Q9: (Developer) Provide and discuss the applicability and content of the Program Protection Plan for information assurance, anti-tamper, and cryptology [5.1.2.C10]

Sample Observations:
5.1.2.O1: MOSA principles (e.g., modular design) have been used in developing the system architecture.

Factor 5.1.3 - Technology Maturity

Criteria:
5.1.3.C1: (Developer) Technology Readiness Levels (TRLs) are established according to acceptable quantification methods. [5.1.3.Q1]
5.1.3.C2: (Developer) The technologies proposed for the system should have measurable metrics that demonstrate their level of maturity. [5.1.3.Q1]
5.1.3.C3: (Developer) The results of a demonstration/validation of new or advanced technologies quantify risk elements, and support the design strategy. A risk mitigation plan addresses the attendant risks, including adequate resources and schedule to accomplish planned mitigation activities. [5.1.3.Q2]

Sample Questions/Requests for Information:
5.1.3.Q1: (Developer) Describe the technologies chosen for incorporation in potential system solutions and identify the corresponding TRLs. [5.1.3.C1 and C2]
5.1.3.Q2: (Developer) Provide the results of, or plan for (i.e., test and evaluation, advanced concept technology demonstrations, Service experiments, etc.)the demonstration/validation of the proposed technologies and the quantifiable risks that remain to mature the technologies for production. Include the risk mitigation plan and how it is integrated into the IMP and IMS, including the resources required to validate (i.e., verification testing, modeling and simulation, etc). [5.1.3.C3]

Sample Observations:
5.1.3.O1: Archaic processing platforms constrain design and growth.
5.1.3.O2: Software development is driven by hardware availability and capability versus true system requirements.

Factor 5.1.4 - Government/Supplier-Furnished Products

Criteria:
5.1.4.C1: (Customer & Developer) Government furnished items (equipment, software, or data) should be confirmed by the Program Office to meet system requirements and to be available, complete, and supportable. [5.1.4.Q1]
5.1.4.C2: (Developer) Planned Non-Developmental Items (NDI) or Commercial Off-The-Shelf (COTS) items have been determined to meet program system performance and sustainment requirements through defined verification process. Open systems architectures enable the use of COTS and NDI. [5.1.4.Q2]
5.1.4.C3: (Developer) Planned reuse software has been confirmed through a defined process designed to verify the software is complete, will meet the allocated system performance requirements, and is supportable. [5.1.4.Q3]

Sample Questions/Requests for Information:
5.1.4.Q1: (Customer & Developer) If government furnished items, equipment, software, or data is being provided to the contractor what process is /was used to assure these are complete, available, meet the requirements, and are supportable? Please explain. . *{This question should be addressed to the government office}* [5.1.4.C1]
5.1.4.Q2: (Developer) Identify and describe any NDI, or COTS items being used in the system development. Identify the sources of these items. How have these items been determined to meet intended program performance and sustainment requirements? Explain. [5.1.4.C2]
5.1.4.Q3: (Developer) Identify planned reuse software. Describe your process to confirm that this reuse software is complete and functional, will meet the system performance requirements, and is supportable. [5.1.4.C3]

Sample Observations:
5.1.4.O1: No COTS refresh strategy.

Sub-Area 5.2 – System Performance

Scope: Assesses development maturity and current and projected system performance as measured by various means.

Perspective:
Customer & Developer: The system performance requirements should satisfy the CDD and provide adequate traceability and definition of verification methods. The systems engineering process is in-place to provide configuration control and integration with the test community. Verification methods and plans (e.g. reliability growth) are integral to the system design baseline. *Factor 5.2.1 – Technical Performance*

Criteria:
5.2.1.C1: (Developer) System level specifications, including Key Performance Parameters (KPPs) have been established and are directly traceable to user requirements using established systems engineering methods and tools. [5.2.1.Q1]
5.2.1.C2: (Developer) System technical performance requirements should be compatible i.e. executable within the program cost, schedule, and risk. [5.2.1.Q2]
5.2.1.C3: (Customer & Developer) A Cost Performance Integrated Product Team (CPIPT) should be established with all stakeholders. As a minimum, it should include user, PM, cost analysis, Chief Engineer, and lead logistician. [5.2.1.Q3]
5.2.1.C4: (Developer) A technical performance baseline should be in place down to the subsystem level, from which the system performance thresholds can be compared and tracked. [5.2.1.Q5]
5.2.1.C5: (Developer) A "how-to" test matrix should be developed to identify verification (inspection, analysis, demonstration, test) methods for each test requirement written in section 3 of the system specification, and key tests summarized in the TEMP. [5.2.1.Q4 and Q6]
5.2.1.C6: (Developer) A reliability growth program should be defined that is technically based on system functional allocation of specification requirements, and reliability prediction modeling. A reliability growth

curve should define the reliability end point and predicted growth based on component, subsystem, and system testing at key points in the development program. [5.2.1.Q7]

Sample Questions/Requests for Information:
5.2.1.Q1: (Developer) Provide and describe your system and lower-level specifications of the performance and verification requirements. Include traceability to user requirements. [5.2.C1]
5.2.1.Q2: (Developer) Explain how it has been determined that the technical performance requirements are executable within the program baselines. [5.2.1.C2]
5.2.1.Q3: (Customer & Developer) Have you formed a senior program leaders' IPT? Describe the membership, function and responsibilities of this IPT. [5.2.1.C3]
5.2.1.Q4: (Developer) Describe the process for ensuring timely verification that the system meets requirements/specifications. [5.2.1.C5]
5.2.1.Q5: (Developer) Provide the technical performance baseline of the current system design. Include the supporting data used to establish the baseline. [5.2.1.C4]
5.2.1.Q6: (Developer) Provide the specified verification requirements and the current verification test matrix that depicts the planned test methods vs. the verification requirements identified in the system and lower-level specifications. Is this level of detail described in the Test and Evaluation Master Plan? Please explain. [5.2.1.C5]
5.2.1.Q7: (Developer) Discuss the planned reliability growth program: Has a reliability growth curve been generated? What was the method used to generate initial reliability predictions? What is the planned reliability maturation at key dates (CDR,MS C, OTRR, IOC)? [5.2.1.C6]

Sample Observations:
5.2.1.O1: Technical performance baseline requires new technologies to achieve threshold requirements. The risks associated with these technologies are not fully quantified.

Sub-Area 5.3 –System Attributes

Scope: Assesses the planning and considerations given to produce and support the system.

Factor 5.3.1 - Producibility and Production Planning

Perspective:
Customer & Developer: The Systems Engineering process provides for analysis of producibility, supportability, and maintainability alternatives concurrent with the allocation of components of the system design.

Criteria:
5.3.1.C1: (Developer) Detailed producibility analyses should be conducted in parallel with and influence design trades. Results should identify requirements for new and/or improvements to existing manufacturing processes to meet cost and schedule requirements. [5.3.1.Q3]
5.3.1.C2: (Developer) Product design changes reflect producibility considerations. Coordination with manufacturing engineering is required for all changes that impact materials, form, fit, or function of the product. [5.3.1.Q1 and Q2]
5.3.1.C3: (Developer) Producibility enhancements to the product are consistent with cost and schedule constraints and pose an acceptable level of technical and schedule risk. [5.3.1.Q2 and Q3]
5.3.1.C4: (Developer) The contractor should be able to identify key manufacturing processes and key characteristics in the program. For established production facilities and manufacturing processes, past performance should be available to demonstrate production capability. For new processes, capability indices should be identified and plans to develop and demonstrate those capabilities provided. Current status should be based upon analysis or actual testing/demonstration. Plans for addressing shortfalls should be provided. [5.3.1.Q3]

Sample Questions/Requests for Information:
5.3.1.Q1: (Developer) Provide the status/results of producibility analyses as reflected in the proposed system design. [5.3.1.C1]

5.3.1.Q2: (Developer) Describe the system engineering process pertaining to design trades to address producibility. Include a description of the expected engineering activities needed to address producibility issues, along with their impact on cost and schedule. [5.3.1.C2 and C3]
5.3.1.Q3: (Developer) Provide and describe the key manufacturing processes that will require verification, and the schedule to establish capability indices. [5.3.1.C1 and C4]

Sample Observations:
5.3.1.O1: Transition to production is pertubated by changes in procurement quantities.

Factor 5.3.2 - Supportability/Maintainability

Criteria:
5.3.2.C1. (Customer & Developer) The Analysis of Alternatives (AOA) should consider the performance options, maintenance environment, hardware complexity, and usage on projected maintenance capabilities available during system IOC (e.g., support equipment, manpower/skills availability, and cost). This information should be the basis of a Life Cycle Cost Estimate (LCCE). [5.3.2.Q1, Q2 and Q5]
5.3.2.C2: (Customer & Developer) The proposed support concept (organic vs. contractor) should clearly define the cost and resource assumptions available at the time of deployment, and reflect the best balance between mission performance, life cycle cost, logistics footprint, and risk. [5.3.2.Q1, Q4, and Q5]
5.3.2.C3. (Developer) The support objectives and requirements should clearly address the state of the technology required and how the system will impact available maintenance facilities and support capabilities. [5.3.2.Q1 and Q2]
5.3.2.C4: (Developer) The Acquisition Program Baseline describes logistics and sustainment considerations. [5.3.2.Q3]
5.3.2.C5: (Developer) The test strategy includes a maintenance demonstration to verify the program maintenance plan. [5.3.2.Q6]

Sample Questions/Requests for Information:
5.3.2.Q1. (Customer & Developer) Provide a detailed description of the system O&S objectives and the performance requirements needed to accomplish the objectives. [5.3.2.C1]
5.3.2.Q2. (Customer & Developer) Provide a detailed description of the Analysis of Alternatives (AOA) operating and support (O&S) concepts based on the performance-based options of the system, and the selected O&S approach. As a minimum, the following should be addressed:

- Key system support parameters that drive the system design to meet reliability, availability, and maintainability requirements.
- Projected manpower and deployment footprint and the impact on the projected support system environment.
- System support and maintenance concepts and the technologies required [5.3.2.C1 and C3]

5.3.2.Q3: (Developer) Provide a detailed description of the logistics metrics, criteria and the corresponding funding requirements in the Acquisition Program Baseline. [5.3.2.C4]
5.3.2.Q4: Describe the risk factors associated with the proposed support concept and how these risks will be mitigated, and the potential cost and schedule impact. [5.3.2.C2]
5.3.2.Q5: (Customer & Developer) Considering the maintenance environment and proposed system complexity, describe the potential impact on potential maintenance capabilities available during system deployment in terms of equipment, manpower/skills, facilities and cost. Include the major cost drivers associated with the selected life-cycle support concept. [5.3.2. C1 and C2]
5.3.2.Q6: (Developer) Does the test strategy include a maintenance demonstration to verify the program's maintenance plan? Please describe the details of the demonstration plan. [5.3.2.C5]

Sample Observations:
5.3.2.O1: Difficulty in identifying trouble areas and common causes of software problems.
5.3.2.O2: Lack of an understanding of the DoD publication: Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint.

6.0 Environment Assessment Area

Scope: Environment is concerned with the multitude of outside/external influences on the program and/or how the resultant system operates. This environment transcends the spectrum of guidance, oversight, and statutory/regulatory requirements imposed on the Government and the developing contractors.

Perspective: There are many perspectives in this area including how the sponsors, contractors, customers, and users are constrained. Sometimes the constraints are formal and documented but often they are not and it is important to be sensitive to subtleties when investigating this area in an assessment. This area applies throughout the life cycle of a program but in varying ways, depending upon the given level of maturity. In short, early in a program this area has more effect on the requirements whereas later in the life cycle, such as production, this area influences how the production facilities are used.

Sub-Area 6.1 – Statutory and Regulatory Environment

Scope: Assesses the statutory and regulatory constraints under which the program operates, and the audit process. Most of the following criteria and questions are appropriately addressed to the government program office.

Perspective:
Customer: The program office must comply with the acquisition-related reporting requirements, both regulatory and statutory, as cited in DoD Instruction 5000.2 and highlighted in Appendix B to this document.
Developer: Execution of the SDD phase, including use of developmental and industrial facilities, complies with all Federal, State, and Local Regulations and Statutes for environmental and safety compliance.

Factor 6.1.1 – Requirements/Specifications

Criteria:
6.1.1.C1: (Customer & Developer) The statutory and regulatory report requirements imposed on the program are factored in to the Integrated Master Plan/Schedule, and are consistent with the exit criteria specified for the current phase of the program. [6.1.1.Q1 and Q3]
6.1.1.C2: (Customer & Developer) Source selection results have considered all known environmental statutes and regulations imposed on the contractor (federal, state, and local) under full disclosure, and considered the cost implications to be consistent with the funding profile to execute the current phase of the program. [6.1.1.Q1 and Q2]

Sample Questions/Requests for Information:
6.1.1.Q1: (Customer & Developer) What is the status of reporting requirements for the current phase of the program? Are these requirements included in the exit criteria? What is the status of compliance with the exit criteria? [6.1.1.C1 and C2]
6.1.1.Q2: (Customer & Developer) Provide a summary of the environmental statutes and regulations that require compliance by the prime contractor and all supporting suppliers. Describe how they impact the execution of the current and future phases of the program and whether they have been incorporated in the Integrated Master Plan/Schedule and funding profile. [6.1.1.C2]
6.1.1.Q3: (Customer & Developer) Provide specific detail on the status of compliance with the Clinger Cohen Act [6.1.1.C3]

Sample Observations:
6.1.1.O1: Most statutory and regulatory requirements are adequately complied with.

Factor 6.1.2 - Policy

Criteria:
6.1.2.C1: (Customer) The Government program office should have a clear and concise understanding of

all DOD and Service-level policies and statutes that the program must comply with. [6.1.2.Q1]
6.1.2.C2: (Customer) The Program Manager should resolve conflicts in applicability of policy, and obtain and document the appropriate waivers, to establish the official baseline under which the program is executed. [6.1.2.Q2 and Q3]

Sample Questions/Requests for Information:
6.1.2.Q1: (Customer) What are the applicable DOD or Service-level policies that pertain to the program? [6.1.2.C1]
6.1.2.Q2: (Customer) Is the acquisition policy consistent with the program requirements? Please explain. [6.1.2.C2]
6.1.2.Q3: (Customer) How does the program resolve policy conflict when executing the program plan? [6.1.2.C2]

Sample Observations:
6.1.2.O1: The dynamics of policy adherence, change, and interpretation are rarely synchronous with program development activities.
6.1.2.O2: Rapid (and/or poorly promulgated) policy changes can have substantial deleterious impact on programs.
6.1.2.O3: Increased direction from oversight agencies limits PM's authority, which in turn can slow progress, weaken the ability to meet goals and satisfy requirements, and often both.

Appendix 2
Topical Cross Reference

- ***Acquisition Strategy:*** 3.1.1; 3.1.2; 4.2
- ***Budgeting and Funding:*** 1.1.1; 2.1.1; 2.1.2; 3.2.2; 4.6; 6.1.1
- ***Logistics and Support:*** 1.1.1, 1.1.3, 1.1.4, 2.1.1, 2.3.1, 2.4.1, 3.1.1, 3.3.2, 3.3.3, 3.3.4, 3.3.6, 3.4.1, 4.1, 4.2, 4.4, 4.5, 4.6, 5.1.2, 5.1.4, 5.3.2
- ***Modeling and Simulation:*** 2.4.1; 3.3.1; 4.2; 4.5; 5.1.3
- ***Open Systems Architecture:*** 1.1.1; 1.1.4; 3.1.1; 3.3.3; 4.4; 5.1.2; 5.1.4
- ***Requirements*:** 1.1; 3.1.1; 3.3.4; 3.4.1; 4.2; 4.3; 4.4; 4.5; 5.1; 5.1.2; 5.1.4; 5.2.1; 5.3.1; 5.3.2; 6.1.1; 6.1.2
- ***Risk:*** 1.1.1; 1.1.3; 2.1.1; 3.1.1; 3.1.2; 3.2.1; 3.2.2; 3.3.3; 3.3.4; 3.4.1; 3.4.2; 4.1; 4.2; 4.3; 4.4; 4.6; 5.1.3; 5.2.1; 5.3.1; 5.3.2
- ***Systems Engineering:*** 2.4.1; 3.3.1; 3.3.6; 3.4.1; 4.1; 4.2; 4.3; 4.4
- ***System of Systems:*** 1.0; 1.1.1; 1.1.3; 3.1.1; 3.2.1; 3.3.3; 3.3.6; 3.4.1; 3.5.1; 4.1; 4.5; 5.1.2
- ***Technology Maturity:*** 1.1.1; 3.1.1; 3.1.2; 3.3.5; 4.1; 4.2; 4.3; 5.1.2; 5.1.3; 5.3.2

Appendix 3
Statutory and Regulatory Information and Milestone Requirements (MS B)

The following tables contain the reporting requirements for all MDAP and MAIS programs that apply to the MS B decision. Status of these requirements should be annotated in pre-milestone assessments as pre-requisite for the Defense Acquisition Board (DAB) process, unless exception to the requirement is granted. This information was extracted from Enclosure 3 to DODI 5000.2, dated May 12, 2003 and is provided for its applicability to the Assessment Methodology for pre-MS B. Additional applicability of these requirements to other phases of the Acquisition Life Cycle may be obtained by referring to the referenced document.

Table 3 - Statutory Information Requirements

Information Required	Applicable Statute
Consideration of Technology Issues	10 U.S.C. 2364, ref. (q)
Market Research	10 U.S.C. 2377, ref. ® 15 U.S.C. 644(e)(2), ref. (s)
CCA Compliance (All IT including NSS) (Ref. DODI 5000.2, Encl 4)	40 U.S.C. Subtitle III, ref. (l) Sec. 8088, Public Law 107-248, ref. (t)
Registration of mission-critical and Mission-essential information systems	Sec. 8088(a), Public Law 107-248, ref. (t)
Benefit Analysis and Determination (part of Acquisition Strategy)	15 U.S.C. 644(e), ref. (s)
Spectrum Certification Compliance (applies to all systems/equipment that utilize the electromagnetic spectrum)	47 U.S.C. 305, ref. (y); Public Law 102-538, 104, ref. (z); 47 U.S.C. 901-904, ref. (aa); DODD 4650.1, ref. (ab); OMB Circular A-11, Part 2, ref. (d)
Live Fire Waiver & Alternate LFT&E Plan **(MDAP only)**	10 U.S.C. 2366, ref. (ae)
Selected Acquisition Report (SAR) **(MDAP only)**	10 U.S.C. 2432, ref. (ac)
Industrial Capabilities (part of Acquisition Strategy)	10 U.S.C. 2440, ref. (af)
Competition Analysis (Depot-level Maintenance $3M rule) (part of Acquisition Strategy)	10 U.S.C. 2469, ref. (am)
Technology Development Strategy (TDS)	Sec. 803, Public Law 107-314, ref. (an)
Acquisition Program Baseline (APB)	10 U.S.C. 2435, ref. (ao)
Cooperative Opportunities (part of Acquisition Strategy)	10 U.S.C. 2350a, ref. (ap)
Clinger-Cohen Act Certification **(MAIS Only)**	Sec. 8088, Public Law 107-248, ref. (t)
Financial Management Enterprise Architecture Certification **(MAIS Only)**	Sec. 8088, Public Law 107-248, ref. (t)

Table 4 - Regulatory Information Requirements

Information Required	Source
Initial Capabilities Document (ICD)	CJCSI 3170.01, ref. (g)
Capability Development Document (CDD)	CJCSI 3170.01, ref. (g)
Acquisition Strategy	DODI 5000.2
Analysis of Alternatives (AoA)	DODI 5000.2
System Threat Assessment (validated by DIA for ACAT 1D programs)	DODD 5105.21, ref. (aq)
Technology Readiness Assessment (TRA)	DODI 5000.2
Independent Technology Assessment (ACAT 1D only) (if req'd by DUSD (S&T)	DODI 5000.2
Command, Control, Communications, Computers, and Intelligence Support Plan (C4ISP) (also summarized in Acquisition Strategy)	DODI 4630.8: DODD 4630.5, refs. (ar) and (as)
Component Cost Analysis (mandatory for MAIS; as requested for MDAP)	DODI 5000.2
Cost Analysis Requirements Description (CARD)	DODI 5000.2
Test and Evaluation Master Plan (TEMP)	DODI 5000.2
Operational Test Agency Report of OT&E results (as applicable)	DODI 5000.2
Program Protection Plan (PPP) (for programs with critical technology information) (also summarized in Acquisition Strategy)	DODD 5200.39, ref. (au)
Exit Criteria	DODI 5000.2
Earned Value Management Systems (EVMS) Planning (RDT&E > $73M and procurement or O&M > $315M (FY 2000 constant dollars)	OMB Circular A-11, Part 7, ref. (d)

Chapter 3
Pre-Milestone C Focus

1.0 <u>Mission Capabilities and 0perational Requirements Assessment Area</u>

Sub-Area 1.1 – Mission Capabilities and Operational Requirements

<u>Scope</u>:
Assesses how the system, as-designed, addresses (traceability and verification) all customer- articulated mission capabilities and operational requirements, with an expectation of minimizing the impact on the user in terms of logistical support and life cycle support costs.

<u>Perspective</u>:
Customer: All stakeholder interests should be represented in the System Engineering process, to ensure accurate communication, incorporation, and traceability of current and evolutionary requirements in the product design, to achieve mission capability and supportability objectives.
Developer: Ensure that requirements are well understood and properly managed in the evolutionary development environment, and are verifiable in the final design and demonstration process, to realize mission capability and supportability requirements.

Factor 1.1.1 – Reasonableness of Requirements

<u>Criteria:</u>
1.1.1.C1: (Developer) There should be active participation by the joint capabilities, operational requirements, Test and Evaluation (T&E), and support communities in the design development process to ensure that the as-designed system addresses all operational l requirements in the most cost-effective, and supportable manner. [1.1.1.Q1 & Q3]
1.1.1.C2: (Customer & Developer) Supportability of the system as-designed should be reasonable and viable meaning that the operation, maintenance, logistics support, testing, environmental impact, and disposal of the system should be able to fit into the user operational environment with minimum disruption to the user, and with an affordable life cycle cost impact to the mission. [1.1.1.Q2]
1.1.1.C3: (Developer) For airborne weapon systems/platforms, air-worthiness requirements are identified and planned for certification prior to flight-testing. May be a single or multiple events, depending on design modifications. [1.1.1.Q4]
1.1.1.C4: (Customer & Developer) Modification, deletion, deferment, or addition of requirements during the development program are reflected in the product baseline, are traceable to the system design, and are verifiable in test or simulation. [1.1.1.Q5]
[1.1.1.C5]: (Developer) Early design trade-off analyses are well documented and supported by quantifiable benefits to the final design. [1.1.1.Q6]
1.1.1.C6: (Customer) System thresholds and objectives, documented in the acquisition and support strategies, include reliability, maintainability and availability. [1.1.1.Q7]

<u>Sample Questions/Requests for Information:</u>
1.1.1.Q1: (Developer) Describe how the operational requirements contained in the CPD (or updated ORD), as revised from the CDD (or MS B ORD) are traceable to the current design configuration of the system. Explain how life cycle cost analyses influenced the system design by achieving the optimal solution. [1.1.1.C1]
1.1.1.Q2: (Customer & Developer) Explain how the as-designed system fits within the expected user operational environment at the time of planned deployment. Identify the specific support (including test) requirements imposed on the user that represent a change in logistical support from what will be available at the time of planned deployment. [1.1.1.C2]
1.1.1.Q3: (Customer) Discuss the role of the customer (user community, support community, training community, T&E community, etc.) in the system engineering process used to achieve the system design. [1.1.1.C1]

1.1.1.Q4: (Developer) If applicable, have air-worthiness requirements been addressed? [1.1.1.C3]
1.1.1.Q5: (Customer & Developer) Are the operational concepts, support concepts and threats the same today as they were when the initial concept was developed? Specifically, identify all requirement additions, deletions, or modifications, and verify their traceability to the system design, and the means of test verification. Are they reflected in the product baseline? Please explain [1.1.1.C4]
1.1.1.Q6: (Developer) What trades were implemented resulting from trade-off analyses conducted during the conversion of the CDD to the CPD, and what was the impact of these trades on system design? [1.1.1.C5]
1.1.1.Q7: (Customer) How are reliability, maintainability, and availability identified in the system threshold and objective performance requirements? [1.1.1.C6]

<u>Sample Observations:</u>
1.1.1O1: In most programs, the operational environment in which the system under development must operate changes between program initiation and projected fielding. In some programs these changes are not accounted for and the system is outdated before it is produced.

Factor 1.1.2 – Verification of Requirements

<u>Criteria:</u>
1.1.2.C1: (Developer) Verification of all Key Performance Parameters (KPPs), Measures of Effectiveness (MOE), Measures of Suitability (MOS) and Critical Technical Parameters (CTP) have been demonstrated by prototypes or engineering development models operating in the system's intended environment. Results are documented in test and evaluation reports described and documented in accordance with the Test and Evaluation Master Plan (TEMP). Deficiencies have been documented and analyzed, and the associated risks for successful testing are manageable. [1.1.2.Q1 and Q2]
1.1.2.C2: (Developer) Verification of all Reliability, Availability, Maintainability, and Built-In-Test requirements has been completed and documented in accordance with the TEMP. Deficiencies have been documented and analyzed, and the associated risks are manageable. [1.1.2.Q2]
1.1.2.C3: (Customer & Developer) Compatibility with other interfacing systems must be maintained and verified through system-level testing as defined in interface specifications, through the development /design process and traceable to the architecture of the system. Interface specifications should be under formal configuration control. [1.1.2.Q4]
1.1.2.C4: (Customer & Developer) The interoperability and Net-readiness of the system with the context of the current and projected Global Information Grid (GIG) architecture should be clearly defined and reflected in the technical requirements, and should be tracked and verified as an integral part of the system design. Interoperability of systems designed outside the GIG architecture must be clearly defined, e.g. some systems must interface in the Navy's legacy Links and Data Distribution Systems. [1.1.2.Q5]
1.1.2.C5: (Developer) Computer/Software configuration items have completed test verification and the system software capability is determined to be mature. All known deficiencies have been documented and evaluated, and fixes have been identified and rescheduled for verification. An Independent (of the contractor/materiel developer) Verification and Validation (IV&V) assessment has been performed. [1.1.2.Q6]

<u>Sample Questions/Requests for Information:</u>
1.1.2.Q1: (Developer) For each configuration item of the system, have the KPPs, MOEs, MOSs, CTPs, and other performance requirements, both explicit and derived, been tested, and verified? What deficiencies have been documented? [1.1.2.C1]
1.1.2.Q2: (Developer) How will test deficiencies be resolved and what is the impact of each on completing system integration and verification prior to committing funds to production? For those that may not be resolved, what is the impact on meeting the Joint Capabilities the program addresses? What is the impact of each on achieving readiness to enter Initial Operational Test and Evaluation (IOT&E)? [1.1.2.C1]
1.1.2.Q3: (Developer) Have Reliability, Availability, Maintainability, and Built-In-Test (BIT) requirements been verified through testing? What deficiencies have been documented? What is the risk associated with these deficiencies and how will they be resolved within the current schedule? For those that may not be resolved, what is the impact on logistics supportability and Total Operational Cost? [1.1.2.C2]

1.1.2.Q4: (Customer & Developer) Describe operational capabilities/requirements as they relate to dependencies (e.g. System of Systems (SoS)) on or commonality with other systems (e.g. Family of Systems (FoS)). How are these interface requirements with other systems incorporated in the system design? What is the status of test and evaluation/verification? [1.1.2.C3]
1.1.2.Q5: (Customer & Developer) Describe the C4ISR interoperability (Net Readiness) capabilities/requirements of the system in terms of the mission requirements with other platforms or systems, both within the command structure and with other US (Component and joint) and foreign defense forces (Standardization). How are these requirements addressed in the system design? What is the status of interoperability test verification? [1.1.2.C4]
1.1.2.Q6: (Developer) For Computer/Software configuration items, is there sufficient progress in testing and test results? What is the status of the software testing? What is the status of open problem reports / deficiency reports (i.e., the numbers of open software trouble reports by level of severity), and how will these open deficiencies affect successful IOT&E? Who performed software IV&V, what were the findings, and was a report published? Please provide the report. [1.1.2.C5]

Sample Observations:
1.1.2.O1: Programs are needlessly delayed and excessive cost increases are realized in the quest for perfection, when good enough would suffice.
1.1.2.O2: Interoperability with systems not under the PM's control is often the Achilles heel of programs that must function in a system of systems environment.
1.1.2.O3: Software deficiencies are deferred to production as "only software" but adversely impact formal Operational Tests.

Factor 1.1.3 – Dependencies/External Interfaces

Criteria:
1.1.3.C1: (Customer & Developer) For a System of Systems, the dependencies, i. e., hierarchical flow, must be clearly defined. This includes interface control specifications that should be definitive early on and placed under strict configuration control. Compatibility with other interfacing systems and common architectures must be maintained through the development /design process. [1.1.3.Q1, Q3, and Q4, Q6, Q7, and Q8]
1.1.3.C2: (Customer & Developer) If there is no explicit dependency or hierarchy of systems, the operational capabilities/requirements may require that the proposed system rely on interface(s) with other systems. In this case, the nature of these known interfaces should be well defined early enough to enable the program to adequately address them during system design. [1.1.3.Q1]
1.1.3.C3: (Developer) Complex and dynamic operational capabilities/requirements that drive capability improvements must be considered as to their potential impact on the system design requirements. Corresponding supportability factors must also be considered. [1.1.3.Q2]
1.1.3.C4: (Customer) Responsibility for development of interfaces in a System-of-Systems should be defined early. [1.1.3.Q7]
1.1.3.C5: (Developer) For all systems that conform to, or perform functions that conform with, the definitions of IT or National Security Systems, a fully developed Net-Ready KPP must be present in applicable capabilities documentation (e.g., CDD for MS B, CPD for MS C). [1.1.3.Q9]

Sample Questions/Requests for Information:
1.1.3.Q1: (Customer & Developer) Provide and describe operational capabilities/requirements as they relate to dependencies (e.g. system of systems) on or interface with other systems. Describe how these dependencies and interfaces are identified, defined and controlled. [1.1.3.C1 and C2]
1.1.3.Q2: (Customer & Developer) Describe the risk associated with possible actual or proposed changes or modifications to operational requirements and their impact on system requirements. How are these changes managed within the program baselines? [1.1.3.C3]
1.1.3.Q3: (If system of systems): Describe the requirements flow down and flow up process for the program. [1.1.3.C1]
1.1.3.Q4: (Developer) Describe how compatibility of the system with other interfacing systems is addressed in developing and maturing the system design. [1.1.3.C1]
1.1.3.Q5: (Developer) Describe how external interfaces impact (enhance or hamper) supportability.

[1.1.3.C3]
1.1.3.Q6: (Customer) What common interfaces must the system design be compliant with? [1.1.3.C1]
1.1.3.Q7: (Customer) Are there any developing complimentary systems that are critical to the success of the proposed system (i.e., the need for JITRS radio support)? Please explain. [1.1.3.C1]
1.1.3.Q8: (Developer) How is the proposed program responsible or responsive toward funding and developing the interfaces to other interfacing systems (e.g., system of systems or family of systems)? Please explain. [1.1.3.C4]
1.1.3.Q9: (Developer) If the system operates within the definitions of Information Technology (IT) or National Security Systems, please provide the status of the Net Ready KPP as described in the Capabilities Production Document (CPD). [1.1.3.C5]

Sample Observations:
1.1.3.O1: Hierarchical dependencies are not clearly defined or become definitive too late for the program to easily accommodate them.
1.1.3.O2: External interfaces are identified after the system design has been finalized, requiring a Pre-Planned Product Improvement (P3I) program to be initiated to run concurrently with the development program.
1.1.3.O3: External interfaces do not facilitate system supportability.

Factor 1.1.4 – Interoperability/Net readiness

Criteria:
1.1.4.C1: (Customer & Developer) The interoperability and Net-readiness of the system within the context of the current and projected Global Information Grid (GIG) architecture and the Net-centric Operations and Warfare Reference Model (NCOW RM) should be clearly defined and reflected in the technical requirements, and should be tracked as an integral part of the system design. [1.1.4.Q1, Q4, and Q8 and Q12]
1.1.4.C2: (Customer) There should be an active technical interchange, such as an overall configuration control board among the interoperability /net-readiness “players.” [1.1.4.Q2, and Q10]
1.1.4.C3: (Developer) Programs should use standardized architectural products and conventions, data formats and open interface standards and protocols to enable interoperability and Net-centricity. [1.1.4.Q3, Q5 and Q9]
1.1.4.C4: (Customer & Developer) Affordable interoperability is achieved when the interoperable systems can fully participate in the GIG in accordance with its intended role in applicable Joint architectures and the GIG, without major redesign and/or modifications, and are supportable in the fielded environment. [1.1.4.Q6, Q7, Q8, and Q9]
1.1.4.C5: (Customer) Interoperability of systems designed outside of the GIG must be clearly defined (i.e., some systems must interface in the Navy’s legacy Links and Distribution Systems}. [1.1.4.Q11]
1.1.4.C6: (Customer) All of the data that can and should be shared externally beyond the programmatic bounds of the program should be visible (advertised), available and usable, to all potential authorized consumers of the data, making use of Web service standards (e.g., SOAP, WSDL, UDDI) interoperable with the NCOW RM and GIG Enterprise Services to make its data assets visible. [1.1.4.Q10]
1.1.4.C7: (Customer) Program should provide or ensure an appropriate mechanism for posting data to shared spaces, without compromise to system, or system-of-system’s functionality in its intended role, to provide access to all users except when limited by security, policy, or regulation. [1.1.4.Q10]
1.1.4.C8: (Customer) Program should provide discovery metadata, in accordance with the DoD Discovery Metadata Standard (DDMS), for all data posted to shared spaces, [1.1.4.Q13]

Sample Questions/Requests for Information:
1.1.4.Q1: (Customer & Developer) Describe how the interoperability capabilities/requirements are documented and how they are addressed in the overall system design and development process on the program. [1.1.4.C1]
1.1.4.Q2: (Customer) Describe how the various other members of the community who have a stake in the interoperability capabilities/requirements communicate with the program. [1.1.4.C2]
1.1.4.Q3: (Developer) Describe the program approach to facilitate interoperability. [1.1.4.C3 and 1.1.4.C4]
1.1.4.Q4: (Customer) Describe the interoperability capabilities/requirements of the system in terms of the

mission requirements with other platforms, both within the command structure and with other US and foreign defense forces. [1.1.4.C1]
1.1.4.Q5: (Developer) Explain the relationship between open systems architecture and interoperability. [1.1.4.C3]
1.1.4.Q6: (Developer) Describe how interoperability capabilities/requirements impact (enhance or hamper) supportability. [1.1.4.C4]
1.1.4.Q7: (Customer & Developer) Describe how technical standards in the TV products were identified and how they interoperate with the GIG Enterprise Services identified for the system's net-centric roles. [1.1.4.C4]
1.1.4 Q8: (Developer) Describe how the system interfaces with and uses GIG NCES Core-enterprise services. [1.1.4.C1]
1.1.4 Q9: (Developer) Provide architecture view products (OV, SV, TV) that comply with the product definitions in the DODAF. [1.1.4.C3]
1.1.4 Q10: (Customer) Explain how the program's data that can and should be shared externally is visible to all potential authorized consumers, and consumers are able to locate the data. [1.1.4.C2, C6, and C7]
1.1.4.Q11: (Customer) For systems not required to be GIG compliant, are interoperability requirements with legacy systems clearly defined? Please explain. [1.1.4.C5]
1.1.4.Q12: (Developer) What are the plans for developing Software-in-the-Loop (SIL) simulation to test a System of Systems or other required interfaces before developing the hardware? [1.1.4.C1]
1.1.4.Q13 (Customer) How does the System provide discovery metadata that conforms to the DoD Discovery Metadata Standard (DDMS), for all data posted to shared spaces? [1.1.4C8]

Sample Observations:
1.1.4.O1: Vague interoperability capabilities/requirements result in programs failing to achieve expected interoperability capabilities.
1.1.4.O2: Interoperability requirements are expressed in terms of a Service-specific doctrine or protocol making it difficult for a different Service to accommodate.
1.1.4.O3: Lack of an overarching configuration control board across concurrently developed systems of systems or systems desired to be interoperable, results in ineffective change control, and ineffective interoperability.
1.1.4.O4: Interoperability capabilities/requirements do not facilitate supply chain integration.
1.1.4.O5: Fragmented teams developed architectural products in isolation and were thus unable to achieve timely identification of interoperability trade-space and risk remediation.
1.1.4 O6: Architectural view (OV-N, SV-N) fails to account for interface to existing GIG Core Service

2.0 Resources Assessment Area

Sub-Area 2.1 – Program Planning and Allocation

Scope:
Assess the amount of funding available to complete development and testing, and initial production, including the funding profile and timeline, and how funding is projected to execute the production program.

Perspective:
Customer: Allocated program funds are sufficient to complete the system development phase, transition to production effort, and initial supportability requirements. Production cost estimates reflect program performance and can sustain initial production commitments.
Developer: Allocated program funding and expenditure rates track with open work packages. All test requirements, support activities, and pre-production transition efforts are accounted for.

Factor 2.1.1 – Sufficiency

Criteria:
2.1.1.C1: (Customer & Developer) The funding (amount and profile) and schedule duration to perform all

the planned activities (including PM reviews) should be determined by systematic estimating methods which may include past completed program cost and schedule ‘actuals’ (history), independent cost estimates, etc. [2.1.1.Q1, Q2]
2.1.1.C2: (Customer & Developer) The T&E program and production program is adequately funded, or the PM has identified funding shortfalls and has a plan to remedy these shortfalls. Adequate T&E resources (e.g. aerial targets, test ranges, etc.) are funded and available to conduct IOT&E. [2.1.1.Q3]
2.1.1.C3: (Developer) The funding profile for Performance Based Logistics implementation is based on a completed Business Case Analysis. [2.1.1.Q4]

<u>Sample Questions/Requests for Information:</u>
2.1.1.Q1: (Customer & Developer) How is it determined that the planned and allocated funding and schedule are adequate to accomplish the system development and support effort? Does the type of funding match the planned scope of work? [2.1.1.C1]
2.1.1.Q2: (Customer & Developer) Identify what is covered by the funding and accommodated within the schedule. Are all elements of projected operation and support costs addressed? Production startup costs? Please explain. [2.1.1.C1]
2.1.1.Q3: (Customer & Developer) Does planned funding include reserve funding to cover development test contingencies, engineering changes, T&E infrastructure and asset needs (ranges, targets, data collection/reduction/analysis, test participants and support) to conduct IOT&E? Please explain. [2.1.1.C2]
2.1.1.Q4: (Developer) Identify the funding profile for implementing Performance Based Logistics. Explain how the funding requirements were derived. {2.1.1.C3]

<u>Sample Observations:</u>
2.1.1.O1: Insufficient program funding has resulted from poor cost estimating practices, as well as ignoring the cost estimates developed to support the funding and scheduling realism decision. Funding profiles have been planned which are not realistically aligned with the program profile fiscal years needs.
2.1.1.O2: The inability to adequately identify and manage risk in the program leads to unexpected or unplanned cost growth.

Factor 2.1.2 – Continuity/Stability

<u>Criteria:</u>
2.1.2.C1: (Customer) It is important that a program obtains and sustains funding to support its core program of work. This flow of funding needs to be stable and steady. [2.1.2.Q1]
2.1.2.C2: (Developer) The Logistics Support Plan clearly identifies the funding and procedures that will be used in carrying out the Total Life Cycle Support requirements and responsibilities. [2.1.2.Q2]

<u>Sample Questions/Requests for Information:</u>
2.1.2.Q1: (Customer) Describe how program funds have been allocated (by fiscal year) against the Integrated Master Plan and the Production Plan. Has the funding for this program been stable and steady so as to meet program needs? Have any program baseline restructures taken place attributed to funding shortfalls? Please explain. [2.1.2.C1]
2.1.2.C2: (Developer) Explain how the total life cycle support requirements and responsibilities are addressed in the Logistics Support Plan. Describe the basis for the estimates. [2.1.2.C2]

<u>Sample Observations:</u>
2.1.2.O1: Inconsistent and constrained funding is a common occurrence.
2.1.2.O2: Funding profile and timeliness are often insufficient for planned program phasing

Sub-Area 2.2 – Personnel

<u>Scope:</u>
Assesses the capability of the existing workforce and the thoroughness of the planning to acquire and train experienced personnel, and to evaluate worker performance to ensure a smooth transition to production and subsequent production contracts.

<u>Perspective:</u>
Customer: Program office staff is the right mix of qualified personnel to complete development and test, and transition to production.
Developer: Workforce management and training programs are high priority to ensure a stable work force to complete development and transition to production.

Factor 2.2.1 – Qualifications

<u>Criteria:</u>
2.2.1.C1: (Customer & Developer) Key contractor Technical personnel including Chief Systems Engineer, head logistician, section chiefs, etc. have worked successfully on projects of similar complexity and have had significant work experience. [2.2.1.Q1]
2.2.1.C2: (Customer & Developer) The experience of the personnel is relevant to the current program in terms of both domain (e.g. system application) and complexity. [2.2.1.Q2]
2.2.1.C3: (Customer) Program Office personnel in acquisition-critical positions must be trained to the appropriate certification levels in accordance with their acquisition career assignments. [2.2.1.Q3]

<u>Sample Questions/Requests for Information:</u>
2.2.1.Q1: (Customer & Developer) Please describe the experience level of each of the key technical personnel. [2.2.1.C1]
2.2.1.Q2: (Customer & Developer) How is the experience of technical personnel relevant to the current program? [2.2.1.C2]
2.2.1.Q3: (Customer) Are the personnel in acquisition-critical positions (e.g. program management, contracting, oversight) trained to the appropriate certification levels in accordance with their acquisition career assignments? Please explain. [2.2.1.C3]

<u>Sample Observations:</u>
2.2.1.O1 Company resources are readily acquired to leverage engineering experience during system development and demonstration.

Factor 2.2.2 – Staffing

<u>Criteria:</u>
2.2.2.C1: (Developer) The company policy and program practice on workforce assignments should reflect a commitment to a stable workforce that will ensure that key personnel will stay with the program to address technical and other issues as it transitions to production. [2.2.2.Q1]
2.2.2.C2: (Developer) Software development staffing should be consistent with increased level of effort required to conduct software integration, validation, and verification activities. [2.2.2.Q2]
2.2.2.C3: (Developer) Metrics used for manpower planning should be verified by company experience with similar manufacturing processes along with the use of production planning software models to identify the required resources. [2.2.2.Q3]
2.2.2.C4: (Developer) The company should have a proactive attitude in support of workforce needs in order to sustain a workforce that is productive and will respond to a continuous improvement approach to the quality of the product. [2.2.2.Q4]
2.2.2.C5: (Developer) Employee performance is a key factor of quality improvement and productivity. Poor performance may be the result of poor training. [2.2.2.Q5]
2.2.2.C6: (Developer) The status of labor agreements and renegotiations of contracts can be a showstopper if not anticipated. The Company should anticipate potential issues when contracts expire and have contingency plans to minimize any adverse impact to the program that may result. [2.2.2.Q6]

<u>Sample Questions/Requests for Information:</u>
2.2.2.Q1: (Developer) Explain the procedures/policies that establish the priority of work force assignments across various company production programs, including this program. What percent of the current technical staff will continue to support the program as it transitions to initial production? [2.2.2.C1]

2.2.2.Q2: (Developer) How has software development staffing increased to complete the software development, integration, and test effort within the program schedule? [2.2.2.C2]
2.2.2.Q3: (Developer) Describe the manufacturing planning metrics used to determine manpower requirements, personnel skill levels and training, and other resources required to support the initial and rate production plan. [2.2.2.C3]
2.2.2.Q4: (Developer) Describe the procedures in-place for analyzing data such as turnover rates, complaints, grievances and absenteeism, and the implementation of methods to improve work force efficiency. [2.2.2.C4]
2.2.2.Q5: (Developer) Describe the policies and procedures for evaluation of employee performance. Provide evidence that performance reports are utilized and documented. How is this information used in conjunction with employee training programs? [2.2.2.C5]
2.2.2.Q6: (Developer) Discuss the status of current labor agreements. Explain any issues anticipated with negotiation of future labor agreements, and the methods and planning to provide continuity of the work force of qualified personnel to support the current program and future year production programs. [2.2.2.C6]

Sample Observations:
2.2.2.O1: Lack of timely document review due to lack of government personnel availability.
2.2.2.O2: Negative program impacts caused by inter-program resource dependencies.
2.2.2.O3: Excessive critical personnel turnover (e.g. software) was resulted in program delays and overruns,

Factor 2.2.3 – Training

Criteria:
2.2.3.C1: (Developer) Policies and standards should be in-place to ensure the thorough and continual training of development and production personnel. [2.2.3.Q1]
2.2.3.C2: Training programs should use interactive tools and techniques, formal classroom or on-the-job training and be of duration commensurate with the type of job. [2.2.3.Q2]
2.2.3.C3: (Developer) The scope of the training program should include training of system operators and maintainers to be used in the IOT&E program. A formal training plan should be in-place to train a cadre of operators and maintainers who will support the initial fielding of the system. This training plan should be described in-detail in logistical support documentation. [2.2.3.Q3]
2.2.3.C4: (Developer) Employee training programs should include periodic review and refresher training to maintain employee awareness of safety and environmental issues that can adversely affect the workforce and the program. [2.2.3.Q4]
2.2.3.C5: (The Developer) The Quality Assurance organization identifies and provides the resources, such as skills, knowledge, tools, and equipment, which people need to implement and maintain the quality system. [2.2.3.Q5]

Sample Questions/Requests for Information:
2.2.3.Q1: (Developer) Describe any in-house training programs, continuous education and/or affiliations with academic centers. What are the standard requirements for training for program development and production personnel? [2.2.3.C1]
2.2.3.Q2: (Developer) How long does it take to train new technical personnel in the tools and methods needed to execute the program position duties? Discuss the training methods used and the job positions and duration of training required for each. [2.2.3.C2]
2.2.3.Q3: (Developer) Have operators and maintainers been trained in preparation for IOT&E and fielding? Is a manning plan established? What documentation and training infrastructure has been developed to ensure that operators and maintainers continue to be properly trained? [2.2.3.C3]
2.2.3.Q4: (Developer) Describe the policies and procedures for training of employees in compliance with safety and environmental regulations. [2.2.3.C4]
2.2.3.Q5: (Developer) Describe the training programs for quality engineering, quality assurance, and quality conformance that are available to the employees. Describe specific training content, such as statistical methods and tools, design of experiments, etc., that are used to maintain or improve quality of products and processes. [2.2.3.C5]

Sample Observations:
2.2.3.O1: Manufacturing labor training programs rely on outside educational sources for basic technical skills training.
2.2.3.O2: No formal program for workforce efficiency improvement. Individual departments are responsible for employee performance and incentives.

Sub-Area 2.3 – Facilities and Equipment

Scope:
Assesses the key areas of planning, utilization, and flexibility of the facilities and equipment program to ensure that cost and efficiency are adequately addressed in the production-planning phase.

Perspective:
Customer: User, T&E, and availability and adequacy of Government-owned resources is verified to support development and test activities, and production plans.
Developer: Plan and schedule the acquisition of equipment and facilities, which are accurately forecasted, cost effective, and meet the needs of the planned production program.

Factor 2.3.1 – Resources Planning

Criteria:
2.3.1.C1: (Developer) A key aspect of production planning is the consideration of labor standards. These standards are important in workforce projection, but should also be considered when planning facilities and equipment, to ensure efficient utilization rates and overall productivity of the workforce. [2.3.1.Q1]
2.3.1.C2: (Developer) Environmental and safety regulations and standards should be an integral part of the production planning and should be compliant with federal, state, and company statutes and laws. Their impact on the cost of production operations should also be evaluated. [2.3.1.Q2]
2.3.1.C3: (Developer) The production facilities and equipment planning should include all key functional groups that play a role in production operations. [2.3.1.Q3]
2.3.1.C4: (Developer) Tradeoff analyses should be documented and provide an optimized solution that is the basis for the production planning effort. The analyses should be based on established modeling tools and factor in the current capabilities and experience of the company or companies involved. Cost optimization should be a significant factor. [2.3.1.Q4]
2.3.1.C5: (Customer & Developer) The identification and planned use of existing company assets and government-owned resources should be supported by the confirmed availability of the resources. Resource sharing between programs should be on a non-competing basis. [2.3.1.Q5]
2.3.1.C6: (Developer) The acquisition of production tooling and equipment should be based on a schedule that represents reasonable acquisition lead times, installation and setup, training, etc. that mates with the overall schedule and presents contingency plans that address any schedule risks. [2.3.1.Q6]
2.3.1.C7: (Developer) The Production Plan provides for scheduled and unscheduled maintenance with little disruption to the production schedule. [2.3.1.Q7]
2.3.1.C8: (Developer) Make/buy decisions are consistent with company policy and should reflect rationale that meets the planned schedule and offers the best value to the customer. [2.3.1.Q8 and Q9]
2.3.1.C9: (Developer) The Company has established procedures for management of company and GFE assets that support the needs of the program. [2.3.1.Q10]
2.3.1.C10: (Developer) The program verifies procedures for ensuring functional compliance and calibration of all tooling and test equipment. [2.3.1.Q11]
2.3.1.C11: (Customer & Developer) The program ensures that adequate T&E infrastructure and resources (ranges, targets, data collection/reduction/analysis, and test participants) and T&E facilities are available. [2.3.1.Q12]

Sample Questions/Requests for Information:
2.3.1.Q1: (Developer) Discuss how labor standards were considered when developing facilities and equipment requirements. [2.3.1.C1]
2.3.1.Q2: (Developer) Describe the safety, health, and environmental standards considered in the

analysis of facilities and equipment requirements, and how these considerations factored into the facilities and equipment plans for the production program. Explain how these standards comply with federal, state, and company requirements, and the cost impact on the production plan. [. [2.3.1.C2]
2.3.1.Q3: (Developer) Explain how the selection of production facilities and capital equipment were coordinated with program production functional elements, e.g., manufacturing, tooling and test, manpower and personnel, etc. [2.3.1.C3]
2.3.1.Q4: (Developer) Describe how the facilities and capital equipment plans provide the optimal solution to the requirements of the production program. Include a description of the tradeoff analyses used to arrive at the selected plan. [2.3.1.C4]
2.3.1.Q5: (Customer & Developer) Provide a list of existing Company and Government-owned resources including facilities, tooling and equipment that is available and will be used for the production program. Explain procedures used to assure accountability of government owned resources. [2.3.1.C5]
2.3.1.Q6: (Customer & Developer) Describe the planning and scheduling for the acquisition of equipment, tooling and test equipment, and Government Furnished Equipment (GFE) required to support initial and subsequent production. Show how these schedules mate with the current program schedule for the transition to production. [2.3.1.C5 & C6]
2.3.1.Q7: (Developer) Explain how scheduled and unscheduled maintenance on facilities, equipment, and tools is addressed in the Production Plan. [2.3.1.C7]
2.1.1.Q8: (Developer) Explain the company make-buy policy for system parts, components, subsystems and support items. Provide some examples of make buy analysis and results. [2.1.1.C8]
2.3.1.Q9: (Developer) Explain the company make-buy policy for tooling and test equipment. Provide the status of make/buy for all major tools and test equipment. What percent of tooling and test equipment requirements are already available to the program? [2.3.1.C8]
2.3.1.Q10: (Developer) Explain the procedures that govern the storage, maintenance, repair and overhaul of tooling and test equipment. [2.3.1.C9]
2.3.1.Q11: (Developer) Describe the procedures used to assure that tooling and test equipment meet production specifications. [2.3.1.C10]
2.3.1.Q12: (Customer/T&E & Developer) Describe the process used to ensure that adequate T&E infrastructure and resources (ranges, targets, data collection/reduction/analysis, and test participants) and T&E facilities are available. [2.3.1.C11]

<u>Sample Observations:</u>
2.3.1.O1: Production planning is deferred to initial production rather than being executed in consonance with system design resulting in higher cost components.
2.3.1O2: Make-buy decisions are weighted toward work loading for the prime Developer's facility rather than best value for the Customer.

Factor 2.3.2 – Allocation and Utilization of Resources

<u>Criteria:</u>
2.3.2.C1: (Developer) A detailed allocation of production space and equipment should be described, along with the factors used in developing the plan. The status of design and acquisition of production equipment should be tracked to the schedule. Equipment cost, efficiency, and availability/down time (maintenance or repair) should be important factors and should be reflected in the planning process. [2.3.2.Q1]
2.3.2.C2: (Developer) Maintenance of production equipment translates to down time and must be accounted for in determining the availability of the equipment and contingency plans. [2.3.2.Q2
2.3.2.C3: (Developer) Utilization rates below 80% (or other developer-determined utilization threshold) should be questioned to determine whether lower cost alternatives to produce the hardware (e.g. contract out) were examined. [2.3.2.Q3 & Q4]

<u>Sample Questions/Requests for Information:</u>
2.3.2.Q1: (Developer) Describe how planned facilities and equipment were allocated to support the production program. Explain how this allocation ensures that the plans will satisfy the requirements of the initial production schedule. Include the status of design and acquisition of equipment to support initial production. Describe how the capability will be expanded to support follow-on production or unplanned

surge requirements. [2.3.2.C1 & C4]
2.3.2.Q2: (Developer) Explain how provisions for maintenance of facilities and equipment were factored in the utilization plan. [2.3.2.C2]
2.3.2.Q3: (Developer) Provide the expected utilization rates for facilities and capital equipment to support planned production rates. What economic utilization rate threshold(s) was used for production capability planning? Please provide the results of production rate capability analyses, and the alternatives considered. [2.3.2.C3]
2.3.2.Q4: (Developer) Explain how planned workloads, production rates, and workflow were major considerations in the utilization plans. [2.3.2.C3]

Sample Observations:
2.3.2.O1: Efficient utilization of space, and assembly workflow considerations (lessons learned from like programs) are leveraged in plant layout plans.2.3.2.O2: Capitalization of equipment is required for system in-process test equipment and final assembly tooling. Environmental testing and component fabrication and assembly are leveraged from existing facilities.

Factor 2.3.3. – Plant Layout

Criteria:
2.3.3.C1: (Developer) A detailed layout of production facilities provides a graphical depiction of the production plan. It should reflect the result of production plan studies that optimize flow of materials, provide adequate space for manufacturing operations, and represents the optimal solution for the production program. Explain if and how computer aided manufacturing tools were used to design the manufacturing plant layout. [2.3.3.Q1]
2.3.3.C2: (Developer) Planning for production should use the system engineering process in that all functional disciplines that have a stake in the production program should be involved in the solution. The material supply and inventory control program is a key aspect the production plan and should be addressed in the early planning process. [2.3.3.Q2]
2.3.3.C3: (Developer) The choice of facilities (new or existing) must be flexible enough to accommodate growth and avoid relocation of production operations that could negatively impact the transition to rate production. The choice of investment in new facilities however, must factor in the impact of government changes in inventory objectives that often result in sustained low production rates for the life of the program. This type of contingency planning should be considered in the facility planning effort. [2.3.3.Q3]

Sample Questions/Requests for Information:
2.3.3.Q1: (Developer) Provide a depiction of the physical plant layout of the production facilities dedicated to the program, including the dimensions of all functional areas. Include a depiction of the flow of components and product, including material receiving and storage. Explain how the layout plan maximizes efficiency and worker safety and productivity. [2.3.3.C1]
2.3.3.Q2: (Developer) Explain how the plant layout was determined and what internal disciplines within the company (e.g. manufacturing, industrial engineering, quality, human factors, etc.) participated in the effort. Explain how the layout plan maximizes production efficiency, safety, and worker productivity in an environment of cost reduction emphasis. Does the program plan to use the “just-in-time” material supply approach? If so, how does this impact the plant layout? [2.3.3.C2]
2.3.3.Q3: (Developer) Describe how the facility will accommodate growth in production rates or changes to the production program that curtail increase in production. [2.3.3.C3]

Sample Observations:
2.3.3.O1: Developer production plans prefer use of existing facility space to avoid cost impact of frequent changes in full-rate production requirements, but full-rate production planning requires new construction.
2.3.3.O2: Prototype manufacturing operations require relocation to achieve workflow efficiencies for production.

3.0 Management Assessment Area

Sub-Area 3.1 – Acquisition Strategy/Process

Scope:
Assesses the current status of the strategy and how the program is being managed to meet strategy objectives.

Perspective:
Customer: Acquisition strategy reflects the current state of the program, and addresses maturity of the technology, future technology refreshment and obsolescence planning, maintainability of the system, and updated cost projections beyond the initial deployment of the system.
Developer: The system design is robust and accommodates the Modular Open Systems Architecture (MOSA) design approach at all key interfaces within the system design. System supportability has been designed-in including incorporation of commercial component application. Technology maturity has been verified and presents little risk to the transition to production.

Factor 3.1.1 – Acceptability of the Acquisition Strategy

Criteria:
3.1.1.C1: (Customer) Acquisition strategy objectives should be reviewed to determine their approach in meeting mission objectives, and the extent to which the approach is achievable, given the status of the program. Acquisition Program Baseline (APB) criteria for performance, schedule, and cost are used to periodically assess periodically the PM's progress in meeting objectives. [3.1.1.Q1]
3.1.1.C2: (Customer) The acquisition strategy should address all the elements that collectively fulfill the operational requirements of the system. [3.1.1.Q2]
3.1.1.C3: (Customer) The acquisition strategy should describe a plan for system life cycle sustainment consistent with operational requirements. [3.1.1.Q3]
3.1.1.C4: (Developer) The system design should incorporate open systems features and commercial hardware consistent with DOD acquisition policy. [3.1.1.Q4]
3.1.1.C5: (Customer & Developer) The acquisition strategy considers competition and other means to manage production and sustainment costs to assure best value for total operational costs. [3.1.1.Q5]
3.1.1.C6: (Customer) The acquisition strategy must be contained in an Acquisition Strategy document that is approved by the MDA prior to Milestone C. [3.1.1.Q6]
3.1.1.C7: (Customer) The Program Manager recognizes the expanded responsibility of total life cycle systems management (based on changes in DoD Policy). [3.1.1.Q7]
3.1.1.C8: (Developer) The support concept incorporates Performance Based Logistics. [3.1.1.Q8]
3.1.1.C9: (Developer) Partnering concepts are considered for all logistics functional areas, which optimize the strengths of both organic and contract resources. [3.1.1.Q9]

Sample Questions/Requests for Information:
3.1.1.Q1: (Customer) Provide the current acquisition strategy to complete the development program and transition to production. Explain how the strategy has changed since the beginning of System Development and Demonstration (SDD) Phase, and the reason(s) for the changes. [3.1.1.C1]
3.1.1.Q2: (Customer) Explain how the acquisition strategy will satisfy operational requirements of the system and/or system of systems. [3.1.1.C2]
3.1.1.Q3: (Customer) Describe how the acquisition strategy addresses life-cycle sustainment of the system. [3.1.1.C3]
3.1.1.Q4: (Developer) Describe how the open systems design will enable the use of Commercial Off-the-Shelf (COTS) technology and how it benefits the production program. Are commercial standards used for internal or external interfaces? Please explain. [3.1.1.C4]
3.1.1.Q5: (Customer & Developer) Explain the elements of the acquisition strategy that will control total ownership costs. Rationalize the approach taken in terms of best value to the government. [3.1.1.C5]
3.1.1.Q6: (Customer) Does the program have an MDA-approved (at MS B) acquisition strategy document, and is it being updated for MS C approval? Are there any anticipated issues with gaining concurrence by the OSD and Army staffs during the approval process? [3.1.1.C6]

3.1.1.Q7: (Customer) Please describe the expanded roles and responsibilities of the Program Office in the context of life cycle system support manager in accordance with changes in DoD Policy. [3.1.1.C7]
3.1.1.Q8: (Developer) Please explain how the logistics support concept for the system incorporates Performance Based Logistics. [3.1.1.C8]
3.1.1.Q9: (Developer) Please describe how execution of the logistics support program leverages partnering with the Government to optimize the use of resources from both parties. [3.1.1.C9]

Sample Observations:
3.1.1.O1: SDD frequently focuses on near term objectives at the expense of production and sustainment cost considerations. When this occurs, corrective action must be initiated prior to MS-C.

Factor 3.1.2 – Feasibility of the Acquisition Strategy

Criteria:
3.1.2.C1: (Developer) The maturity of the technology used in the system design should not be an issue for a program approaching production. Maturity should be confirmed during the hardware build, integration and test activities of System Design and Development (SDD). All employed technologies should be assessed, during SDD, including independently by OSD S&T personnel, as level 7 using technology maturity metrics used by S&T in their technology readiness assessment process, prior to entering production. [3.1.2.Q1]
3.1.2.C2: (Customer & Developer) Evolutionary acquisition or future capability improvements should be defined in the acquisition strategy, along with the metrics, funding requirements and schedule that must be satisfied. These specifics should be collectively considered for feasibility, given the status of the program and any maturity issues with the technology. [3.1.2.Q2 and Q3]
3.1.2.C3: (Customer) Technology obsolescence should be factored into the acquisition strategy. Electronic components likely to become obsolete should be a consideration during design. Plans should include a process to determine when a technology-refresh action should be performed. Funding should consider the need for future technology-refresh procurement. Contingency plans should be made well in advance of planned production, to provide more options to the government and Developer. [3.1.2.Q4]
3.1.2.C4: (Customer & Developer) Plans for life cycle support of embedded software and software support systems should describe how the software systems will be supported, beginning with initial production through operational testing and deployment. Software configuration control, maintenance, and upgrades should be consistent with system operational requirements. [3.1.2.Q5]
3.1.2.C5: (Customer & Developer) PM makes optimum use of available technologies to improve maintenance decisions and integrate the logistic process into the acquisition strategy. [3.1.2.Q6]

Sample Questions/Requests for Information:
3.1.2.Q1: (Developer) Explain how the maturity of the technology used in the system design has been or will be verified to support the acquisition strategy. Describe how the applied technology, i.e. the design and developed system is mature and will support a production decision. Describe the critical technologies used in the design and provide an assessment of their maturities using accepted technology readiness level Standards (i.e., levels 1 through 9). For any assessed below level 6, what is being done to mature those technologies prior to MS C? Did OSD S&T conduct an independent assessment and, if so, what were their findings? [3.1.2.C1]
3.1.2.Q2: (Customer) Explain how the incorporation of advanced technologies for capability improvements to the system is factored into the acquisition strategy. [3.1.2.C2]
3.1.2.Q3: (Customer & Developer) Describe the continuous evolution of the product or program under an evolutionary or spiral acquisition approach to incorporate deferred or evolving capability requirements into subsequent builds of the product or project. Explain if and/or how early production systems will be evolved to subsequently developed capabilities. [3.1.2.C2]
3.1.2.Q4: (Customer) Explain how the acquisition strategy addresses technology obsolescence during the transition to production and future years' production programs. Describe the process for ensuring repair parts support, and the need for periodic technology-refresh procurement. [3.1.2.C3]
3.1.2.Q5: (Customer & Developer) Explain how the acquisition strategy addresses delivery, maintenance, and upgrades to software and software support systems through the life-cycle sustainment of the system. [3.1.2.C4]

3.1.2.Q6: (Customer & Developer) Describe how available, mature technologies have positively impacted the choice of maintenance planning in the logistic support process. [3.1.2.C5]

Sample Observations:
3.1.2.O1: Planned capabilities are postponed beyond initial production due to software verification issues, and must be separately funded, resulting in unplanned evolution of the system capability.
3.1.2.O2: Technology obsolescence of electronic components is a planned occurrence, with reliance on Commercial Off-the-Shelf (COTS) components to reduce risk. Product is designed to commercial specifications where possible.

Sub-Area 3.2 – Project Planning

Scope:
Assesses the effectiveness of the program's planning approach to include scheduling, funding, program planning and management control.

Perspective:
Customer: SDD developer is managing the program risks to an acceptable level to proceed with the transition to production. Program management has provided high fidelity to production and support cost estimates.
Developer: Program management and tracking activities are controlling the risks on the program. Production program planning effectively mitigates program risk and provides high fidelity of expected production funding requirements.

Factor 3.2.1 – Schedule Tracking

Criteria:
3.2.1.C1: (Developer) An integrated master schedule (IMS) is tracked to the critical path. Schedule variances have been assessed and workarounds are reasonable and executable to support the production schedule. The IMS integrated master schedule and the EVMS schedules are consistent and directly linked. [3.2.1.Q1]
3.2.1.C2: (Developer) The performance variance of the current program to the critical path, including development subcontractor's activities, highlights the risk areas and whether they are relevant to transitioning the program to production. [3.2.1.Q2 and 3.2.1.Q4]
3.2.1.C3: (Developer) The program master schedule provides a current representation of all program activities. Performance to the critical path is annotated and highlights technical risk areas at least weekly. Transition to production related activities are assessed for possible impact to the critical path. [3.2.1.Q1]

Sample Questions/Requests for Information:
3.2.1.Q1: (Developer) Provide a history of actual schedule performance to the current contract schedule. Explain the relationship between the Integrated Master Schedule (IMS) and the EVMS schedules. Describe the activities associated with the transition from development to production. Explain any schedule variances and how they will impact the start of production. [3.2.1.C1]
3.2.1.Q2: (Developer) Identify the critical path and risk areas associated with the transition to production. [3.2.1.C2]
3.2.1.Q3: (Developer) Describe the process for managing the master schedule to changes in critical events during the transition to production and initial production deliveries of the system. Explain how the schedule highlights known technical risk areas on the program. [3.2.1.C3]
3.2.1.Q4: (Developer) Explain how the performance variance to the critical path will be analyzed and communicated to the subcontractors. [3.2.1.C2]

Sample Observations:
3.2.1.O1: Transition from development to production requires revision of early production plans to address changes in manufacturing processes and expected lead times.
3.2.1.O2: The IMS is not used as an effective management tool to plan production, but is more focused on SDD activity.

Factor 3.2.2 – Feasibility of Project Planning

Criteria:
3.2.2.C1: (Customer) Program funding and schedules were constructed to account for known program risks. Transition to production efforts resolve risks and highlight areas where additional resources and planning is needed to execute the program. [3.2.2.Q1]
3.2.2.C2: (Customer) Allocation of funding is reasonable and is based on experience and sound estimating/modeling methods. [3.2.2.Q2]

Sample Questions/Requests for Information:
3.2.2.Q1: (Customer) How will the production contract funding and schedule accommodate the known program risks and production start-up issues that will likely occur during contract execution? [3.2.2 C1]
3.2.2.Q2: (Customer) How will financial resources be allocated to the production program by fiscal year to accommodate the learning curve associated with the transition to production and ramp-up in production rates? Explain the method used to arrive at the planned allocation. [3.2.2.C2]

Sample Observations:
3.2.2.O1: Learning curve experience with similar programs reduces the risk of under-funding the initial production program.
3.2.2.O2: Experienced resources are sometimes diverted to new business within the Company and are not available as full-time assets for production transition.

Factor 3.2.3 – Suitability of Project Planning

Criteria:
3.2.3.C1: (Developer) The program has an appropriate process in place to manage a program plan and control changes to the plan, including planning for transition to and execution of production. [3.2.3.Q1]
3.2.3.C2: (Developer) The subcontract management team has sufficient insight into subcontractors' programs to recommend realistic changes to program plans. [3.2.3.Q2]
3.2.3.C3: (Developer) A key attribute of effective program planning is a solid foundation of strategic planning that occurred at the earliest point in the program and that is kept current as the program evolves. [3.2.3.Q3]

Sample Questions/Requests for Information:
3.2.3.Q1: (Developer) What is the process for maintaining/updating program planning activities? Who has the authority to change the planning process? [3.2.3.C1]
3.2.3.Q2: (Developer) As a stakeholder in successful performance of subcontractors, how is the prime contractor developer involved in/cognizant of its major subcontractors' re-planning processes? [3.2.3.C2]
3.2.3.Q3: (Developer) Describe how strategic planning is accomplished on the program, and who is involved in the process. [3.2.3.C3]

Sample Observations:
3.2.3.O1: Subcontractor schedule performance not routinely integrated with prime developer schedule performance.
3.2.3.O2: Program planning activities are effectively considered through the Integrated Product Team process when a good system engineering approach is followed.

Sub-Area 3.3 – Program and Project Management

Scope:
Assesses the capability of the program management organizational structure and implementation of sound management practices across the cost, schedule, technical, and quality aspects of the program.

Perspective:
Customer: The Government Program Office must be staffed with qualified personnel who possess acquisition-certified credentials, and have the requisite experience in weapons system development, test, and production, in the right mix to oversee developer contract activities in all functional areas of the program.
Developer: Success of the program depends on maintaining qualified staff and leveraging the tools and resources of the Company. Effective risk management includes integrated team management and reporting, a strong quality assurance program, and visibility to Company management, in order to provide resources necessary to maintain critical path schedules throughout development and during production transition.

Factor 3.3.1 – Organization

Criteria:
3.3.1.C1a. (Customer): The Program Office is organized to execute all acquisition functions. Integrated Product Teams (IPTs) or equivalent are formed and include contractor/developer representation, and all appropriate program stakeholders. The Team includes support from the Government acquisition organization infrastructure, agencies like DCMA, and from contracted support personnel, as required. The roles and responsibilities are clearly defined and consistent with achieving program objectives. [3.3.1.Q1a]
3.3.1.C1b. (Developer): The development team is organized with assigned development functions. IPTs or equivalent are formed and include representatives from the Customer, and all appropriate stakeholders. The Team includes support from the Contractor development organization infrastructure, subcontractors and contracted support personnel, as required. Roles, responsibilities, and lines of authority are clearly defined and consistent with achieving program objectives. [3.3.1.Q1b]
3.3.1.C2: (Developer) The program office has good cooperation from the company infrastructure in support of the program. The Program Manager ensures close communication within the support functional areas and is able to get priority on resources as needed to execute the program. [3.3.1.Q2]
3.3.1.C3: (Developer) The Company has written policy that delineates how the Program Office is structured to ensure compatibility with the Company functional organizations. [3.3.1.Q3]
3.3.1.C4: (Developer) The Program Manager is part of the Company management decision-making process for program-related financing and Company capital resource allocation. His position brings positive influence on Company decisions to benefit the program both in development and production planning. [3.3.1.Q4]
3.3.1.C5: (Developer) The program office is adequately staffed with clear lines of authority. Functional areas are all stakeholders in the management of the program and lines of reporting within the organization are logical. [3.3.1.Q5]
3.3.1.C6: (Developer) Software engineering activities are implemented following the Software Development Plan. Software engineering and hardware engineering are closely coupled early in the process, and viewed as an integrated engineering activity applied to the system development effort for management purposes. [3.3.1.Q6]
3.3.1.C7: (Developer) The program office is following a Production Plan for staffing and training of personnel to accommodate the transition of the manufacturing, assembly, test, etc. of the product from an engineering environment to a production environment. Key personnel from the development program are planned to remain with the program as it makes the transition. [3.3.1.Q7]

Sample Questions/Requests for Information:
3.3.1.Q1a: (Customer) Describe the organization of the program office staff in managing the production program. Include all management personnel in the areas of engineering, production, manufacturing, software development, integration and testing, logistics, and quality assurance. [3.3.1.C1a]
3.3.1.Q1b: (Developer) Describe the experience of the program office staff in executing the production program. Include all management personnel in the areas of engineering, manufacturing, software development, integration and testing, subcontracting, logistics, and quality assurance. [3.3.1.C1b]
3.3.1.Q2: (Developer) Explain how the program office leverages Company resources (personnel, facilities, test equipment, etc.) to support the execution of the program. [3.3.1.C2]
3.3.1.Q3: (Developer) Describe the Company policy that defines the program organization’s lines of

authority and responsibility in managing the program. [3.3.1.C3]
3.3.1.Q4: (Developer) Describe the degree of authority that the Program Manager has over budgeting, financial commitments, and allocation material resources within the company. [3.3.1.C4]
3.3.1.Q5: (Developer) Provide a detailed description of the organization and staffing to execute the program. Include a description of the lines of authority and functional responsibilities of each of the organizational managers. [3.3.1.C5]
3.3.1.Q6: (Developer) Describe how the software engineering management function is integrated with the Systems Engineering function. [3.3.1.C6]
3.3.1.Q7: (Developer) Describe how the program office will be structured or restructured to handle the transition from the system development phase to production. Identify the key personnel and functions that have the experience to manage the risks associated with a smooth transition to production. [3.3.1.C7]

<u>Sample Observations:</u>
3.3.1.O1: Needed expertise in some key personnel areas is deficient on the developer program management staff.
3.3.1.O2: Program manager has complete fiscal authority over allocation of funds to development activities. This authority is intensely managed by Company executives.

Factor 3.3.2 – Suitability of Program Staff Experience

<u>Criteria:</u>
3.3.2.C1: (Customer) The program office should have personnel with sufficient experience or training in the production and testing of similar defense systems. [3.3.2.Q1]
3.3.2.C2: (Developer) The Program Manager should have sufficient relevant management experience in the development and transition to production of similar defense systems. [3.3.2.Q2]
3.3.2.C3: (Developer) The program management staff should have sufficient participation of systems engineering, software engineering, subcontract management, integration and test, logistics, modular, open systems and other relevant disciplines, with experience and expertise in the development of similar defense systems. [3.3.2.Q3]

<u>Sample Questions/Requests for Information:</u>
3.3.2.Q1: (Customer) Describe the relevant experience of the personnel within the Government Program Office to manage the transition of the program from development and test verification into production. [3.3.2.C1]
3.3.2.Q2: (Developer) Describe the relevant experience of the Developer Program Manager to transition the program into production. [3.3.2.C2]
3.3.2.Q3: (Developer) Describe the relevant management experience and qualifications of the program staff to successfully transition the program to production. Include all disciplines relevant to completing system development and test verification, and those key technical personnel who will execute the production program. [3.3.1.C3]

<u>Sample Observations:</u>
3.3.2.O1: Program fiscal constraints and manpower plans dictate technical staff reductions following IOT&E and prior to actual production deliveries.

Factor 3.3.3. – Risk Management

<u>Criteria:</u>
3.3.3.C1: (Developer) The contractor Developer has an active risk management plan/program that addresses production risks. [3.3.3.Q1]
3.3.3.C2: (Developer) The risk management program identifies history and status of risk management, including top active risks to complete development, testing, and transition into production. [3.3.3.Q1]
3.3.3.C3: (Developer) Mitigation activities are defined and being implemented to reduce identified risks. [3.3.3.Q3 & Q5]
3.3.3.C4: (Developer) Risk analysis includes production schedule impact, including schedule concurrency. [3.3.3.Q2 & Q3]

3.3.3.C5: (Developer) Risk analysis includes open system architecture. [3.3.3.Q4]
3.3.3.C6: (Developer) Risk analysis includes sustainment and obsolescence issues. [3.3.3.Q6]

Sample Questions/Requests for Information:
3.3.3.Q1: (Developer) Describe the past history and status of risk management and the top ten risk areas (hardware and software, technical and non-technical, testing, etc) that exist on the program. [3.3.3.C1 & C2]
3.3.3.Q2: (Developer) Describe how the known risks will impact the production planning and delivery schedule. How are the risks being mitigated? [3.3.3.C3 &C4]
3.3.3.Q3: (Developer) Have any known risk areas created planned schedule concurrency in the current contract or the planned production program? Please explain. [3.3.3.C4]
3.3.3.Q4: (Developer) Describe any risk areas associated with the use of open-systems architecture. [3.3.3.C5]
3.3.3.Q5: (Developer) Describe the risk mitigation plans put in-place to manage the known risks on the program. [3.3.3.C3]
3.3.3.Q6: (Developer) Describe any risks associated with sustainment and obsolescence. [3.3.3.C6]

Sample Observations:
3.3.3.O1: Risk management of software development efforts is given less visibility as hardware technical issues are encountered.

Factor 3.3.4 – Techniques and Methods

Criteria:
3.3.4.C1: (Developer) Established, documented program management techniques, methods, and tools are used to manage the program. [3.3.4.Q1]
3.3.4.C2: (Developer) Software metrics are defined and used to manage the software development effort. These metrics are integrated with other management tools and reported to senior program management. [3.3.4.Q2, Q3 &Q5]
3.3.4.C3: (Developer) Suitable metrics are defined and used to manage the production program? [3.3.4.Q2]
3.3.4.C4: (Developer) Methods exist and are used to periodically monitor the status of the program. [3.3.4.Q4]

Sample Questions/Requests for Information:
3.3.4.Q1: (Developer) Provide and describe the program management techniques, methods, and tools used to manage the program. [3.3.4.C1]
3.3.4.Q2: (Developer) Provide and describe the software metrics used to manage the software development program. What metrics will be used to manage the production program? [3.3.4.C2 & C3]
3.3.4.Q3: (Developer) How are production metrics interrelated and integrated with other management tools such as Technical Performance Measures (TPM), risk management, and Earned Value Management (EVM)? [3.3.4.C2]
3.3.4.Q4: (Developer) Describe other forms and content of periodic program management status monitoring (e.g. internal audits) [3.3.4.C4]
3.3.4.Q5: (Developer) Explain who in the organization generates metrics, how and to whom the metrics are reported, and what is done with the data. [3.3.4.C2]

Sample Observations:
3.3.4.O1: Program performance metrics are well defined for the system development phase. Production metrics are event-oriented, e.g., delivery dates, but do not address process capability.

Factor 3.3.5 – Information Systems

Criteria:
3.3.5.C1: (Developer) Established management information systems are used on the program to report program status/progress to company management and the customer. [3.3.5.Q1]

3.3.5.C2: (Developer) Useful data is developed using the MIS, including data from major subcontractors. [3.3.5.Q2]
3.3.5.C3: (Developer) Critical path analysis and trend forecasting are accomplished. [3.3.5.Q3]
3.3.5.C4: (Developer) The MIS system will be used to manage the production program. [3.3.5.Q4]

Sample Questions/Requests for Information:
3.3.5.Q1: (Developer) Describe the management information system (s) being used on the program. How does the Program Manager use this information to report progress? [3.3.5.C1]
3.3.5.Q2: (Developer) How is the data reported from these systems used as a management tool? Does the data reporting include similar information from major subcontractors? [3.3.5.C2]
3.3.5.Q3: (Developer) What analyses of the data are performed to evaluate the critical path of the program? Do these analyses include trend forecasting? [3.3.5.C3]
3.3.5.Q4: (Developer) Will the same information systems be used to manage the production program? Please explain. [3.3.5.C4]

Sample Observations:
3.3.5.O1: Management information systems are often not interconnected and must be individually statused.

Factor 3.3.6 – Configuration Management

Criteria:
3.3.6.C1: (Developer) The Configuration Management process addresses the system life cycle including the current system configuration baseline. It addresses and includes the supplier base. [3.3.6.Q1]
3.3.6.C2: (Developer) The configuration management process addresses production including change management and includes periodic configuration audits. [3.3.6.Q2]
3.3.6.C3: (Developer) The current system configuration has been approved as the product baseline, or design issues have been identified and are being worked to achieve a product baseline to proceed with production. [3.3.6.Q3]
3.3.6.C4: (Developer) Documented manufacturing instructions exist and are controlled. [3.3.6.Q4]
3.3.6.C5: The change management process identifies impacts of change on open interfaces. [3.3.6.Q5]
3.3.6.C6: (Developer) System/subsystem software and hardware (including parts, components, subassemblies, and assemblies, as appropriate) is configuration controlled. [3.3.6.Q6]
3.3.6.C7: (Developer) Deliverable and non-deliverable support items, including proprietary items, are identified and controlled. [3.36.Q7]

Sample Questions/Requests for Information:
3.3.6.Q1: (Developer) Provide the details of the Configuration Management process, including the current configuration baseline and how it was derived. Does the process provide coverage throughout the system life cycle? Does it include the supplier base? Please explain. [3.3.6.C1]
3.3.6.Q2: (Developer) Describe the configuration management process to be used on the production program, the content of the current configuration baseline and how the process will manage configuration changes. Are periodic configuration audits conducted to ensure the integrity of the product and the process? Please explain. [3.3.6.C2]
3.3.6.Q3: (Developer) Has the current system configuration been approved as the product baseline to proceed with production? If not, what are the design issues that have not yet been resolved? [3.3.6.C3]
3.3.6.Q4: (Developer) Provide the status of the manufacturing instructions for the current configuration and how these instructions are controlled within the configuration control process. [3.3.6.C4]
3.3.6.Q5: (Developer) Does the change management process used by the program identify the impact of change on open interfaces? Please explain. [3.3.6.C5]
3.3.6.Q6: (Developer) At what breakout levels are items under configuration control? How is the system/subsystem software configuration controlled (either as separate configuration items or integral to the hardware)? [3.3.6.C6]
3.3.6.Q7: (Developer) How are deliverable and non-deliverable support items identified and controlled? Are proprietary items and software controlled under the same system? Please explain. [3.3.6.C7]

Sample Observations:
3.3.5.O1: The configuration management process manages hardware and software configurations in separate, but linked databases.
3.3.5.O2: Configuration audits are performed with each change in baseline of the configuration items.

Factor 3.3.7 – Quality Program

Criteria:
3.3.7. C1: (Developer) The Quality Assurance (QA) organization structure is appropriate to accomplish the QA function and responsibilities on the program. [3.3.7.Q1]
3.3.7.C2: (Developer) The QA organization is the central office for managing quality, disseminates quality-related information, and collects current information on status of quality activities in the company. Quality programs differentiate requirements for the quality system and the product quality. [3.3.7.Q2]
3.3.7.C3: (Developer) Staffing of the Quality organization is planned and is consistent with the required effort on the program. [3.3.7.Q3]
3.3.7.C4: (Developer) The Quality program is visible to company management and Quality objectives and requirements are flowed down to subcontractors and suppliers. [3.3.7.Q4]
3.3.7.C5: (Developer) Quality policy, plans, procedures, and manuals are current. They explain the quality system and product quality requirements and how they can be met. [3.3.7.Q5]
3.3.7.C6: (Developer) The QA Plan exists and is being followed. QA is being properly applied to the inspection and acceptance of hardware, software, and support products. [3.3.7.Q6]
3.3.7.C7: (Developer) Internal quality audits should be periodically conducted on the program. [3.3.7.Q7]
3.3.7.C8: (Developer) Documented procedures exist to ensure that factory work instructions comply with inspection and test requirements for the hardware and software. [3.3.7.Q8]
3.3.7.C9: (Developer) Metrics that track product defects, corrective actions, percent accept and reject, are maintained. [3.3.7.Q9]
3.3.7C10: (Developer) Management has used the documented quality program results to correct product and process deficiencies. [3.3.7.Q10]
3.3.7.C11: (Developer) Metrics to track the cost of quality deficiencies are maintained and provided to the customer. [3.3.7.Q11]
3.3.7.C12: (Developer) The Quality organization has an appropriate role in the oversight of tooling and test equipment maintenance and calibration. A process to determine repair/replacement of support equipment exists. [3.3.7.Q12]
3.3.7.C13: (Developer) Company policy addresses use of personally owned tools and measuring devices and how the quality of such tools is ensured. [3.3.7.Q13]
3.3.7.C14: (Developer) Documented procedures exist which define the duties and responsibilities of source inspectors [3.3.7.Q14]

Sample Questions/Requests for Information:
3.3.7.Q1: (Developer) Provide the organizational structure of the Quality Assurance function that supports the program, and describe the responsibility and authority of the key personnel. [3.3.7.C1]
3.3.7.Q2: (Developer) Describe quality management tools to disseminate specific quality requirements and mechanisms to collect data for quality-related activities. [3.3.7.C2]
3.3.7.Q3: (Developer) Explain how the staffing of the Quality department will be managed to address the initial production program and the buildup to full production rate. [3.3.7.C3]
3.3.7.Q4: (Developer) Describe the visibility of the Quality program to company management external to the program, and explain how the objectives of the Quality program are flowed down to major subcontractors and suppliers that support the program. [3.3.7.C4]
3.3.7.Q5: (Developer) Describe quality documents that are used to manage quality initiatives on the program. Describe the difference between quality of processes and quality of products. [3.3.7.C5]
3.3.7.Q6: (Developer) Provide and describe the Quality Assurance Plan and explain the role of the Quality Assurance function in the inspection and acceptance of software. [3.3.7.C6]
3.3.6.Q7: (Developer) Describe the company policy on the conduct of internal quality audits of the program during the current program and during production. [3.3.6.C7]
3.3.7.Q8: (Developer) Describe the documented procedures that ensure that factory work instructions comply with inspection and test requirements for the hardware and software. [3.3.7.C8]

3.3.7.Q9: (Developer) Provide a sample of the type of documentation being used to record product defects, corrective actions, percent accept and reject, etc. [3.3.7.C9]
3.3.7.Q10: (Developer) Discuss how management has used quality-related documentation to correct product and process deficiencies. [3.3.7.C10]
3.3.7.Q11: (Developer) Describe the system being used to track the cost of quality deficiencies and whether this information is shared with the customer. [3.3.7.C11]
3.3.7.Q12: (Developer) Describe the role of Quality in the oversight of tooling and test equipment maintenance and calibration. Describe the decision making process for repair/replacement of this support equipment. [3.3.7.C12]
3.3.7.Q13: (Developer) Describe the company policy on the use of personally owned tools and measuring devices and how the quality of such tools is ensured. [3.3.7.C13]
3.3.7.14: (Developer) If source inspection is planned for production, provide the documentation or written procedures that show the duties and responsibilities of source inspectors? [3.3.7.C14]

<u>Sample Observations:</u>
3.3.7.O1: Process quality improvement initiatives within the program structure are virtually non-existent with the focus on product quality to prepare for production.

Sub-Area 3.4 – Contracting and Subcontracting

<u>Scope:</u>
Assesses how the contract structure serves the needs of the program in terms of ensuring success in delivering the best product to the Government.

<u>Perspective:</u>
Customer: Contracting strategy for production is well defined. Contracting type, incentives, and deliverables represent the best interests of the Government, and pose reasonable expectations upon the Developer. Total system performance responsibility (TSPR) of the Prime Developer is the preferred approach.
Developer: Use of Company contracting can leverage other Company business with qualified suppliers. Integration of subcontractor performance with program performance is essential for risk management and transition to production. Program management and control extends to effective control and administration of cooperative agreements. These agreements must be managed as “team partnerships” to maintain open and honest communication for program success.

Factor 3.4.1 – Conditions/Constraints

<u>Criteria:</u>
3.4.1.C1: (Customer & Developer) Authority and responsibilities of the contracting organization is consistent with executing the prime contract and subcontracting functions. [3.4.1.Q1]
3.4.1.C2: (Developer) The contract administration team functions effectively in providing for the technical accuracy and tracking of data submitted to the Government, including safeguarding of sensitive information. [3.4.1.Q2]
3.4.1.C3: (Developer) Documented processes and procedures exist to consistently manage subcontracted efforts. These address how system performance requirements and manufacturing requirements are flowed down to subcontractors and suppliers. [3.4.1.Q3]
3.4.1.C4: (Customer) An appropriate contract type for the production program (cost reimbursable versus fixed price), commensurate with the program risk, is in place defined at the prime and major subcontractor levels. [3.4.1.Q4]
3.4.1.C5: (Customer) Appropriate warranty provisions will be put on contract. [3.4.1.Q5]
3.4.1.C6: (Customer) Contract provisions are in place to obtain rights to data, software, and property, including consideration of proprietary information. [3.4.1.Q6]
3.4.1.C7: (Customer & Developer) Prime contract and subcontract provisions are in place defined to incentivize program performance. The Program Manager should have final approval of incentive awards. [3.4.1.Q7]
3.4.1.C8: (Developer) Quality goals and objectives at subcontractors and suppliers are consistent with the

developer's quality requirements. Each subcontractor or supplier has agreed to quality requirements. [3.4.1.Q8]

Sample Questions/Requests for Information:
3.4.1.Q1: (Developer) Describe the contracting Organization and the authority and responsibility of each of the functional areas. Explain how the contract administration function will be performed on the prime contract and the administration process of subcontracts awarded for the program. [3.4.1.C1]
3.4.1.Q2: (Developer) How does the contract administration function provide for the technical accuracy and tracking of data submitted to the Government, including safeguarding of sensitive information? [3.4.1.C2]
3.4.1.Q3: (Developer) Explain the subcontract management function to address how system performance requirements and manufacturing requirements are flowed down to subcontractors and suppliers. Describe the documented procedures in-place to assure consistency in the management of subcontracts. [3.4.1.C3]
3.4.1.Q4: (Customer) Describe the preferred approach for contracting the production program at the prime and major subcontractor levels, and explain why this approach best suits the Government and Developer. [3.4.1.C4]
3.4.1.Q5: (Customer) Describe the warranty provisions to be put on contract. [3.4.1.C5]
3.4.1.Q6: (Customer) Describe the contract provisions to obtain rights to data, software, and property. Explain how proprietary information will be addressed. [3.4.1.C6]
3.4.1.Q7: (Customer) Describe the prime contract and subcontract provisions to incentivize program performance. Explain how the incentives will be awarded. Who will be the approving authority for award of incentives? [3.4.1.C7]
3.4.1.Q8: (Developer) Describe the quality policy and programs in dealing with subcontractors and suppliers. Are there specific quality goals that have been signed by subcontractors and suppliers? Please explain. [3.4.1.C8]

Sample Observations:
3.4.1.O1: Contract administration of major subcontracts consumes resources to the detriment of oversight of the supplier base.

Factor 3.4.2. – Cost/Schedule Accounting

Criteria:
3.4.2.C1: (Developer): Cost and schedule performance on the program is maintained and used by the program leadership. [3.4.2.Q1]
3.4.2.C2: (Developer) An approved standard Earned Value Management System (EVMS) is applied and includes low-level work packages and provides high-level accurate status reporting. The EVMS includes software development earned value, and is used in controlling the program execution within the budget and allocated schedule. EVMS is planned for use in production. [3.4.2.Q2]
3.4.2.C3: (Developer) Program status from subcontractors is integrated into the cost control system to provide a comprehensive picture of the program status. [3.4.2.Q3]
3.4.2.C4: (Developer) Software progress being tracked through the program's cost monitoring and control system. [3.4.2.Q4]
3.4.2.C5: (Developer) EVMS data reflects risk reduction activities for the known technical risks in the program. [3.4.2.Q5]

Sample Questions/Requests for Information:
3.4.2.Q1: (Developer) Provide the current status of cost and schedule performance on the program. [3.4.2.C1]
3.4.2.Q2: (Developer) Provide and describe the Earned Value Management System (EVMS) from the lowest level work packages to the highest-level status reporting. Does the EVMS reporting conform to any commercial or DOD Standard? Include application to software development earned value. How is EVMS used in managing and controlling the program execution within the budget and allocated schedule? Will the same system be used during the production program? [3.4.2.C2]
3.4.2.Q3: (Developer) Is the information from subcontractors' cost monitoring and control systems rolled

into the prime contractor's system to present a comprehensive picture of program status? [3.4.2.C3]
3.4.2.Q4: (Developer) Is software progress being tracked through the program's cost monitoring and control system? [3.4.2.C4]
3.4.2.Q5: (Developer) Does EVMS reporting data reflect risk reduction activities for the known technical risks in the program? Please explain. [3.4.2.C5]

<u>Sample Observations:</u>
3.4.2.O1: EVMS is highly visible with Company management and the customer, with a thorough cost accounting process.

Factor 3.4.3 – Cooperative Agreements

<u>Criteria:</u>
3.4.3.C1: (Developer) The quality of a teaming agreement is judged by how well it is being used and how the participants (i.e., the "team") believe in it and speak of it. [3.4.3.Q1 and Q2]
3.4.3.C2: (Developer) A program needs the teaming agreement to be well documented; otherwise it is difficult to manage. [3.4.3.Q1]
3.4.3.C3: (Developer) There should be an atmosphere of open and honest communication across all elements of a program/system. Issues should be raised early before they become a problem and resolved expeditiously with concurrence from all affected participants. [3.4.3.Q3]
3.4.3.C4: (Developer) Sustainment strategies include the best use of public and private sector capabilities through Government/Industry partnering initiatives, in accordance with statutory requirements identified in DoDD 5000.21 [3.4.3.Q4]

<u>Sample Questions/Requests for Information:</u>
3.4.3.Q1: (Developer) How have the teaming agreements between relevant parties been documented, defined, and communicated between all relevant parties? Are the teaming arrangements working well? Please explain. [3.4.3.C1 and C2]
3.4.3.Q2: (Developer) What is the process for making changes to the work agreements, and who is involved? [3.4.3.C1]
3.4.3.Q3: (Developer) How are program issues raised among the stakeholders? [3.4.3.C3]
3.4.3.Q4: (Developer) Describe the use of Government/Industry partnerships to maximize the use of the public and private sector resources in the chosen support strategy. [3.3.4.C4]

<u>Sample Observations:</u>
3.4.3.O1: Poor cooperation exists between development organizations of major subcontractors.
3.4.3.O2: The program office staff has no confidence in the program schedule.

Sub-Area 3.5 – Communication

<u>Scope:</u>
Assesses the communication processes in-place both within and between the Government and the developer, including the accuracy, timeliness and means of communicating relevant program management information to all stakeholders.

<u>Perspective:</u>
Customer: Open communication and partnering with the Developer and other Government stakeholders must be maintained to provide cooperation and trust. Near real-time program status and accurate reporting is essential to the hierarchal Command structure.
Developer: Integrated Product Teams are formal and represent the entire work breakdown structure. Relevant stakeholders from Government and subcontractors are appropriately represented, to foster effective systems engineering, communication, and accurate reporting.

Factor 3.5.1 – Interfaces

Criteria:
3.5.1.C1: (Customer) The Program office organization has established periodic communication and participative activity with the Developer program organization and other program stakeholders, such as the operational command and the test and evaluation organizations. The Government organization effectively leverages supporting infrastructure in executing the program [3.5.1.Q1]
3.5.1.C2: (Developer) The Program office involves the Government program organization, major subcontractor development organizations and other program stakeholders in program activities. The Program organization effectively leverages the supporting infrastructure organization in executing the program. [3.5.1.Q2]
3.5.1.C3: (Developer) Program information is communicated internally among the program participants, including subcontractors, in a timely, accurate manner. Program groups and teams participate effectively in the communication process. [3.5.1.Q3]
3.5.1.C4: (Customer) Program information is communicated externally through the program chain of command and to external program stakeholders in a timely accurate manner. [3.5.1.Q4]

Sample Questions/Requests for Information:
3.5.1.Q1: (Customer) How does the Government program office organization interrelate with the Developer program organization and other program stakeholders, such as the Operational Command and the test and evaluation organizations? [3.5.1.C1]
3.5.1.Q2: (Developer) How does the Developer organization interrelate with the Government program office organization, including major subcontractor development organizations and other program stakeholders? How does the Developer program organization leverage the supporting infrastructure organization in executing the program? [3.5.1.C2]
3.5.1.Q3: (Developer) Explain how program-related information is communicated internally among the program participants, including subcontractors. Explain how the communication is both timely and accurate. Describe how participating program groups and functions, including production and support functions, participate in the communication process. Identify and describe the periodic reporting means used to communicate internally. [3.5.1.C3]
3.5.1.Q4: (Customer) Explain how program related information is communicated externally through the program chain of command and to external program stakeholders. Explain how the communication is both timely and accurate. Identify and describe the periodic reporting means used to communicate externally. If the System is an integral component of a System of Systems, how is communication accomplished across the Program offices? [3.5.1.C4]

Sample Observations:
3.5.1.O1: The developer and Government program office are an integral management team, making effective use of the Integrated Product Team engineering process. Both the user and test community supplement the Government program office.

Factor 3.5.2 – Teamwork

Criteria:
3.5.2.C1: (Developer) Integrated Product Teams (IPTs) are established and functioning effectively to execute the program. [3.5.2.Q1]
3.5.2.C2: (Developer) IPTs coordinate their actions internally and externally effectively with their Government program office counterparts? [3.5.2.Q2]
3.5.2.C3: (Customer) Government and Developer test communities use an integrated test planning approach to combine test activities where practicable and avoid duplication in test verification. [3.5.2.Q3]

Sample Questions/Requests for Information:
3.5.2.Q1: (Developer) Identify the existing Integrated Product Teams (IPTs) on the program and explain their roles, responsibilities, and levels of authority to make program-related decisions. [3.5.2.C1]
3.5.2.Q2: (Developer) How do the various IPTs coordinate their actions internally within the program organization and externally with their Government program office counterparts? [3.5.2.C2]

3.5.2.Q3: (Customer) Have the Government and Developer formed a Combined Test Organization, or similar activity, to plan for and manage T&E activities, thereby eliminating duplicative technical testing to save time and reduce testing costs? [3.5.2.C3]

Sample Observations:
3.5.2.O1: Integrated Product Teams function within the Systems Engineering process, coupled with Government counterparts. Shared accountability between the developer and Government has buy-in among the workforce.
3.5.2.O2: There is a trend to combine Developer and Government T&E activities to reduce time and costs, as opposed to having the Developer conduct a test program and then have the system "thrown over the fence" for the Government to repeat all of the testing for "verification" or specification compliance purposes. This latter process is unproductive and unaffordable in many cases.

4.0 Technical Process Assessment Area

Sub-Area 4.1 – Technology Assessment and Transition

Scope:
Assesses how the Systems Engineering process identifies and selects technologies for program implementation within the context of the documented Technology Development Strategy, accounts for the impact on planned production, and manages the associated risk.

Perspective:
Customer: Technology risk reduction and analysis of alternatives of performance, cost, and supportability form the basis of the acquisition strategy and are essential for selection of reasonably mature technologies for capability upgrades.
Developer: Risk mitigation of technologies drives system capability upgrades. Cost and performance trades are viewed within the bounds of the available mature technologies.

Criteria:
4.1.C1: (Customer & Developer) For an evolutionary acquisition strategy, an iterative process is applied for evaluating/incorporating new/advanced technologies in the follow-on capability upgrade of the current system design. [4.1.Q1]
4.1.C2: (Customer & Developer) A process that utilizes performance, cost, and supportability trades is applied for assessing the impact of incorporating new technologies, including impacts on interfaces in Family of Systems or System of Systems applications. [4.1.Q2]
4.1.C3: (Developer) Appropriate technology readiness metrics are used for determining the level of maturity required to incorporate the new/advanced technology into the system design [4.1.Q3]
4.1.C4: (Developer) Design trade studies and maturity metrics are applied to support the use of the new technology. [4.1.Q4]

Sample Questions/Requests for Information:
4.1.Q1: (Customer & Developer) For an evolutionary acquisition strategy, describe the iterative process for evaluating/incorporating new/advanced technologies in the follow-on capability upgrade of the current system design. Explain how capability upgrades will be incorporated in the current planned production version. [4.1.C1]
4.1.Q2: (Customer & Developer) For a system of systems, explain the process for assessing the impact of incorporating new technologies on interface control within the hierarchy of systems. [4.1.C2]
4.1.Q3: (Developer) What are the metrics for determining the level of maturity required to incorporate the new/advanced technology into the system design? Are Technology Readiness Levels (TRLs) applied to this process? Please explain. [4.1.C3]
4.1.Q4: (Developer) Where new technologies are being used in the design, provide the results of design trade studies and maturity metrics that support the use of the new technology. [4.1.C4]

Sample Observations:
4.1.O1: Technology Readiness Assessments result in assigning technology readiness levels with some technical subjectivity or “best fit” of test measurement results to TRL definitions.

Sub-Area 4.2 – Requirements Development

Scope:
Assesses how system level requirements are derived from the required operational capabilities through the systems engineering process, and are documented in the system level specification.

Perspective:
Customer & Developer: The systems engineering process must be disciplined, documented, and traceable to reflect total consideration of system life cycle attributes in establishing the system specifications. Engineering tools are rigorously applied to trace the applicability of all operational requirements to all elements of the work breakdown structure. Complete functional interface collaboration is required.

Criteria:
4.2.C1: (Developer) At each level of specification, requirements are identified and defined applying the systems engineering process. This includes market analysis, technology assessment, and modeling and simulation, to support trade-off studies to include life cycle costs, identification of measurable technical specifications along with the approach to verify performance. [4.2.Q1]
4.2.C2: (Developer) The objective should be to optimize system performance against cost, schedule, and risk. [4.2.Q1]
4.2.C3: (Developer) Appropriate stakeholders should be included in the requirements process steps. [4.2.Q1]
4.2.C4: (Developer) The process should include a description of how specifications are developed at each level of allocation, and defined as an input to the design process. A complete architecture should be developed which links the various levels of performance with allocations and specifications. [4.2.Q2]
4.2.C5: (Developer) The process should include development of derived specifications at each level and definition of the appropriate (and testable) verification requirements to verify achievement of each requirement in the specification. Critical technical parameters for each sub-system should be incorporated into the Test and Evaluation Master Plan. Implementation of high-risk technologies should be deferred and addressed through pre-planned product improvement or an evolutionary acquisition strategy. [4.2.Q2, Q3, and Q4]
4.2.C6: (Developer) The process should be disciplined in documenting and tracking specifications at all levels and structured for handling any changes. Configuration control should be integrated with this process. [4.2.Q2]
4.2.C7: (Developer) Except for the simplest of systems, this process should be supported by automated tools which provide for the automatic identification of relationships between requirements so that when changes are made, all impacted requirements are identified and accounted for in the updated system configuration, architecture, and verification requirements. [4.2.Q2]
4.2.C8: (Developer) Requirements development should encompass the development and refinement of system-level functional and performance requirements and external interfaces to facilitate the design of open systems. [4.2.Q5]
4.2.C9: (Developer) Requirements development should encompass analysis to ensure that open systems are used to the maximum extent possible in reducing life cycle costs. [4.2.Q5]
4.2.C10: (Developer) Definition of product support requirements are established concurrent with the product design. This process should consider the DoD publication: Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint. [4.2.Q6]
4.2.C11: (Developer) Supportability measures (e.g., Operational Availability (Ao), Mean Time Between Failure (MTBF), Mean Time To Repair (MTTR) and Mean Logistics Delay Time (MLDT)) are quantifiable and measurable, and are defined in terms of performance requirements in the system specifications. [4.2.Q7]

Sample Questions/Requests for Information:
4.2.Q1: (Developer) Describe the process used for translating required operational capabilities into technical specifications. Identify the relevant stakeholders involved in the process and discuss their roles in this process and how conflicting requirements among stakeholders were resolved. [4.2.C1, C2, and C3]
4.2.Q2: (Developer) Describe the process for allocating, verifying and managing specifications, including change management and control, from the system level to the lowest level of system decomposition. [4.2.C4, C5, C6 and C7]
4.2.Q3: (Developer) Describe the method of defining verification requirements to verify performance requirements. [4.2.C5]
4.2.Q4: (Developer) Has a Pre-Planned Product Improvement program or an evolutionary acquisition strategy/spiral development been identified to address follow-on capability improvements? Please explain. [4.2.C5]
4.2.Q5: (Developer) Does the detailed design ensure that open systems are used to the maximum extent possible in reducing life cycle costs? Describe the analyses performed to determine the extent of open systems application. [4.2.C8 and C9]
4.2.Q6: (Developer) Describe the process used for determining the product support requirements. [4.2.C10]
4.2.Q7: (Developer) Describe the supportability requirements in the system specifications and how they are quantified and measured in the test verification process. [4.2.C11]

Sample Observations:
4.2.O1: The translation from requirements (or expectations) to specific engineering tasks and specific design elements is the most challenging part of program development.

Sub-Area 4.3 – Functional Analysis & Allocation

Scope:
Defines in detail the key functions the system must perform when it is in the field, including sustainability considerations, and decomposes the system functions into lower-level functions that are satisfied by elements of the system design- functional architecture.

Perspective:
Customer & Developer: Allocation of system functions defines the functional baseline of the system design. As such, this architecture must be well defined and documented and is in accordance with all applicable standards, protocols and data interchange definitions as defined by key interface descriptions. Test verification descriptions are critical to the process.

Criteria:
4.3.C1: (Developer) Analyses provide a clear, detailed description of the design approach resulting from functional analysis and allocation. [4.3.Q1, and Q2]
4.3.C2: (Developer) This The design effort partitioned the system into self-contained, functionally cohesive, logical groupings of interchangeable, and adaptable modules to enable identification of key T&E requirements to verify sub-assembly performance. [4.3.Q5]
4.3.C3: (Developer) The design effort used rigorous and disciplined definitions of interfaces and, where appropriate, defined the key interfaces within the System by widely supported
Standards (including interface standards, protocols, and data interchange language and standards) that are published and maintained by recognized Standards organizations. These interface definitions drive the requirements for data extraction and collection, and key interfaces will be verified early in the test program. [4.3.Q4, Q5, and Q6]
4.3.C4: (Developer) Analyses include supportability and maintainability as functional requirements defined in terms of operational performance. [4.3.Q1]

Sample Questions/Requests for Information:
4.3.Q1: (Developer) Describe the system function-related analyses that were used to allocate system requirements (include risk analyses if applicable). Were supportability and maintainability included in the analyses? Please explain. [4.3.C1 and C4]

4.3.Q2: (Developer) Provide and explain the internal “design rules” that were used to partition the proposed system into its functional elements. [4.3.C1]
4.3.Q3: (Developer) Provide the Standards used in the systems engineering process to establish the system design. [4.3.C3]
4.3.Q4: (Developer) Does the program’s functional analysis and allocation result in application of a modular, open systems design approach? Please explain. [4.3.C3]
4.3.Q5: (Developer) How does the program’s functional analysis and allocation partition the system into self-contained, functionally cohesive, decoupled groupings of interchangeable and adaptable modules to enable identification of key T&E requirements, and mitigate the risk of obsolescence? [4.3.C2]
4.3.Q6: (Developer) In partitioning the system into modules, were disciplined definitions of modular interfaces used to define the key interfaces within the system? Describe the Standards (including interface Standards, protocols, and data interchange language and Standards) that guided the effort. Are they published and maintained by recognized Standards organizations? Please explain. [4.3.C3]
4.3.Q7: (Developer) Based on the interface definitions, have the requirements for data extraction and collection to be used in the test program been defined? How are key interfaces prioritized for early testing? [4.3.C3]

Sample Observations:
4.3.O1: The program has applied a modular open systems design approach in developing the system.
4.3.O2: System design is not modular.
4.3.O3: External interfaces are not well understood. There are no provisions for changes to external interfaces (outside program control).

Sub-Area 4.4 – Design Synthesis

Scope:
Translates derived requirements, the functional architecture, and system constraints into alternative design solutions that address people, products, support, and process entities, and related internal and external interfaces. The output of this process is the design or physical architecture. Assesses how the system engineering process is applied to the design process (this includes an assessment of methodologies, tool use, and application).

Perspective:
Customer & Developer: Design architecture conforms to MOSA Standards. Software development process is integral with hardware design. Design for producibility and supportability is reflected in the trade analyses and final design. Concurrent engineering is integral to the systems engineering process.

Criteria:
4.4.C1: (Developer) A design process is defined for program use and is being applied across the program, including subcontractors, in completing the design. The design process utilizes proven methods and tools. [4.4.Q1]
4.4.C2: (Developer) Software code and unit test follow a specific process that is described in the software development plan. This process includes reviews, and accepted methods, and tools. [4.4.Q2]
4.4.C3: (Developer) Hardware implementation follows a defined process that is described in a Systems Engineering Plan. Prototypes are part of the development process as are reviews, methods, and tools. [4.4.Q3]
4.4.C4: (Developer) An internal review process is used during design to include both hardware and software design. The schedule, scope, organization, and coordination of this process between the engineering disciplines, ensures an integrated system design. [4.4.Q4]
4.4.C5: (Developer) By following the Modular Open Systems Architecture Approach (MOSA) principles in design synthesis, the Developer should ensure that the selected physical architecture would remain robust and adaptable throughout the System life cycle. [4.4.Q5]
4.4.C6: (Developer) To reduce risk and employ open Standards where they make sense, the Developer should group interfaces into key and non-key interfaces based on module characteristics such as criticality of function, ease of integration, change frequency, interoperability, and commonality. [4.4.Q6]
4.4.C7: (Developer) The Developer should identify which of the key system interfaces implement open

Standards. [4.4.Q7]
4.4.C8: (Developer) The Developer should establish criteria to select the most appropriate sStandards for key interfaces used within their system. [4.4.Q8]
4.4.C9: (Developer) The Developer should specify any options or extensions to the interface Standards selected and ensure that these options (profile) do not prevent the program from using similar components available from other programs or from the commercial sector. [4.4.Q9]
4.4.C10: (Developer) The design focuses on supportability outputs, in terms of reliability and maintainability, to execute mission capability. [4.4.Q10]

Sample Questions/Requests for Information:
4.4.Q1: (Developer) Describe the design process, including analysis and synthesis. Identify where the process is defined/tailored for program use. Was the same process used across the program, including subcontractors? Please explain. Identify methods and tools used to support your processes. How was previous experience from similar programs used in the process? Please explain. [4.4.C1]
4.4.Q2: (Developer) Describe the process used to implement the software design in terms of code and unit test. Identify and provide the process description. Describe the methods and tools used to support this process. Describe the reviews involved in code and unit test. [4.4.C2]
4.4.Q3: (Developer) Describe the process used to implement the hardware design and related supportability factors. Does your process include prototypes? Please explain. Identify and provide the hardware implementation process description. Describe the methods and tools used to support this process. [4.4.C3]
4.4.Q4: (Developer) Describe the internal review process used during design. Address both hardware and software design. Include the schedule, scope, organization, and coordination process between the engineering disciplines that ensure an integrated system design. [4.4.C4]
4.4.Q5: (Developer) Has the program produced design solutions that are sufficiently detailed to verify the application of MOSA principles (i.e., modular design, key interfaces designation, and use of open standards) during the design synthesis? Describe features of the design architecture to assure it remains robust and adaptable throughout the system life cycle. [4.4.C5]
4.4.Q6: (Developer) What module characteristics (e.g., criticality of function, ease of integration, change frequency, interoperability, commonality, etc.) were used to identify key system interfaces within the system design? [4.4.C6]
4.4.Q7: (Developer) Which key interfaces within your system implement open Standards? [4.4.C7]
4.4.Q8: (Developer) What criteria were used in selecting sStandards for key interfaces (e.g., DoD mandate, industry consensus, market support, prime contractor recommendation, etc.)? [4.4.C8]
4.4.Q9: (Developer) Has the program specified any options or extensions to the interface Standards selected? Do these options (profile) prevent the program from using similar components available from other programs or from the commercial sector? [4.4.C9]
4.4.Q10: (Developer) How is supportability of the system quantified and measurable in the current design? [4.4.C10]

Sample Observations:
4.4.O1: Most programs have satisfactory tools and skill to perform systems engineering tasks. However, inadequate time and resources hamper some programs.
4.4.O2: Some programs do not account for supportability considerations.

Sub-Area 4.5 – System Integration, Test, and Verification

Scope:
Assesses the planning, status, and success criteria for the necessary integration and test activities (DT&E) and facilities to support system integration and verification. Emphasis is on process and performance measurement criteria to support OT&E and production.

Perspective:
Customer: The development test and verification program tracks in accordance with the Test & Evaluation Master Plan (TEMP). All Government furnished resources are available to meet the current test schedule. Test activities are coordinated with the OT&E to consolidate test requirements where

possible. Testing uses production-representative hardware.
Developer: All testing is in accordance with the TEMP. Test objectives are well defined and traceable to operational requirements. Risk mitigation plans are in-place to minimize schedule slips that could jeopardize resource availability. Software validation and verification testing precedes hardware testing and verification.

<u>Criteria:</u>
4.5.C1: (Customer & Developer) The system integration, test, and verification strategy is event driven, vice schedule driven, with clearly identified objectives and criteria to be met before proceeding from one event to the next. [4.5.Q1]
4.5.C2: (Customer & Developer) As part of the entrance criteria for production, prototype systems or engineering development models (EDM) (individually and as part of a greater system-of-systems, if appropriate) should demonstrate acceptable performance in DT&E, and operational assessment (i.e., operational testing). The System should demonstrate, mature software capability, acceptable interoperability, and acceptable operational supportability. Acceptability is determined based on demonstrated progress in achieving criteria such as mission capabilities (including KPPs, MOEs, MOSs), critical technical parameters, ADM-approved SDD Exit Criteria, software maturity levels, and other metrics. [4.5.Q2]
4.5.C3: (Customer & Developer) The results of pre-MS C operational assessment should indicate that the system is likely to be assessed as operationally effective and operationally suitable in IOT&E. If this is not the case, remedial or mitigation plans should be pursued. [4.5.Q3]
4.5.C4: (Developer) The software development has followed a disciplined process documented in the program software development plan (SDP) and related plans. This process includes reviews, design, implementation and integration and test. Tools and facilities exist and are used to execute the software development and verification (testing). The current status of software completion verification testing is consistent with the verification test schedule. [4.5.Q4]
4.5.C5: (Developer) The hardware development has followed a disciplined process documented in the program development and test plans. This process includes reviews, design, implementation and integration and test. Tools and facilities, such as models, simulations and prototypes, exist and are used to execute the hardware development and verification (testing). The current status of hardware completion verification testing is consistent with the verification test schedule. [4.5.Q5]
4.5.C6: (Customer & Developer) A Failure Reporting, Analysis, and Corrective Action System (FRACAS) is being used and the reporting is current. (A government reliability failure scoring process should be in effect). The process should include representatives from the Government program office, user community, and operational test agency, to score formally the failures observed in DT and OT. An approved failure definition/scoring criteria document should guide this scoring process). [4.5.Q6 and Q7]
4.5.C7: (Customer & Developer) The integration test program schedule incorporates time for test, analyze, and fix from components to the all-up system. Integration testing is on schedule. Additionally, adequate time is allocated after testing is completed to evaluate test results prior to the MS C decision. [4.5.Q8]
4.5.C8: (Customer) The existing Test and Evaluation Master Plan (TEMP), is being followed. The Government (PM and Operational Test Agency (OTA)) have developed a plan to update the TEMP prior to the MC C decision and Full Rate Production Decision Review (FRPDR). T&E working-level IPT meetings are scheduled to perform this TEMP update. The status of logistic support test and evaluation is in accordance with the TEMP. [4.5.Q9]
4.5.C9: (Customer & Developer) The TEMP contains complete plans, including resource requirements, for Production Qualification Testing of LRIP articles (if LRIP is planned) prior to the FRPDR. Initial Operational Test and Evaluation (IOT&E) is normally performed using production representative or LRIP articles (NA for AIS programs or software-intensive systems with non-developmental hardware) to support the FRPDR. If the program is identified as a covered system under USC Title 10 oversight for Live Fire T&E (LFT&E), adequate LFT&E is planned for the production and deployment phase prior to the FRPDR). [4.5.Q10]
4.5.C10: (Customer) The Government PM has a plan to obtain JITC interoperability/net ready certification prior to the FRPDR, if appropriate for the type of system. [4.5.Q11]
4.5.C11: (Developer) Subsystems software interfaces follow standards and are complete and verifiable. Interface testing is on schedule. [4.5.Q12]

4.5.C12: (Customer) (For a system of systems) The TEMP addresses system of system tests, and these tests are budgeted and supported by the program test resources and schedule. [4.53.Q13]
4.53.C13: (Developer) The subsystems and/or components of the system are in compliance with the open interface standards. [4.5.Q14]
4.5.C14: (Customer) The PM has developed reasonable success criteria and IOT&E/OPEVAL Entrance Criteria being used in assessing technical progress and maturity for operational testing as the system proceeds through its development. These criteria are documented in the TEMP. [4.53.Q15]
4.53.C15: (Customer & Developer) Models and simulations (M&S) that are being used (or will be used) to assess system performance and mission capability are verified and validated, and are being accredited by the intended users of the M&S. Documentation exists on the verification, validation, and accreditation (VV&A) work performed. [4.5.Q16]

<u>Sample Questions/Requests for Information:</u>
4.5.Q1: (Customer & Developer) Is the system integration, test, and verification strategy event driven, vice schedule driven? Are there clearly identified objectives and criteria to be met before proceeding from one event to the next? [4.5.C1]
4.5.Q2: (Customer & Developer) Have prototype systems or engineering development models (EDM) (individually and as part of a greater system-of-systems, if appropriate) demonstrated acceptable performance in DT&E, and operational assessment (i.e., operational testing)? What acceptability criteria does the PM use to judge readiness for IOT&E? [4.5.C2]
4.5.Q3: (Customer & Developer) Do results of pre-MS C operational assessment indicate that the system is likely to be assessed as operationally effective and operationally suitable in IOT&E? If not, have remedial or mitigation plans been developed? [4.5.C3]
4.5.Q4: (Developer) Describe the process used to implement and verify the software design, including the methods and tools, testing, and facilities used to support this process. Include a description of the reviews involved in the software coding and unit testing. What is the current status of software verification testing? How does the percent complete compare with the verification test schedule? [4.5.C4]
4.5.Q5: (Developer) Describe the process used to implement and verify the hardware design and whether this process involves prototypes and/or modeling and simulation. Include a description of the methods and tools, testing, and facilities used to support this process. What is the current status of the hardware component and system verification testing? How does actual testing compare with the test schedule? [4.5.C5]
4.5.Q6: (Customer & Developer) Has a Failure Reporting, Analysis, and Corrective Action System (FRACAS) been used? Please provide a summary of the Reporting to date. [4.5.C6]
4.5.Q7: (Customer & Developer) Is a government reliability failure scoring process in effect? Has an approved failure definition/scoring criteria document or analysis methodology document been developed and distributed? Please explain. [4.5.C6]
4.5.Q8: (Customer & HowDeveloper) How does the integration test program schedule incorporate time for test, analyze, and fix from components to the all-up system? Does the schedule provide adequate time to evaluate test results prior to a MS C decision? Provide the schedule performance of integration testing. [4.5.C7]
4.5.Q9: (Customer) Has the TEMP been updated since the MS B decision? Please provide the status of logistic support test and evaluation in accordance with the TEMP. [4.5.C8]
4.5.Q10: (Customer & Developer) Does the TEMP contain complete plans, including resource requirements, for Production Qualification Testing of LRIP articles (if LRIP is planned) prior to the full rate production decision review (FRPDR)? Will IOT&E be performed using production representative or LRIP articles? Is adequate LFT&E planned for the P&D phase prior to the FRPDR (if applicable)? [4.5.C9]
4.5.Q11: (Customer) Does the Government PM have a plan to obtain JITC interoperability/net ready certification prior to the FRPDR (if applicable)? [4.5.C10]
4.5.Q12: (Developer) Are the software standards for key subsystem interfaces verifiable and their implementation evaluated during testing? Provide the status of interface testing. [4.5.C11]
4.5.Q13: (Customer) (For a system of systems): Are system of systems-level tests and support requirements addressed within the TEMP? Is the test effort budgeted within the program? [4.5.C12]
4.5.Q14: (Developer) Describe the testing process or other mechanisms used by the program to verify claims made by vendors that their products comply with open interface sStandards and their respective profile. [4.5.C13]

4.5.Q15: (Customer) Has the PM developed success criteria and IOT&E/OPEVAL Entrance Criteria to use in assessing technical progress and maturity for operational testing? [4.5.C14]
4.5.Q16: (Customer & Developer) Have Models and Simulations (M&S) that are being used (or will be used) to assess system performance and mission capability been verified, validated, and accredited by the intended users of the M&S? [4.5.C15]

Sample Observations:
4.5.O1: Subsystem test activities reveal design deficiencies that drive engineering overtime labor costs to adhere to test schedules.
4.5.O2: Implementation of FRACAS increases effectiveness of Configuration Management Board and risk mitigation.

Sub-Area 4.6 – Transition to Deployment

Scope:
Assesses the completeness of the planning for operational support in the context of test & evaluation feedback, initial spares procurement, maintenance training, support concepts, required support facilities and equipment.

Perspective:
Customer: The OT&E phase of the program is fully resourced to support verification of system performance, maintenance & supportability concepts. User training programs are in-place and verified.
Developer: Development test results and failure modes analyses are factored into operational test plans. Hardware deficiencies have been addressed. Reliability growth testing remains ongoing and the fidelity of predictive spare parts requirements is improved. Operational test resources are identified and available.

Criteria:
4.6.C1: (Customer & Developer) The results of Operational Test and Evaluation (OT&E) can have a significant impact on product design, spares, and levels of maintenance. The program should have a process in-place to provide additional resources as necessary to address the test issues, in order to minimize the risk of schedule delays. [4.6.Q1 and Q2]
4.6.C2: (Developer) Detailed design analyses should provide predictive data of failure modes and reliability at the subsystem and component level to define the logistics support requirements. Reliability Centered Maintenance (RCM) analysis and the Failure Modes, Effects and Criticality Analysis (FMECA) are used to identify failure modes, their frequency, their effects on performance and their criticality, and are further used to develop condition based and schedule based maintenance tasks [4.6.Q3]
4.6.C3: (Customer & Developer) Specific maintenance support concepts strategy should be presented early be exercised in the development IOT&E phase of the program. These concepts should be supported by detailed analyses of trades related to life cycle support costs. The complexities of the system design and technology are accounted for in the decision to go with either contractor or organic support. [4.6.Q4, Q5 and Q6]
4.6.C4: (Customer & Developer) User training and concept of operations need to be designed in parallel with the system. [4.6.Q7]

Sample Questions/Requests for Information:
4.6.Q1: (Customer & Developer) Describe the process for supporting the OT&E of the system. [4.6.C1]
4.6.Q2: (Customer & Developer) Explain how the process addresses the potential outcomes of the OT&E testing in terms of the schedule for production, deployment, and support of the system. Describe the support planning requirements for IOT&E. [4.6.C1]
4.6.Q3: (Developer) Provide a description of the design analyses and design decisions that were performed to minimize the logistics support structure and develop the schedule of maintenance tasks. [4.6.C2]
4.6.Q4: (Developer) Provide a detailed description of the projected maintenance strategy, including diagnostics, prognostics, maintenance duration targets, and other measures. Will this strategy be fully exercised during IOT&E? [4.6.C3]

4.6.Q5: (Customer & Developer) Provide the status and/or results of the performance-based logistics product support concept analyses Operational Support Plan (organic and/or contractor developer support) during initial deployment and follow-on support of the system). Provide the life cycle cost estimates that support the system design, including initial spares procurement, and manpower and personnel requirements. [4.6.C3]
4.6.Q6: (Customer & Developer) Identify the projected funding requirements to meet the operational support concept Plan and explain the system and program risks that could impact the projected funding. [4.6.C3]
4.6.Q7: (Customer & Developer) How were user training and development of tactics, techniques, and procedures defined during system development and test? [4.6.C4]

Sample Observations:
4.6.O1: Lack of a complete understanding and appreciation of how the system will perform and be used in the field is often a weakness in program development.
4.6.O2: Military Utility Assessment (MUA) is performed as a requirement but is not translated into meaningful guidance to program developers.
4.6.O3: Lack of an understanding of the DoD publication: Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint.

Sub-Area 4.7 – Process Improvement

Scope:
Assess the program's approach to continuous process improvement, to include process evaluation and plan of implementation.

Perspective:
Customer: The Developer's Cost of Quality program is integrated in the Systems Engineering process and cost reporting reflects predictable savings for production and future capability upgrades. Company policies embrace continuous improvement as evidenced in past program performance.
Developer: Initial manufacturing process descriptions provide focus for process improvement initiatives. Selected manufacturing, assembly, and test processes unique to the program are evaluated during SDD hardware build and test, in order to incorporate process improvements beginning with initial production.

Criteria:
4.7.C1: (Developer) Process improvement is an ongoing activity both within the Developer program office (for large extended development programs), and within the Company. Company processes being applied on the program have been assessed as mature and continue to be improved. [4.7.Q1]
4.7.C2: (Developer) Programmatic data on process execution and effectiveness, including metrics, are collected and provided to the Company process improvement group. [4.7.Q2]
4.7.C3: (Developer) Quality goals and objectives, responsibilities and authority for implementing quality are clearly defined and understood by all employees. The developer provides the necessary resources for maintaining and improving quality. [4.7.Q3 and Q4]
4.7.C4: (Customer & Developer) The costs and benefits of quality are identified for each process and product improvement initiative, and they are monitored and reported. [4.7.Q5]
4.7.C5: (Developer) Input and output of each system engineering process (e.g., requirements definition, requirements flow-down, design activities, test and integration, modeling and simulation, etc) are measured for quality. [4.7.Q6]
4.7.C6: (Developer) Documented procedures exist and are adequate to identify process control capability and to verify the relationship between process control variables and final product characteristics. Quality metrics for each process control capability are measured and reported using statistical methods and tools. [4.7.Q7 and Q8]
4.7.C7: (Developer) Management should be actively aware of work center productivity, and act on the information to support continuous improvement. [4.7.Q9]

Sample Questions/Requests for Information:
4.7.Q1: (Developer) Describe you process improvement activities both internal to your program and

across your Company. Have your program processes been assessed by any independent assessors relative to any established process models? Please explain. [4.7.C1]
4.7.Q2: (Developer) Describe your process to collect data to support process improvement. [4.7.C2]
4.7.Q3: (Developer) What are the specific quality goals and objectives assigned to manufacturing supervisors? What are the metrics and time frame allotted to achieve them? [4.7.C3]
4.7.Q4: (Developer) What amount of funds are set aside for quality on the program, and how are the funds allocated? [4.7.C3]
4.7.Q5: (Customer & Developer) Provide any quality reports that depict the cost and benefits of process and product improvement initiatives (prior programs included). [4.7.C4]
4.7.Q6: (Developer) Explain what quality metrics are used for each system engineering process and how they are measured. [4.7.C5]
4.7.Q7: (Developer) Describe quality-engineering and quality assurance tools and methods (e.g., design of experiments, house of quality, statistical analysis tools, modeling & simulation, etc.) used on the program for improving quality of products and processes. How many specific process control capabilities are identified and monitored for the program? [4.7.C6]
4.7.Q8: (Developer) Describe how changes in the process control capability are traceable to changes in product quality. [4.7.C6]
4.7.Q9: (Developer) Describe the metric(s) that enable management to review the productivity of different work centers that support the program. [4.7.C7]

Sample Observations:
4.7.O1: Process improvement and continuous improvement are widely accepted as useful approaches but the operational tempo is so intense that they are relegated to “nice-to-haves.”

5.0 Technical Product Assessment Area

Sub-Area 5.1 – System Description

Scope:
Assesses technical system descriptions in the form of systems requirements specifications, including a set of lower level, allocated product specifications, and the definition(s) of technical systems/subsystems architecture(s).

Perspective:
Customer & Developer: System requirements specifications and performance test/verification requirements are linked and verification methods are defined. Traceability to current requirements documentation is configuration managed for approved capability upgrades commensurate with maturity of the technology required for the upgrade. Maturity is verified through readiness assessments and well-defined metrics. The architecture as designed incorporates MOSA via approved Standards. Availability of Government-furnished products planned for the production program are verified to satisfy program needs.

Factor 5.1.1 – Requirements/Specifications

Criteria:
5.1.1.C1: (Developer) System level specifications are directly traceable to user requirements using established systems engineering methods and tools. [5.1.1.Q1 and Q3]
5.1.1.C2: (Developer) System and lower-level specifications are completely defined and stable, including subcontractor development specifications. [5.1.1.Q2].
5.1.1.C3: (Developer) Specifications are allocated and defined to the appropriate level consistent with program phase. [5.1.1.Q3]
5.1.1.C4: (Developer) Verification requirements are defined for each performance requirement. [5.1.1.Q4]
5.1.1.C5: (Developer) Design requirements include supportability, defined in measures of performance. [5.1.1.Q5]

Sample Questions/Requests for Information:
5.1.1.Q1: (Developer) Provide and describe the System and lower-level specifications including both the performance and verification requirements. Include traceability to user requirements. [5.1.1.C1]
5.1.1.Q2: (Developer) Describe the requirements definition and allocation process. Identify where this process is defined/tailored for program use. Is the same process used across the program, including subcontractors? Please explain. [5.1.1.C2 and C3]
5.1.1.Q3: (Developer) Identify the methods and tools used to support the requirements definition and design baseline process. [5.1.1.C1]
5.1.1.Q4: (Developer) Describe the process and show evidence that you have defined verification requirements exist for each performance requirement. [5.1.1.C4]
5.1.1.Q5: (Developer) Describe the verification requirements that address the system supportability. [5.1.1.C5]

Sample Observations:
5.1.1.O1: Programs are relatively “connected” to the users and stakeholders and hence are able to effectively relate user requirements to system development activities.
5.1.1.O2: There is a lack of requirements traceability to all design components.

Factor 5.1.2 - Architecture

Criteria:
5.1.2.C1: (Developer) System architecture, subsystem architecture, and hardware/software implementation architecture are defined and documented. [5.1.2.Q1]
5.1.2.C2: (Developer Technical) Technical system descriptions address the total system to include the end item, production, and support systems. [5.1.2.Q2]
5.1.2.C3: (Developer) The system design is modular and incorporates an open architecture with the following features/capabilities:
- Optimized to reduce life cycle costs and development cycle time
- Predictions meet system performance capabilities
- Leverage OTS products
- Provide growth capability over the life of the system
- Mitigate obsolescence/DMS
- Enable technology refresh
- Predicted to achieve interoperability
- Predicted to achieve compatibility with the hierarchical system(s) (for a system of systems) [5.1.2.Q3]

5.1.2.C4: (Developer) The system architecture provides operational and sustainment benefits which are verifiable and will be verified. [5.1.2.Q4]
5.1.2.C5: (Developer) The system architecture implementation will be verified against the specified performance requirements. [5.1.2.Q5]
5.1.2.C6: (Developer) Materials suitable to the operational environment will be used in the design implementation. [5.1.2.Q6]
5.1.2.C7: (Developer) Reliability, maintainability, and Built-In-Test (BIT) have been addressed in the design. [5.1.2.Q7]
5.1.2.C8: (Developer) A software product baseline has been established and documented for the product/system. [5.1.2.Q8]
5.1.2.C9: (Developer) Software support equipment required to produce and integrate the system exists. [5.1.2.Q9]
5.1.2.C10: (Developer) A documented Program Protection Plan exists for information assurance, anti-tamper, and cryptology. [5.1.2.Q10]

Sample Questions/Requests for Information:
5.1.2.Q1: (Developer) Provide and describe the system architecture, subsystem architecture, and hardware/software implementation architecture. [5.1.2.C1]
5.1.2.Q2: (Developer) Explain and illustrate how your technical system descriptions address the total system to include the end item, production, and support systems. [5.1.2.C2]
5.1.2.Q3: (Developer) Describe how your system design is modular and incorporates an open

architecture. Describe how the system architectures will:
- Reduce life cycle costs and development cycle time
- Meet system performance capabilities
- Leverage OTS products
- Provide growth capability over the life of the system
- Mitigate obsolescence/DMS
- Enable technology refresh
- Achieve interoperability
- Achieve compatibility with the hierarchical system(s) (for a system of systems) [5.1.2.C3]

5.1.2.Q4: (Developer) Identify and describe any other system operational and sustainment benefits your architecture provides. Describe how these benefits will be verified. [5.1.2.C4]
5.1.2.Q5: (Developer) Describe how the system architecture will be verified against the specified performance requirements. [5.1.2.C5]
5.1.2.Q6: (Developer) Are exotic materials used in the design? If so, please identify. [5.1.2.C6]
5.1.2.Q7: (Developer) How have reliability, maintainability, and Built-In-Test (BIT) been addressed in the design? Have they been verified? [5.1.2.C7] quality improvement analyses
5.1.2.Q8: (Developer) Has the product baseline for software been established? [5.1.2.C8]
5.1.2.Q9: (Developer) Describe the software support equipment required to produce and integrate the system. Provide the status of this equipment. [5.1.2.C9]
5.1.2.Q10: (Developer) Provide and discuss the applicability and content of the Program Protection Plan for information assurance, anti-tamper, and cryptology. [5.1.2.C10]

<u>Sample Observations:</u>
5.1.2.O1: Verification of BIT is frequently hampered trying to meet the false alarm requirement.
5.1.2.O2: DMS issues require frequent investment in qualifying new sources of supply for militarized components.

Factor 5.1.3 – Technology Maturity

<u>Criteria:</u>
5.1.3.C1: (Developer) Technology Readiness Levels (TRLs) are established according to acceptable quantification methods. [5.1.3.Q1]
5.1.3.C2: (Developer) The technologies proposed for use in the System design should have measurable metrics that demonstrate their level of maturity. [5.1.3.Q1]
5.1.3.C3: (Developer) The results of a demonstration/validation of new or advanced technologies quantify risk elements, and support the design strategy. A risk mitigation plan addresses the attendant risks, including adequate resources and schedule to accomplish planned mitigation activities. [5.1.3.Q2]
5.1.3.C4: (Developer) The Developer implements the tenets of Reliability Centered Maintenance to include Maintenance Task analysis, Diagnostics, Prognostics, and Conditioned Based Logistics in the system design. [5.1.3.Q3]

<u>Sample Questions/Requests for Information:</u>
5.1.3.Q1: (Developer) Describe the technologies chosen for incorporation in potential system solutions the design and identify the corresponding TRLs. [5.1.3.C1 and C2]
5.1.3.Q2: (Developer) Provide the results of, or plan for (i.e., test and evaluation, advanced concept technology demonstrations, Service experiments, etc.) the demonstration/validation of the proposed technologies used in the design and the quantifiable risks that remain to mature the technologies for production. Include the risk mitigation plan and how it is integrated into the IMP and IMS, including the resources required to validate (i.e., verification testing, modeling and simulation, etc). [5.1.3.C3]
5.1.3.Q3: (Developer) Describe the expectations of available technologies to fulfill the tenets of Reliability Centered Maintenance (e.g. diagnostics, prognostics, and condition-based logistics). [5.1.3.C4]

<u>Sample Observations:</u>
5.1.3.O1: Archaic processing platforms constrain design and growth.
5.1.3.O2: Software development is driven by hardware availability and capability versus true system requirements.

Factor 5.1.4 – Government/Supplier-Furnished Products

<u>Criteria:</u>
5.1.4.C1: (Customer & Developer) Government furnished items (equipment, software, or data) should be confirmed by the Program Office to meet system requirements and to be available, complete, and supportable. [5.1.4.Q1]
5.1.4.C2: (Developer) Planned Non-Developmental Items (NDI) or Commercial Off-The-Shelf (COTS) items have been determined to meet program system performance and sustainment requirements through defined verification process. Open systems architectures enable the use of COTS and NDI. [5.1.4.Q2]
5.1.4.C3: (Developer) Planned reuse software has been confirmed through a defined process designed to verify the software is complete, will meet the allocated system performance requirements, and is supportable. [5.1.4.Q3]

<u>Sample Questions/Requests for Information:</u>
5.1.4.Q1: (Customer & Developer) If Government-furnished items, equipment, software, or data is being provided to the Developer, what process is used to assure these are complete, available, meet the requirements, and are supportable? Please explain. [5.1.4.C1]
5.1.4.Q2: (Developer) Identify and describe any NDI, or COTS items being used in the system development. Identify the sources of these items. How have these items been determined to meet intended program performance and sustainment requirements? Please explain. [5.1.4.C2]
5.1.4.Q3: (Developer) Identify planned reuse software. Describe the process to confirm that this reuse software is complete and functional, will meet the system performance requirements, and is supportable. [5.1.4.C3]

<u>Sample Observations:</u>
5.1.4.O1: No COTS refresh strategy.
5.1.4.O2: Planned use of Government-furnished products becomes costly and unavailable.

Sub-Area 5.2 – System Performance

<u>Scope:</u>
Assesses development maturity and current and projected system performance as measured by various means.

<u>Perspective:</u>
Customer & Developer: Performance verification is a progression of test and evaluation that keeps pace with the scheduled test program, and verifies all KPPs. Technical and test issues are adequately resolved to support a production decision.

Factor 5.2.1 – Technical Performance

<u>Criteria:</u>
5.2.1.C1: (Developer) System level specifications, including Key Performance Parameters (KPPs) are established and are directly traceable to user requirements using established systems engineering methods and tools. [5.2.1.Q1]
5.2.1.C2: (Developer) System performance requirements verification should be in-progress within the program cost and on schedule. Verification issues should be well defined in terms of risk, cost, and schedule to resolve. [5.2.1.Q2]
5.2.1.C3: (Developer) A Cost Performance Integrated Product Team (CPIPT) should be active with all stakeholders. As a minimum, it should include user, PM, cost analysis, Chief Engineer, and lead logistician. [5.2.1.Q3]
5.2.1.C4: (Developer) A technical performance baseline should be in place down to the subsystem level, from which the system performance verification can be compared and tracked. [5.2.1.Q5]
5.2.1.C5: (Developer) A "how-to" test matrix should be developed and in-use to identify verification

(inspection, analysis, demonstration, test) methods and status for each test requirement written in section 3 of the system specification, and key tests summarized in the TEMP. [5.2.1.Q4 and Q6]
5.2.1.C6: (Developer) A reliability growth program should be defined that is technically based on system functional allocation of specification requirements, and reliability prediction modeling. A reliability growth curve should define the reliability end point and predicted growth based on component, subsystem, and system testing at key points in the development program. [5.2.1.Q7]
5.2.1.C7: (Developer) If implemented, a performance-based logistics program should optimize total system availability while minimizing cost and logistics footprint. [5.2.1.Q8]

Sample Questions/Requests for Information:
5.2.1.Q1: (Developer) Provide and describe your system and lower-level specifications of the performance and verification requirements. Include traceability to user requirements. [5.2.C1]
5.2.1.Q2: (Developer) Explain how the technical performance requirements are stabilized and being verified within the program baselines. Identify any performance verification issues that exist, and the actions being taken to resolve in accordance with the program schedule and cost. [5.2.1.C2]
5.2.1.Q3: (Developer) Describe the membership, function and responsibilities of any senior-level IPT in-place to manage cost and performance metrics on the program. [5.2.1.C3]
5.2.1.Q4: (Developer) Describe the process for ensuring timely verification that the system meets requirements/specifications. [5.2.1.C5]
5.2.1.Q5: (Developer) Provide the technical performance baseline of the current system design. Include the supporting data used to establish the baseline. [5.2.1.C4]
5.2.1.Q6: (Developer) Provide the specified verification requirements and the current verification test matrix that depicts the planned test methods vs. the verification requirements and status identified in the system and lower-level specifications. Is this level of detail described in the TEMP? Please explain. [5.2.1.C5]
5.2.1.Q7: (Developer) Discuss the planned reliability growth program. Has a reliability growth curve been generated? What was the method used to generate initial reliability predictions? Identify the start date of the growth program and the planned reliability maturation at key dates (CDR, MS C, OTRR, IOC). [5.2.1.C6]
5.2.1.Q8: (Developer) Is the logistics support program performance-based? If so, describe how the design was optimized for total system availability while minimizing cost and logistics footprint. [5.2.1.C7]

Sample Observations:
5.2.1.O1: Technical performance baseline requires new technologies to achieve threshold requirements. The risks associated with these technologies are not fully quantified.

Sub-Area 5.3 – System Attributes

Scope:
Assesses the planning and considerations given to produce and support the system.

Perspective:
Customer: Transition to production effort provides significant data collection relative to supportability planning and budgeting requirements for fielding of the System. Future year's program budget supports contractor estimates for improving product capability and support attributes via technology refresh efforts,
Developer: Integrated production planning efforts of the Systems Engineering process, including producibility investments, are reducing the risk of production-related issues. Estimated materials supply requirements and manufacturing resource support is adequate to address manufacturing issues. Manufacturing process planning is effective in identifying and correcting product quality issues that arise in development hardware builds. Transition-to-production issues do not pertubate the program critical path. Transition to production effort provides significant data collection relative to supportability planning and budgeting requirements for fielding of the System.

Factor 5.3.1 - Producibility and Production Planning

Criteria:
5.3.1. C1: (Developer) Analyses were accomplished to establish improve the producibility of the system, and the hardware build & test results have confirmed its producibility. [5.3.1.Q1]
5.3.1.C2: (Developer) The design disclosure is documented in the form of specifications and drawings, and manufacturing work instructions exist to support production. The completion percentage is consistent with the schedule. [5.3.1.Q2]
5.3.1.C3: (Developer) Outstanding (remaining) (form/fit/function and performance critical design issues, are documented and resources, including schedule adjustments, have been allocated to resolve these issues. [5.3.1.Q3]
5.3.1C4: (Developer) The Production Plan provides for the conduct of functional and physical configuration audits to establish the product baseline. These audits are resourced and scheduled. [5.3.1.Q4]
5.3.1.C5: (Developer) Proven manufacturing processes are being applied. [4.4.1.Q5]
5.3.1.C6: (Developer) Manufacturing processes that require verification to establish process capability indices are defined and verification is scheduled or completed. [5.3.1.Q6]
5.3.1.C7: (Developer) Yield rates for initial and ramp-up to mature production have been estimated using appropriate tools and models. [5.3.1.Q7]
5.3.1.C8: (Developer) The critical path for the manufacture and assembly of the system and major subsystems is defined. Manufacturing performance planning is statused relative to the critical path over the past 12 months. [5.3.1.Q8]
5.3.1.C9: (Developer) The Transition to Production Plan is fully defined and documented and describes the top risk areas. Mitigation activities are defined to reduce these risks. [5.3.1.Q9]
5.3.1C10: (Developer) A system is defined for managing and statusing manufacturing and assembly. [5.3.1.Q10]
5.3.1.C11: (Developer) An inventory control system is in place, and verified, to support production. This system can accommodate transition to production demands and will preclude supply-related schedule issues. [5.3.1.Q11]
5.3.1.C12: (Developer) A joint manufacturing/engineering support team will be applied to solve problems on the factory floor during the transition to production and initial production. [5.3.1.Q12]

Sample Questions/Requests for Information:
5.3.1.Q1: (Developer) Provide the results of producibility analyses that were performed during system design. Describe how the analyses were used to make the design more producible. [5.3.1.C1]
5.3.1.Q2: (Developer) Provide a detailed description of the hardware and software specifications, engineering drawing package and manufacturing work instructions that will be used to produce the system. Describe how the percent of documentation complete compares with the schedule. [5.3.1.C2]
5.3.1.Q3: (Developer) Provide a description of form/fit/function and performance critical design issues that are still outstanding and have not been incorporated into the final design description package. What is the schedule and technical risk to resolve these issues? [5.3.1.C3]
5.3.1Q4: (Developer) Does the Production Plan provide for the conduct of functional and physical configuration audits to establish the product baseline? When will these audits be performed? [5.3.1.C4]
5.3.1Q5: (Developer) Provide evidence that proven manufacturing processes were selected where possible, to produce the system. [5.3.1.C5]
5.3.1.Q6: (Developer) Describe the key manufacturing processes that require verification to establish process capability indices. Provide the schedule for verification, capability metrics, and the current status. [5.3.1.C6]
5.3.1.Q7: (Developer) Explain how manufacturing planning is establishing estimated yield rates for initial and ramp-up to mature production. Include the estimating methods and tools, as well as the results. [5.3.1C7]
5.3.1.Q8: (Developer) Describe the critical path for the manufacture and assembly of the system and major subsystems. Provide the status of manufacturing planning vs. the critical path, for the previous 12 months. [5.3.1C8]
5.3.1.Q9: (Developer) Provide the details of the Transition to Production Plan and describe the top (moderate-high) risk areas associated with delivery of systems during initial production. Explain the risk

mitigation plan to address these risk areas. [5.3.1.C9]
5.3.1.Q10: (Developer) Describe the information system(s) to be used on the manufacturing and assembly floor to provide the work instructions and record status of work-in-process. [5.3.1C10]
5.3.1.Q11: (Developer) Describe the inventory control system that will be used to support production. Has the system been tested, to include verification of just-in-time delivery requirements (if applicable)? If the system has not been tested, describe how the supply system will transition to production and avoid supply-related schedule issues. [5.3.1C11]
5.3.1.Q12: (Developer) Describe plans for establishing a joint manufacturing/engineering support team to solve problems on the factory floor during the transition to production and initial production. If no plans are in-place, describe the alternative solution. [5.3.1C12]

Sample Observations:
5.3.1.O1: Manufacturing and assembly yield rates have not been established beyond LRIP predictions. Solutions are driven by assembly process improvement, but requires product throughput to improve.
5.3.1.O2: Computerized manufacturing and assembly instructions are the standard for most assembly processes. Full-up capability is demonstrated with low rate initial production.
5.3.1.O3: Manufacturing centers of excellence offer improved learning curve expectations for production planning.

Factor 5.3.2 – Production Support

Criteria:
5.3.2.C1: (Developer) A documented process exists and is adequate for the identification, storage, and control of incoming material, including Government Furnished Material and Equipment. [5.3.2.Q1]
5.3.2.C2: (Developer) A documented process exists and is adequate for incoming inspection used for all delivered material and hardware. [4.5.2.Q2]
5.3.2.C3: (Developer) The Quality Assurance (QA) program is integrated with the manufacturing methods and processes currently used and planned for production. [5.3.2.Q3]
5.3.2.C4: (Developer) A documented process exists and is adequate for marking, documenting and controlling defective incoming products and material, and work-in-process. A bar coding system is used to track all components. QA monitors this process to ensure that it is followed. [5.3.2.Q4]
5.3.2.C5: (Developer) A screening program for electronic components exists and will be applied during initial and subsequent production. A detailed list of screened components exists and indicates which components will be produced with less than mature production processes. [5.3.2.Q5]
5.3.2.C6: (Developer) The Quality Plan provides for the conduct of trend analyses of rework and repair vs. total man-hours, or other metrics to track product quality during initial and subsequent production. [5.3.2.Q6]

Sample Questions/Requests for Information:
5.3.2.Q1: (Developer) Describe the process for the identification, storage, and control of incoming material, including Government Furnished Material (GFM) and Equipment. [5.3.2.C1]
5.3.2.Q2: (Developer) Describe the incoming inspection process used for all delivered material and hardware. [5.3.2.C2]
5.3.2.Q3: (Developer) Discuss how the Quality Assurance program is integrated with the manufacturing methods and processes currently used and planned for production. [5.3.2.C3]
5.3.2.Q4: (Developer) Describe the method of marking, documenting and controlling defective incoming products and material, and work-in-process. Explain the role of Quality in the review and disposition of such items. [5.3.2.C4]
5.3.2.Q5: (Developer) Describe the current screening program for electronic components and explain how the screening program will be continued, modified, or replaced during initial and subsequent production. Include a detailed list of screened components and indicate which components will be produced with less-than mature production processes. [5.3.2.C5]
5.3.2.Q6: (Developer) Does the Quality Plan provide for the conduct of trend analyses of rework and repair vs. total man-hours, or other metrics to track product quality during initial and subsequent production? Please describe. [5.3.2.C6]

Sample Observations:
5.3.2.O1: Incoming inspection process is well defined. Procedures for tracking of defective material not closely followed; needs bar coding process to improve.

Factor 5.3.3 – Supportability and Maintainability

Criteria:
5.3.3.C1: (Customer & Developer) The Operations & Support (O&S) Plan should consider the performance options, maintenance environment, hardware complexity, and usage on projected maintenance capabilities available during system IOC (e.g., support equipment, manpower/skills availability, and cost). This information should be the basis of an updated Life Cycle Cost Estimate (LCCE). [5.3.3.Q1 and Q4]
5.3.3.C2: (Customer & Developer) The Support Plan (organic/ vs. contractor) should clearly define the cost and resource assumptions available at the time of deployment, and reflect the best balance between mission performance, life cycle cost, logistics footprint, and risk. [5.3.3.Q1, Q3, and Q4]
5.3.3.C3: (Developer) The support objectives and requirements should clearly address the maturity of the technology required and how support of the System will impact available maintenance facilities and support capabilities. [5.3.3.Q1]
5.3.3.C4: (Customer) The Acquisition Program Baseline describes logistics and sustainment considerations. [5.3.3.Q2]
5.3.3.C5: (Developer) The test strategy includes a maintenance demonstration to verify the program maintenance plan. [5.3.3.Q5]
5.3.3.C6: (Developer) The System design reduces the logistics footprint by focusing on reducing spares, special tools, personnel, and fuel consumption; and maximizing parts commonality across the DoD. [5.3.3.Q6]
5.3.3.C7: (Customer & Developer) The Program Manager's life cycle support strategy pursues the development of improved maintenance practices and technologies throughout the product life cycle. Technology refreshment is planned to increase reliability and/or reduce operating and support cost. [5.3.3.Q7]
5.3.3.C8: (Customer & Developer) The Support Plan optimizes a combination of organic and developer support at all levels of maintenance (organizational, intermediate and depot). [5.3.3.Q8]

Sample Questions/Requests for Information:
5.3.3.Q1: (Developer) Provide a detailed description of the Operating & Support (O&S) Plan based on the performance-based metrics of the system. As a minimum, the following should be addressed: Key system support parameters that drive the system design to meet reliability, availability, and maintainability requirements; the projected manpower and deployment footprint, and their impact on the projected support system environment; system support and maintenance requirements and the mature technologies required. [5.3.3.C1 and C3]
5.3.3.Q2: (Customer) Provide a detailed description of the logistics metrics, criteria and the corresponding funding requirements in the Acquisition Program Baseline. [5.3.3.C4]
5.3.3.Q3: (Developer) Describe the risk factors associated with the O&S Plan and how these risks are mitigated, and the potential cost and schedule impact. [5.3.3.C2]
5.3.3.Q4: (Customer & Developer) Considering the maintenance environment and proposed system complexity, describe the potential impact on maintenance capabilities available during system deployment in terms of equipment, manpower/skills, facilities and cost. Include the major cost drivers associated with the selected Life-Cycle Support Plan. [5.3.3. C1 and C2]
5.3.3.Q5: (Developer) Does the test strategy include a maintenance demonstration to verify the program's maintenance planning? Please describe the details and status of the maintenance demonstration plan. [5.3.3.C5]
5.3.3.Q6: (Developer) How does the system design meet the objective of reducing the logistics footprint of the system when deployed? [5.3.3.C6]
5.3.3.Q7: (Customer & Developer) How does the program life cycle support strategy leverage new technologies to address future parts obsolescence and support costs? [5.3.3.C7]
5.3.3.Q8: (Customer & Developer) Describe how the system support plan leverages the use of Government resources most effectively when the system is deployed. [5.3.3.C8]

Sample Observations:
5.3.3.O1: Difficulty in identifying trouble areas and common causes of software problems.
5.3.3.O2: Lack of an understanding of the DoD publication: Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint.

6.0 Environment

Sub-Area 6.1 – Statutory and Regulatory Environment

Scope:
Assesses the statutory and regulatory constraints under which the program operates, and the audit process. Most of the following criteria and questions are appropriately addressed to the government program office.

Perspective:
Customer: Government Program Office ensures that all mandatory policies and statutes that govern the program production phase are tracked for compliance.
Developer: Production Plan complies with all Federal, State, and Local Regulations and Statutes for environmental and safety compliance.

Factor 6.1.1 – Requirements/Specifications

Criteria:
6.1.1.C1: (Customer) The statutory and regulatory report requirements imposed on the program are factored in to the Integrated Master Plan/Schedule, and are consistent with the exit criteria specified for the current phase of the program. [6.1.1.Q1 and Q3]
6.1.1.C2: (Developer) Production planning efforts have considered all known environmental statutes and regulations imposed on the Developer (federal, state, and local) under full disclosure, and considered the cost implications to be consistent with the funding profile to execute the production program. [6.1.1.Q1 and Q2]
6.1.1.C3: (Customer & Developer) Maintenance planning and analyses are consistent with requirements for USC Title 10 and consider CORE Government logistics maintenance capability and public/private partnering. [6.1.1.Q4]

Sample Questions/Requests for Information:
6.1.1.Q1: (Customer) What is the status of reporting requirements for the current phase of the program? Are these requirements included in the exit criteria? What is the status of compliance with the exit criteria? [6.1.1.C1 and C2]
6.1.1.Q2: (Developer) Provide a summary of the environmental statutes and regulations that require compliance by the Developer and all supporting suppliers. Describe how they impact the execution of the current and future phases of the program and whether they have been incorporated in the Integrated Master Plan/Schedule and funding profile. [6.1.1.C2]
6.1.1.Q3: (Customer) Provide specific detail on the status of compliance with the Clinger Cohen Act [6.1.1.C3]
6.1.1.Q4: (Customer & Developer) How does the program satisfy the requirements of USC Title 10 in the context of use of CORE Government maintenance capabilities and partnering initiatives with the Developer? [6.1.1.C3]

Sample Observations:
6.1.1.O1: Developer closely monitors facility compliance issues company-wide. Additional costs added to program for compliance are not anticipated.
6.1.1.O2: Most statutory and regulatory requirements are adequately complied with.

Factor 6.1.2 – Policy

Criteria:

6.1.2.C1: (Customer) The Government Program Office should have a clear and concise understanding of all DOD and Service-level Policies and Statutes that the program must comply with. [6.1.2.Q1]

6.1.2.C2: (Customer) The Program Manager should resolve conflicts in applicability of Policy, and obtain and document the appropriate waivers, to establish the official baseline under which the program is executed. [6.1.2.Q2 and Q3]

Sample Questions/Requests for Information:

6.1.2.Q1: (Customer) What are the applicable DOD or Service-level policies that pertain to the program? [6.1.2.C1]

6.1.2.Q2: (Customer) Is the acquisition policy consistent with the program requirements? Please explain. [6.1.2.C2]

6.1.2.Q3: (Customer) How does the Program Office resolve policy conflict when executing the Program Plan? [6.1.2.C2]

Sample Observations:

6.1.2.O1: The dynamics of policy adherence, change, and interpretation are rarely synchronous with program development activities.

6.1.2.O2: Rapid (and/or poorly promulgated) policy changes can have substantial deleterious impact on programs.

6.1.2.O3: Increased direction from oversight agencies limits PM’s authority, which in turn can slow progress, weaken the ability to meet goals and satisfy requirements, and often both.

Appendix 4

Topical Cross Reference

Acquisition Strategy: 3.1.1; 3.1.2; 4.1; 4.2

Budgeting and Funding: 1.1.3; 2.1.1; 2.1.2; 3.1.2; 3.2.2; 3.3.1; 4.6; 5.3.3; 6.1.1

Family of Systems: 1.1.3

Logistics and Support: 1.1.1; 1.1.2; 1.1.4; 2.1.1; 2.1.2; 2.2.3; 3.1.1; 3.1.2; 3.3.1; 3.3.2; 3.4.3; 4.1; 4.2; 4.3; 4.4; 4.5; 4.6; 5.1.1; 5.1.2; 5.1.3; 5.1.4; 5.2.1; 5.3.3; 6.1.1

Modeling and Simulation: 1.1.1; 1.1.4; 2.3.1; 3.2.2; 4.2; 4.5; 4.7; 5.1.3; 5.2.1

Open Systems Architecture: 1.1.4; 3.1.1; 3.3.2; 3.3.3; 4.2; 4.3; 4.4; 5.1.2; 5.1.4

Producibility and Production: 5.3.1

Requirements: 1.1.1; 1.1.2; 1.1.3; 1.1.4; 2.1.1; 2.1.2; 2.2.2; 2.2.3; 2.3.1; 2.3.2; 3.1.1; 3.1.2; 3.3.7; 3.4.1; 3.4.3; 4.2; 4.3; 4.5; 4.6; 4.7; 5.1.1; 5.1.2; 5.1.4; 5.2.1; 5.3.1; 5.3.3; 6.1.1; 6.1.2

Risk: 1.1.2; 1.1.3; 1.1.4; 2.1.1; 2.3.1; 3.1.2; 3.2.1; 3.2.2; 3.3.1; 3.3.3; 3.3.4; 3.4.1; 3.4.2; 4.2; 4.3; 4.4; 4.6; 5.1.3; 5.2.1; 5.3.1; 5.3.3

Software: 1.1.2; 1.1.4; 2.2.2; 3.1.2; 3.3.1; 3.3.2; 3.3.3; 3.3.4; 3.3.6; 3.3.7; 3.4.1; 3.4.2; 4.4; 4.5; 5.1.2; 5.1.4; 5.3.1

Systems Engineering: 3.3.1; 3.3.2; 3.5.2; 4.1; 4.2; 4.3; 4.4; 5.1.1; 5.2.1

System of Systems: 1.1.3; 1.1.4; 3.1.1; 3.5.1; 4.1; 4.5; 5.1.2

Technology Maturity: 3.1.2; 4.1; 4.2; 5.1.3; 5.2.1; 5.3.3

Test & Evaluation: 1.1.1; 1.1.2; 3.3.2; 3.5.1; 4.2; 4.5; 4.6; 5.2.1

Appendix 5
Statutory and Regulatory Information Requirements

The following tables contain the reporting requirements for all MDAP and MAIS programs that apply to the MS C decision. Status of these requirements should be annotated in pre-milestone assessments as pre-requisite for the Defense Acquisition Board (DAB) process, unless exception to the requirement is granted. This information was extracted from Enclosure 3 to DODI 5000.2, dated May 12, 2003 and is provided for its applicability to the Assessment Methodology for pre-MS C. Additional applicability of these requirements to other phases of the Acquisition Life Cycle may be obtained by referring to the referenced document.

Table 5: Statutory Information Requirements for Milestone C

Information Required	Applicable Statute
Consideration of Technology Issues	10 U.S.C. 2364, ref. (q)
CCA Compliance (All IT including NSS) (Ref. DODI 5000.2, Encl 4) (if equivalent to full-rate production)	40 U.S.C. Subtitle III, ref. (l) Sec. 8088, Public Law 107-248, ref. (t)
Registration of mission-critical and Mission-essential information systems (if program initiation, i.e. ships, or if equivalent to full-rate production)	Sec. 8088(a), Public Law 107-248, ref. (t)
Benefit Analysis and Determination (part of Acquisition Strategy) (if no MS B)	15 U.S.C. 644(e), ref. (s)
Programmatic Environment Safety and Occupational Health Evaluation (PESHE) (including National Environmental Policy Act)	42 U.S.C. 4321, ref. (x)
Spectrum Certification Compliance (applies to all systems/equipment that utilize the electromagnetic spectrum) (if no MS B)	47 U.S.C. 305, ref. (y); Public Law 102-538, 104, ref. (z); 47 U.S.C. 901-904, ref. (aa); DODD 4650.1, ref. (ab); OMB Circular A-11, Part 2, ref. (d)
Selected Acquisition Report (SAR) (MDAP only – end of Qtr. following MS C))	(10 U.S.C. 2432, ref. (ac)
Industrial Capabilities (part of Acquisition Strategy)	10 U.S.C. 2440, ref. (af)
Independent Cost Estimate (CAIG) and Manpower Estimate (MDAPS only)	10 U.S.C. 2434, ref. (ah)
Core Logistics Analysis/Source of Repair Analysis (part of Acquisition Strategy) (if no MS B)	10 U.S.C. 2460, ref. (aj) 10 U.S.C. 2464, ref. (ak) 10 U.S.C. 2466, ref. (al)
Competition Analysis (Depot-level Maintenance $3M rule) (part of Acquisition Strategy) (if no MS B)	10 U.S.C. 2469, ref. (am)
Technology Development Strategy (TDS)	Sec. 803, Public Law 107-314, ref. (an)
Acquisition Program Baseline (APB)	10 U.S.C. 2435, ref. (ao)
Cooperative Opportunities (part of Acquisition Strategy)	10 U.S.C. 2350a, ref. (ap)
Clinger-Cohen Act Certification (MAIS only)	Sec. 8088, Public Law 107-248, ref. (t)
Financial Management Enterprise Architecture Certification (MAIS only)	Sec. 8088, Public Law 107-248, ref. (t)

Table 6: Regulatory Information Requirements

Information Required	Source
Initial Capabilities Document (ICD) (if program initiation)	CJCSI 3170.01, ref. (g)
Capability Production Document (CPD)	CJCSI 3170.01, ref. (g)
Acquisition Strategy	DODI 5000.2
Analysis of Alternatives (AoA) (updated as necessary)	DODI 5000.2
System Threat Assessment (validated by DIA for ACAT 1D programs)	DODD 5105.21, ref. (aq)
Technology Readiness Assessment (TRA)	DODI 5000.2
Independent Technology Assessment (ACAT 1D only) (if req'd by DUSD (S&T)	DODI 5000.2
Command, Control, Communications, Computers, and Intelligence Support Plan (C4ISP) (also summarized in Acquisition Strategy)	DODI 4630.8: DODD 4630.5, refs. (ar) and (as)
Affordability Assessment	DODI 5000.2
Component Cost Analysis (mandatory for MAIS; as requested for MDAP)	DODI 5000.2
Cost Analysis Requirements Description (CARD)	DODI 5000.2
Test and Evaluation Master Plan (TEMP) (update if necessary	DODI 5000.2
Operational Test Agency Report of OT&E results (as applicable)	DODI 5000.2
Program Protection Plan (PPP) (for programs with critical technology information) (includes Anti-Tamper Annex(also summarized in Acquisition Strategy)	DODD 5200.39, ref. (au)
Exit Criteria	DODI 5000.2
DAES Summary	DODI 5000.2
ADM	DODI 5000.2

Appendix 6
Glossary

AOA……………………………………………………………………..Analysis of Alternatives
BIT……………………………………………………………………………..Built In Test
CAD/CAM…………………………Computer-Aided Design/Computer-Aided Manufacturing
CPD…………………………………………………………..……Capability Production Document
CDR……………………………………………………………………Concept Design Review
COTS………………………………………………………………..…Commercial Off The Shelf
CPIPT……………………………………………………………………...Cost Performance IPT
DCMA...Defense Contract Management Agency
DMS……………………………………………………Diminished Manufacturing Sources
DoD…………………………………………………………………...Department of Defense
EVMS……………………………………………….Earned Value Management System
FRACAS……………………………….. Reporting, Analysis, and Corrective Action System
GAO……………………………………………………………Government Accounting Office
GFE……………………………………………………..…Government Furnished Equipment
IMS……………………………………………………………Integrated Master Schedule
IPM………………………………………………………………….Integrated Master Plan
IPT…………………………………………………………………Integrated Product Team
IT………………………………………………………………………...Information Technology
JCIDS……………………………….Joint Capabilities Integration and Development System
KPP………………………………………………………………Key Performance Parameter
LCCE……………………………………………………………….…Life Cycle Cost Estimate
MIS…………………………………………………………….Management Information System
MOSA……………………………………….Modular Open Systems Approach/Architecture
O&S………………………………………………………………..…Operating And Support
OMB PART…………………………………..…………OMB Program Assessment Rating Tool
OMB……………………………………………………………..Office of Management and Budget
OSD……………………………………………………………...Office of the Secretary of Defense
OT&E……………………………………………………………..Operational Test and Evaluation
P3I………………………………………………………….…Preplanned Product Improvement
PM…………………………………………………………………………….Program Manager
SCS…………………………………………………………......System Capability Specifications
SDD……………System Description Documents/System Development and Demonstration
TPM…………………………………………………………… Technical Performance Measures
TRL…………………………………………………………………..Technology Readiness Level
WBS…………………………………………………………………..…Work Breakdown Structure