<table>
<thead>
<tr>
<th><strong>Lesson Number</strong></th>
<th>02</th>
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<tbody>
<tr>
<td><strong>Lesson Title</strong></td>
<td>SE Policies/Current Events</td>
</tr>
<tr>
<td><strong>Lesson Time</strong></td>
<td>1.5 hours</td>
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<tr>
<td><strong>Learning Objective</strong></td>
<td>Given an overview of the Defense Acquisition Process, the Requirements Generating Process, and the Budget Process, relate how these processes are reflected in the DoD 5000 series documents and how they influence DoD Systems Engineering across the acquisition life cycle</td>
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<tr>
<td><strong>Assignments</strong></td>
<td>Review the following ENG 202 course material:</td>
</tr>
<tr>
<td></td>
<td>• Lesson 02, Systems Engineering Policies</td>
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<tr>
<td><strong>Estimated Student Preparation Time</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td>Class participation</td>
</tr>
<tr>
<td><strong>Related Lessons</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Self-Study References</strong></td>
<td>Defense Acquisition Guidebook Chapter 3 (<a href="http://www.dau.edu">http://www.dau.edu</a>) DoDI 5000.02 (<a href="http://www.dau.edu">http://www.dau.edu</a>) CJCSI 5123.01</td>
</tr>
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</table>
Lesson 02
SE Policies/Current Events

Learning Objectives
(Lesson)

Relate how the Defense Acquisition Process, the Requirements Generating Process, and the Budget Process are reflected in the DoD 5000 series documents and how they influence DoD Systems Engineering across the acquisition life cycle.

- Identify the role of the major decision support systems (Defense Acquisition System, JCIDS, and PPBE) and their relationship to Systems Engineering (SE).
- Given current trend data on DoD acquisition cost, schedule and performance, identify how the current SE policies are attempting to reverse the negative trends.
- Identify the characteristics of the six acquisition pathways as described in the DoDI 5000.02 Adaptive Acquisition Framework
- Identify the purpose of the SE activities throughout the acquisition lifecycle as described in DAG Chapter 3.
**Learning Objectives**

**(Homework)**

Apply the processes for SE Design, Work Breakdown Structures (WBS), and Earned Value Management (EVM) development in a given DoD acquisition scenario to reduce technical risk.

- Describe the characteristics of effective technical communication.
- Given a Work Breakdown Structure (WBS) exercise, discuss how the WBS can be used to support DoD Risk Management processes.
- Given an acquisition scenario, use the "design" part of the SE Technical Processes to demonstrate how to flow-down a product requirement through the Requirements Analysis and Architectural Design steps.
- Given a manufacturing scenario, explain how DoD Earned Value Management techniques of CPI and SPI are used to evaluate program status.

**Lesson 02 Recommended Reading**

- Operation of the Adaptive Acquisition Framework
  - DoDI 5000.02 and DoDI 5000.02T ("Transitional")
  - DoD 5000 Series Acquisition Policy Transformation Handbook
- Systems Engineering (SE)
  - DAG Chapter 3
- Planning, Programming, Budgeting, and Execution (PPBE) Process
  - DoDD 7045.14
- Joint Capabilities Integration and Development System (JCIDS)
  - CJCSI 5123.01H
The Defense Acquisition System (DAS)

As per the DAG: The management process by which the Department acquires weapon systems, automated information systems, and services.


The next few charts were taken from the Performance of the Defense Acquisition System 2016 Annual Report to demonstrate DoD acquisition performance trends in recent years as viewed by Congressional/DoD Leadership. These trends have been a key driver in recent DoD policy transformations.
Cumulative Growth Over Original MS B MDAP Planned Total RDT&E Funding (CY 1997–2015)

System Beyond Low Rate Initial Production (BLRIP) Operational Test (OT) Ratings DoD-Wide (FY 1984–2016Q1)
FY17 National Defense Authorization Act (NDAA) Changes

- **Effective February 2018:**
  - The position of Undersecretary of Defense for Acquisition, Technology, and Logistics (USD AT&L) was eliminated.
  - The position of Undersecretary of Defense for Research and Engineering (USD R&E) was established with precedence immediately below Deputy Secretary of Defense.
  - The position of Undersecretary of Defense for Acquisition and Sustainment (USD A&S) was established to set Acquisition Policy and act as oversight (Milestone Decision Authority) for DoD Acquisition Programs.
  - Specific organization beneath each of the new USDs was left to the DoD to recommend and implement by Feb 2018 including appropriate assignments of Deputy Assistant Secretaries.

Secretary of Defense (SECDEF) and the Office of the Secretary of Defense (OSD)

**OSD Oversight of Defense Agencies/DoD Field Activities**

SECDEF is the principal defense policy advisor to the President, and exercises authority, direction, and control over the Department of Defense.
Under Secretary of Defense for Acquisition and Sustainment (USD(A&S))

Responsible to the Secretary of Defense for all matters pertaining to acquisition; contract administration; logistics and materiel readiness; installations and environment; operational energy; chemical, biological, and nuclear weapons; the acquisition workforce; and the defense industrial base.

Under Secretary of Defense for Research and Engineering (USD(R&E))

Department’s Chief Technology Officer, and is responsible for the research, development, and prototyping activities across the DoD enterprise and is mandated with ensuring technological superiority for the Department of Defense.
Defense Acquisition System Policy Changes in 2020

- **DoD Directive 5000.01, “The Defense Acquisition System”**
  - The overarching policies and responsibilities of key executives in the Defense Acquisition System.
  - Most recent version: May 2003 with updates pending early 2020.

- **DoD Instruction 5000.02, “Operation of the Adaptive Acquisition Framework” released 23 Jan 2020**
  - Adaptive Acquisition Framework (AAF) provides six acquisition pathways with more details discussed in separate instructions:
    - Urgent Capability Acquisition
    - Middle Tier of Acquisition
    - Major Capability Acquisition
    - Software Acquisition
    - Defense Business Systems
    - Acquisition of Services
  - Will eventually cancel in its entirely the prior DoDI 5000.02; that version has been renumbered DoDI 5000.02T (Transition) Change 6 of 23 Jan 2020 to establish a distinction between the two issuances.

Defense Acquisition System Policy Changes in 2020 (cont’d)

- Tenets of the 2020 DoDI 5000 series acquisition policy transformation:
  - Simplifying Acquisition Policy
  - Tailoring Acquisition Approaches
  - Empowering Program Managers
  - Conducting Data Driven Analysis
  - Actively Managing Risk
  - Emphasizing Sustainment

Enabling innovative acquisition approaches that deliver warfighting capability at the speed of relevance.
Adaptive Acquisition Framework Policy Flowdown

**DOD 5000.01: The Defense Acquisition System**
Updated to outline the overarching policies and responsibilities of key executives.

**DOD 5000.02: Operation of the Adaptive Acquisition Framework**
Outlines the six pathways of the Adaptive Acquisition Framework.

**DODIs for Each Acquisition Pathway**
- Urgent Capability Acquisition (DoDI 5000.81)
- Major Capability Acquisition (DoDI Pending)
- Middle Tier of Acquisition (DoDI 5000.80)

**DODIs for Each Functional Area**
- Engineering
- T&E
- Cybersecurity
- AoAs
- Cost Est
- IP
- Program Protection
- HSI
- Acquisition Intelligence
- IT

* Interim policy as of Jan 9, 2020

2020 DoDI 5000.02 Adaptive Acquisition Framework Pathways

Interactive Adaptive Acquisition Framework Tool on DAU Tools
• Program managers may select and tailor **one or more** acquisition pathways to acquire and deliver capabilities.
  - Part of acquisition strategy for decision authority approval.

• Programs may **transition** to other pathways as needed.

• **Tailor** acquisition processes, documents, and reviews to enable speed, agility, and innovation.
  - Statutory (law) requirements must be met, whereas DoD and Service level policies may be tailored upon approval.

Note: For the purposes of this course, focus of the content and exercises will primarily be on the Major Capability Acquisition pathway with some additional coverage on Urgent Capability Acquisition and Software Acquisition.

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**Urgent Capability Acquisition Pathway**

- **DoDI 5000.81 “Urgent Capability Acquisition”**
  - Estimated cost below MDAP thresholds.
  - Processes, reviews, and documents are aggressively streamlined.
  - Planning in a few weeks; development and production in months.
  - Joint Urgent Operational Needs (JUONs) for example.

To field capabilities to fulfill urgent existing and/or emerging operational needs or quick reactions in less than 2 years.
Middle Tier of Acquisition Pathway

Rapid Prototyping

To rapidly develop “fieldable” prototypes to demonstrate new capabilities (≤ 5 years).

Rapid Fielding

To rapidly field production quantities of systems with proven technologies that require minimal development (≤ 5 years).

Middle Tier of Acquisition Pathway (cont’d)

- **DoDI 5000.80 “Operation of the Middle Tier of Acquisition (MTA)”**
  - Section 804 of the FY 2016 NDAA (Public Law 114-92) provides authority to the DoD to rapidly prototype and/or rapidly field capabilities under a new pathway, distinct from the traditional acquisition system. The Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) provided authority to the DoD Components to implement this policy in April 2018.
  - Under the Middle Tier of Acquisition (MTA), programs are not subject to the JCIDS manual and DoD 5000 series except to the extent specifically provided in the implementing guidance.
  - “Bridges the gap” between Urgent Capability Acquisition (≤ 2 years) and Major Capability Acquisition (see next slide).
  - Services have implemented their own MTA guidance; Program Manager (PM) reports directly to Service Acquisition Executive (SAE).
Middle Tier of What?

<table>
<thead>
<tr>
<th>Instruction</th>
<th>DODI 5000.81</th>
<th>DoDI 5000.80 Middle Tier of Acquisition (MTA)</th>
<th>DODI 5000.02T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Urgent Capability Acquisition</td>
<td>MTA Rapid Prototyping</td>
<td>MTA Rapid Fielding</td>
</tr>
<tr>
<td>Technology</td>
<td>-</td>
<td>Innovative</td>
<td>Proven</td>
</tr>
<tr>
<td>Requirement</td>
<td>Validated UON</td>
<td>Exempt from JCIDS</td>
<td>Exempt from JCIDS</td>
</tr>
<tr>
<td>Timeline</td>
<td>Field ≤ 2 years</td>
<td>Field prototype ≤ 5 years</td>
<td>Start production ≤ 6 months; Complete fielding ≤ 5 years</td>
</tr>
<tr>
<td>Other</td>
<td>Below ACAT I and IA</td>
<td>Not subject to DoDD 5000.01, PM reports to SAE</td>
<td>Not subject to DoDD 5000.01; PM reports to SAE</td>
</tr>
</tbody>
</table>

MTA “Bridges the gap” between Urgent Capability Acquisition (≤ 2 years) and Traditional Acquisition (i.e. Major Capability Acquisition).

Major Capability Acquisition Pathway

To acquire and modernize military unique programs that provide enduring capability.
Major Capability Acquisition Pathway (cont’d)

• DoDI 5000.02T “Major Capability Acquisition”
  - Based on a highly structured and methodical analysis, design, development, integration, test, evaluation, production, and support approach.
  - Supports Major Defense Acquisition Programs (MDAPs), major systems, and complex acquisitions.
  - Processes, reviews, and documentation will be tailored based on the program size, complexity, risk, urgency, and other factors.
  - Intended for “Large-Scale Traditional Hardware Acquisitions”.
    • Software intensive components may be acquired via the software acquisition pathway, with the outputs and dependencies integrated with the overall major capability pathway.
  - Phase and milestone nomenclature remains the same as in recent DoDI 5000.02 versions.

Software Acquisition Pathway

• “Software Acquisition Pathway Interim Policy and Procedures” Memo USD(A&S) Jan 2020
  - Integrates modern software development practices such as Agile, DevSecOps (Development, Security, and Operations), and Lean.
  - Active user engagement and leveraging enterprise services.
  - Working software is rapidly, iteratively delivered to meet the highest priority user needs.
  - Leverage automated tools for development, integration, testing, and certification.
Defense Business Systems Pathway

- **DoDI 5000.75 “Defense Business Systems”**
  - Assesses the business environment, identify existing commercial or government solutions.
  - Review and revise DoD business processes to align more closely with IT best practices.
  - Minimal customization of a selected IT solution.

Acquisition of Services Pathway

- **DoDI 5000.74 “Acquisition of Services”**
  - Identify the required services.
  - Research the potential contractors.
  - Contract for the services.
  - Manage performance.
Acquisition Roles and Responsibilities

- **USD(A&S) is the Milestone Decision Authority (MDA) for the Materiel Development Decision (MDD), Milestone A, Request for Proposal (RFP) release for Engineering and Manufacturing Development (EMD) phase of the program, Milestone B, and Milestone C.**

- **USD(A&S) will publish all Middle Tier of Acquisition (MTA) policy, to include Middle Tier Prototyping policy and Middle Tier Fielding policy. This policy only applies to prototypes for acquisition programs. USD(R&E) will maintain authority over early development prototyping policy outside of MTA.**

- **Director Operational Test & Evaluation (DOT&E) approves the operational testing and evaluation in the Test and Evaluation Master Plan (TEMP), and USD(R&E) approves the developmental testing and evaluation in the TEMP.**


Independent Technical Risk Assessments (ITRAs)

- **Independent Technical Risk Assessments (ITRAs) will be conducted on all Major Defense Acquisition Programs (MDAPs) prior to Milestone A, Milestone B approval, and any decision to enter into low-rate initial production or full-rate production.**
  
  — Use *ITRA Framework for Risk Categorization*, USD(R&E), June 2018.

- **The ITRA will consider the full spectrum of Technology, Engineering and Integration risk and the potential impacts to cost, schedule and performance. ITRAs provide a view of program technical risk, independent of the program or Component.**

- **USD(R&E) will conduct or approve ITRAs for ACAT 1D programs. This responsibility may be delegated.**

- **The Military Departments will conduct ITRAs consistent with USD(R&E) guidance for ACAT IB/IC programs. The (USD)R&E will approve the Military Departments' ITRAs (the number of Military Department ITRAs that (USD)R&E reviews will be at the USD(R&E)'s discretion).**

- **For non-MDAP programs, ITRAs are not required by statute, but if the Military Departments conduct an ITRA, they are to follow the USD(R&E)-published ITRA policy.**

General Overview of the Planning, Programming, Budgeting, and Execution (PPBE) Process

As per the DAG: The Department’s strategic planning, program development, and resource determination process.

Planning, Programming, Budgeting, and Execution (PPBE)

- Planning, Programming, Budgeting, and Execution (PPBE) is the primary vehicle for identifying mission requirements and translating them into the budget and personnel resources required to accomplish a mission.
  - Through the evaluation of alternatives, PPBE ensures that the highest priority requirements are funded.
PPBE Phases

- **Planning**
  - Assess capabilities / review threat
  - Develop guidance
- **Programming**
  - Turn guidance into affordable packages
  - 5-year program (Future Years Defense Program, FYDP)
- **Budgeting**
  - Prepare defensible budget
  - Scrub budget years
  - Test for efficient funds execution
- **Execution**
  - Develop performance metrics
  - Assess actual output vs. planned performance
  - Adjust resources to achieve desired performance goals

Program Objective Memorandum (POM)

- Programming begins with the development of a POM by each DoD Component. The goal is to construct a balanced set of programs responding to priorities of the Joint Programming Guidance within fiscal constraints.

- When completed, the POM provides a fairly detailed, comprehensive description of proposed programs, including a time-phased allocation of resources (forces, funding, and manpower) by program, projected five years into the future.

- The DoD Component may also describe important programs not fully funded (or not funded at all) in the POM, and may assess the risks associated with the shortfalls.

- Thorough phase-by-phase process reviews ensure that major issues (mission-readiness, quality-of-life for military personnel, modernization, administration priorities, and legislative initiatives) have been addressed within the constraints of total DoD resources.
General Overview of the Joint Capabilities Integration Development System (JCIDS)

As per the DAG: The systematic method to support the Joint Requirements Oversight Council (JROC) and Chairman of the Joint Chiefs of Staff (CJCS) responsibilities in identifying, assessing, validating, and prioritizing Joint military capability requirements.

Where Do Requirements Come From?

Who Identifies the Requirement?

It is important to understand who identifies the requirements so that you can understand the nature of the requirement. The two most prominent sources for identification are sponsors and policy makers.

**Sponsors**

Sponsors are either the warfighter or a sponsor organization that represents the warfighter, sometimes referred to as "users" or "user sponsors":

- Combatant Commands (CCMDs)
- Military Services or Defense Agencies

**Policy Makers**

Policy makers base requirements on perceived future needs. The policy makers can be within the:

- Office of the Secretary of Defense
- Joint Staff
- White House, or
- Congress
Summary of JCIDS August 2018
Major Changes

  - Cancels prior CJSCI 3170.01 series and absorbs content.
  - Updated Joint Requirements Oversight Council (JROC) functions.
  - Describes multiple entry points into JCIDS; urgent/emergent needs, deliberate planning needs, and insertion of a Science and Technology (S&T) prototype or other innovative approaches.

  - Reduces number of mandatory Key Performance Parameters (KPPs) from six to four.
  - Eliminates Capability Production Document (CPD) at Milestone C.
  - Modifies Initial Capabilities Document (ICD) and Capability Development Document (CDD) formats.

Key JCIDS Documents

• Initial Capabilities Document (ICD): Describes capability requirements in terms of operational attributes with appropriate qualitative parameters.
  - Supports Materiel Development Decision (MDD) prior to MSA phase
• Capability Development Document (CDD): Defines authoritative, measurable, testable parameters across one or more increments of a materiel solution. Defines Key Performance Parameters (KPPs), Key System Attributes (KSAs), and Other System Attributes (OSAs) (see following slides for JCIDS Manual definitions).
  - Draft (Component endorsed) due at Milestone A.
  - Validated and released prior to Development RFP Release Decision Point.
  - Updated as needed for Milestone C.
JCIDS Definitions

- **Key Performance Parameter (KPP)** - Performance attributes of a system considered critical or essential to the development of an effective military capability.

- **Key System Attribute (KSA)** - Performance attributes of a system considered important to achieving a balanced solution/approach to a system, but not critical enough to be designated a KPP.

- **Additional Performance Attribute (APA)** - Performance attributes of a system not important enough to be considered KPPs or KSAs, but still appropriate to include in the CDD.

Source: JCIDS Manual, Aug 2018

JCIDS Definitions (cont’d)

- **Threshold** - Performance below the threshold value is not operationally effective or suitable or may not provide an improvement over current capabilities.

- **Objective** - The objective values are applicable when a higher level of performance represents significant increase in operational utility. If applicable, desired operational goal achievable but at higher risk cost, schedule, and technology. Performance above objective does not justify additional expense.

- **Tradespace** - The difference between threshold and objective values sets trade space for balancing multiple performance attributes while remaining above the threshold values.

Source: JCIDS Manual, Aug 2018
Mandatory JCIDS Key Performance Parameters (KPPs)

Mandatory JCIDS KPPs (4):

- **Force Protection** – Ensure protection of occupants, users, or other personnel who may be adversely affected by the system or threats to the system.
- **System Survivability** – Promote the development of critical warfighter capabilities that can survive kinetic and non-kinetic threats across domains and applicable environments including space:
  - Kinetic: Traditional, Non-traditional, and Chemical, Biological, Radiological, and Nuclear (CBRN) (including Electromagnetic Pulse)
  - Non-Kinetic: Cyber and Electromagnetic Spectrum.
- **Sustainment** – Ensure an adequate quantity of the capability solution will be ready for tasking to support operational missions.
- **Energy** - Ensure combat capability of the force by balancing the energy performance of systems and the provisioning of energy to sustain systems/forces required by the operational commander under applicable threat environments.

*Note: As per the Aug 2018 JCIDS changes, Net-Ready and Training are no longer mandatory KPPs. Net-Ready is still required but can be addressed as a KPP, KSA, or APA depending on the system.*

Source: JCIDS Manual, Aug 2018

Navy Mandatory Cost/Schedule Parameters and KPPs

- **Key Cost Parameter**: Identify the appropriate procurement cost per unit (e.g. Average Procurement Unit Cost- APUC) to become threshold value. Objective value will be at least 5% below threshold value.
- **Key Schedule Parameter**: Threshold value shall be Initial Operational Capability (IOC) date. Objective value will be at least 6 months earlier.
- **Space, Weight, Power, and Cooling (SWaP-C) Margins KPP**: Defined as a KPP for platforms which will carry payloads. The amount of margin available in a platform will be defined in terms such as cubic or square feet, center of gravity, tons, megawatts, and British Thermal Units.

Reference: CNO Memo Ser. N00/100050 dated 11 August 2014
Statutory/Regulatory Definitions

- **Statutory Requirement**: Statutory refers to laws passed by the federal government.

- **Regulatory Requirement**: Regulatory refers to a rules issued by a government agency to manage their workforce.

- DoDI 5000.02T, Enclosure 1 lists the Statutory and Regulatory requirements in Table 2. Milestone and Phase Information Requirements.

- DAU Milestone Document Identification (MDID) Tool available at https://www.dau.edu/mdid/Pages/Default.aspx

Lesson Artifacts

- **Student Book**: Two student homework worksheets
  
  Homework Areas:
  - Technical Design Processes
  - WBS/EVM

- **Exercise & Artifact Book**: Technical Review Summary extract from DAG
Lesson 02

Student Homework
ENG-202 Student Homework Worksheets

The Student Participation Worksheets are being used to allow discussion of SE topics not highlighted in-depth in the normal lessons but still relevant to the course. The topics will be presented as a problem exercise for homework and discussed the next morning. Emphasis on the morning worksheet reviews will be heavy on participation in discussing the topics and not necessarily the textbook solution. The following worksheet areas shall be discussed in this order:

Homework Worksheet 1: Technical Design Processes
Homework Worksheet 2: WBS/EVM

The ENG-202 Student CD provides good references for the various topics covered.
Technical Design Processes
(Ref: Lesson 1 SE Processes / DAG)

PURPOSE: This exercise is to serve as a catalyst for an open discussion on Technical Design Processes within the Systems Engineering Life Cycle.

ASSIGNMENT: Read the User Requirement and use it to initiate the Design Process.

User Requirement: The Bull Dog UGV shall be capable of being transported to the forward area. It shall be capable of patrolling 25 – 30 km per day. It shall be capable of identifying and targeting enemy forces. Bull Dog UGV shall communicate Line-Of-Sight (LOS) with the Firebird UAV with 98% interoperability.

1. Identify the Bull Dog functions from the above User Requirement. If stated, indicate how well the function must be performed.

<table>
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<tr>
<th>BULL DOG FUNCTION</th>
<th>HOW WELL</th>
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<td>5.</td>
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2. Decompose the “communicate” function to the next lower level. Use more blocks, as required.

   COMMUNICATE

   □ □ □ □ □

3. Identify design solutions (a physical architecture) for the lower level functions identified above (e.g. transmit).

   RADIO

   □ □ □ □ □
4. For the "communicate" function show how the physical components trace to the functions they perform. Physical components may have more than one function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Physical Components</th>
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5. Given the radio has a total weight allocation of 10 kgs, show a representative allocation of weight to the lower physical architecture. What other allocation could apply to the physical architecture besides weight?
Purpose: This exercise is to serve as a catalyst for an open discussion on the Work Breakdown Structure (WBS), its relation to the development process and documentation of the system architecture, and the importance of Earned Value Management (EVM) as a program management tool.

Assignment: Assume the Bull Dog program plans to upgrade the Communications, Engine, and Survivability areas. Use the provided Bull Dog WBS on the following page to help answer exercise questions 1 through 3. Use knowledge from previous coursework in EVM and EVM definitions provided to answer questions 4-5.

1. Identify where the Communications (an NDI upgrade), the Engine (a COTS upgrade), and the Survivability (a Science & Technology upgrade from Lincoln Labs) are located on the WBS. Will any of the Communications, Engine, and Survivability upgrades possibly affect any of the other WBS elements? Explain.

2. Identify the functional types of personnel (e.g. Electrical Engineer, Tester) you will need for the Communications, Engine, and Survivability upgrades? Do you think the personnel skill mixes for these upgrades can overlap or may need to be changed over time? Explain.

3. When would you need information below WBS Level 3 to manage this program? Explain.
4. Who is responsible for EVM in the Program Office? Why is EVM important to the SE process?

5. For each of the following sets of EVM data from the contractor for the Bull Dog subsystem upgrade effort answer the following:

   What does the EVM data indicate at this point in time? What recommendations might you have if the EVM data indicates negative trends?

1. CPI = 1.3, SPI = 1.4
2. CPI = 0.8, SPI = 1.2
3. CPI = 1.4, SPI = 0.9
4. CPI = 0.8, SPI = 0.7

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**EVM Definitions**

- **Budgeted Cost for Work Scheduled (BCWS)** is value of work planned to be accomplished = Planned Value.
- **Budgeted Cost for Work Performed (BCWP)** is value of work accomplished = Earned Value.
- **Actual Cost of Work Performed (ACWP)** is cost of work accomplished = Actual Cost.
- **Estimate At Completion (EAC)** is estimate of total cost for total contract through any given level; may be generated by contractor, PMO, DCMA, etc. = EAC<sub>est/PMO/DMCA</sub>
- **Variance** ("+" favorable; "-" unfavorable):
  - Cost Variance (CV) = BCWP – ACWP
  - Schedule Variance (SV) = BCWP – BCWS
- **Efficiencies** (Favorable is > 1.0; Unfavorable is < 1.0):
  - Cost Performance Index (CPI) = BCWP/ACWP
  - Schedule Performance Index (SPI) = BCWP/BCWS