PM’s are required by DoDI 5000.02 to develop systems and platforms that are interoperable and to coordinate family-of-system testing

- Developing DoDAF products early in the acquisition phases supports cost estimation, design, interoperability and test

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**DoDI 5000.02**

**ENCLOSURE 2**

6. ENGINEERING AND MANUFACTURING DEVELOPMENT (EMD) PHASE

(Statutes applicable to the Systems Development and Demonstration Phase shall be applicable to the EMD phase.)

**a. Purpose.** The purpose of the EMD Phase is to develop a system or an increment of capability; complete full system integration (technology risk reduction occurs during Technology Development); develop an affordable and executable manufacturing process; ensure operational supportability with particular attention to minimizing the logistics footprint; implement human systems integration (HSI); design for producibility; ensure affordability; protect CPI by implementing appropriate techniques such as anti-tamper; and demonstrate system integration, interoperability, safety, and utility. The CDD, Acquisition Strategy, SEP, and Test and Evaluation Master Plan (TEMP) shall guide this effort.

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**DoDI 5000.02**

**ENCLOSURE 6: INTEGRATED T&E**

1. OVERVIEW

a. The fundamental purpose of T&E is to provide knowledge to assist in managing the risks involved in developing, producing, operating, and sustaining systems and capabilities. T&E measures progress in both system and capability development. T&E provides knowledge of system capabilities and limitations to the acquisition community for use in improving the system performance, and the user community for optimizing system use in operations. T&E expertise must be brought to bear at the beginning of the system life cycle to provide earlier learning about the strengths and weaknesses of the system under development. The goal is early identification of technical, operational, and system deficiencies, so that appropriate and timely corrective actions can be developed prior to fielding the system.

b. The PM, in concert with the user and the T&E community, shall coordinate DT&E, OT&E, LFT&E, family-of-systems interoperability testing, information assurance testing, and modeling and simulation (M&S) activities, into an efficient continuum, closely integrated with requirements definition and systems design and development. The T&E strategy shall provide information about risk and risk mitigation, provide empirical data to validate models and simulations, evaluate technical performance and system maturity, and determine whether systems are operationally effective, suitable, and survivable against the threat detailed in the STAR or STA. The T&E strategy shall also address development and assessment of the weapons support equipment during the EMD Phase, and into production, to ensure satisfactory test system measurement performance, calibration traceability and support, required diagnostics, and safety. Adequate time and resources shall be planned to support pre-test predictions and post-test reconciliation of models and test results, for all major test events. The PM, in concert with the user and the T&E community, shall provide safety releases (to include formal Environment, Safety, and Occupational Health (ESOH) risk acceptance in accordance with Section 6 of Enclosure 12) to the developmental and operational testers prior to any test using personnel.

c. The PM shall design DT&E objectives appropriate to each phase and milestone of an acquisition program. Testing shall be event-driven and monitored by the use of success criteria within each phase, OT&E entrance criteria, and other metrics designed to measure progress and support the decision process. The OTA and the PM shall collaboratively design OT&E objectives appropriate to each phase and milestone of a program, and these objectives shall be included in the TEMP. Completed IOT&E and completed LFT&E shall support a beyond-LRIP decision for ACAT I and II programs for conventional weapons systems designed for use in combat. For this purpose, OT&E shall require more than an OA that was based exclusively on computer modeling, simulation, or an analysis of system requirements, engineering proposals, design specifications, or any other information contained in program documents (sections 2399 and 2366 of Reference (k)).
PM’s are required by DoDI 5000.02 to develop systems and platforms that are interoperable and to coordinate family-of-system testing.

- Platform and System level architecture processes and products.
- User needs are defined in detail when the ISP is written post milestone B.

- Developing DoDAF products early in the acquisition phases supports cost estimation, design, interoperability and test.
- Mission Level Architectures meet this need.
Mission-Level Architectures Support Mission Performance

**LEGACY METHOD**

- **CDD / ORD**
  - OV-1

- **IPT**
  - Initial Discussions
  - Functional Reqs Document (FRD)
  - Mtg Notes

- **Requirements Clarification Mtg (SRR)**
  - Contract Award
  - Provided to Prime Contractor
  - Performance Spec
  - SOW

**INTEGRATED ARCHITECTURE METHOD**

- **CDD**
  - OV-1, AV-1

- **IPT**
  - Initial Discussions
  - Functional Reqs Document (FRD)
  - Mtg Notes

- **Requirements Clarification Mtg (SRR)**
  - Contract Award
  - Provided to Prime Contractor
  - Performance Spec
  - SOW
  - DoDAF

- **OV-2, OV-3, OV-4, OV-5/6, AV-2**
- **SV1, SV-4, SV-7, STDVs**

Further Discussions
Pre-Milestone ‘A’ Activities

- Broadly defined requirements prior to Milestone ‘A’ stifles detailed standards and integration.

- Operating in stovepipes with only snapshot viewpoints during the JCIDS process does not allow for clearly defined requirements integration early in the acquisition lifecycle.

- Integrated products and clearly defined requirements and standards:
  - Establish network standards
  - Enables greater discipline in requirements and standards development to meet future capability needs.
Mission-Based Testing

- COTF is incorporating DoDAF Architecture products at varying times over the acquisition timeline. Does not occur early enough in the timeline.
- Paying for the work of creating DoDAF products in multiple places within a program.
Multiple Communities – Same Data

- DoN communities often define common mission information with different viewpoints and separate approaches.

- DoN communities can leverage from a consistent mission information reference point.
  - Develop training in synchrony with systems functions
  - Define metrics for acquisition and testing
    - Measure systems and people performance to meet mission
Integrated Approach
Mission Thread Development
(What: Detailed Capability Requirement Definition)

Develop OPERATIONAL TEMPLATE for Each Mission Area Using OP Taskers
(What needs to happen)

Decompose OP Tasks to UNTL

Associate OP Tasks to JCA

UNTIL OPERATIONAL TEMPLATE
(What Needs to Happen for Each OP Task)

Start: Navy 20 Mission Areas

OPNAVINST C3501.2K
Naval Warfare Mission Areas

RDA Chief Systems Engineer
Mission Thread Development
(How: Complete Agnostic Capabilities Requirements Breakdown by Task)

RDA Chief Systems Engineer

Identify Operational Nodes needed to perform UNTL Tasks

Abstract Operational Performer OV-1

CONOPS

Decompose UNTL Tasks to User Activities

System Agnostic OV-5/6c

Common Operational Reference Point

OV-5 (Notional)

OV-5

COTF (MTBT)

Common Operational Reference Point

UNTL OPERATIONAL TEMPLATE

Nodal OV-1

Strike Platform
Sensor
Fires CC
Observer

Abstract Operational Performer OV-1

NTA 3.2 Attack Target
NTA 3.1.2 Select Target to Attack
NTA 3.1.1 Request Attack
NTA 3.2.2 Attack Enemy Land Targets
NTA 3.2.5 Conduct Tactical Combat Assessment
NTA 3.2.3 Conduct Fire Support
NTA 3.2.8.1 Organize Fire Support Assets
NTA 3.1.4 Develop Order to Fire
NTA 3.2.8.3 Conduct Platform and System for attack
NTA 3.2.10 Integrate Tactical Fires
NTA 3.1.1 Select Platform and System for attack

OV-5

AOA

EAC Mission-Level Engineering _ 13 April 2011
Mission Thread Development
(Who: Analysis of Agnostic View into Best System /Operator Solution Set)

INFORMATION ANALYSIS
- Kill Chain Analysis
- METL standards
- Conditions

AoA Complete

Fit for Purpose
OV-5/6c
Allows Use of
Best Practices

Common Operational Reference Point

Common Reference Point Enables Coordinated Analysis
Mission Thread Development
(Who: Clear System Functions/Operator Activities Definition)

SYSTEM ENGINEERING ANALYSIS
• Functional Decomposition
• DOTMLPF Solutions
• Gap Analysis

Common Operational Reference Point

Fit for Purpose
OV-5/6c

SV-4

Fit for Purpose
SV-4/10c

 Represents the complete solution:
System Functions with Operator Activities
Mission Thread Development
(Why: Community Integration)

**ACQUISITION**
- System Functional Decomposition
- Metrics for Performance Measurements

**TRAINING**
- Identifies Functions to be performed by Operators

**TESTING**
- Functional Decomposition
- Critical Operational Issues
- Metrics for Performance Measurements

Supporting all communities with a consistent reference point

Common Operational / System Reference Point

Fit for Purpose SV-4/10c
ASN(RD&A) CHSENG Challenges

Five Areas Influencing Mission-Level Architectures
ASN(RD&A) CHSENG Challenges

Five Areas Influencing Mission-Level Architectures

- Improve Mission Engineering Guidance Documents
- Metadata Structure Definition
- Mission-Level Safety Management
- Lead System Integrator
- Supporting SE Training at the Mission Level
Five Areas Influencing Mission-Level Architectures: Supporting SE Training at the Mission Level

- One of CHSENG’s observations of DoN System Engineers is the need for training in developing DoDAF architectures and thinking at the Mission Level

- Challenge:
  - Institutionalize the development and use of DoDAF architectures in all SYSCOM SE/TE policies and processes, early in the acquisition process
  - Support training in the use of DoDAF tools
Five Areas Influencing Mission-Level Architectures: Metadata Structure Definition

- Defining the metadata structure of the tasks in a mission thread so that the TASKS can be “discoverable” and re-used in multiple architectures

  Challenge:
  - Given the Naval Mission Essential Tasks, identify the attributes of the tasks and define the metadata for those attributes

  Example:
  NTA 2.2.1.2 TRACK CONTACTS:
  - Range: KM
  - Relative Bearing: degrees
  - Grid Bearing: degrees
  - Magnetic Bearing: degrees
  - Altitude: KM
  - Depth: KM, NM
  - Speed: km/hr, knots
Five Areas Influencing Mission-Level Architectures: Mission-Level Safety Management

- **Managing Safety at the Mission Level.** Current processes at the Platform and System level have unknowingly created safety issues at the Mission Level.

- **Challenge:**
  
  - A process is needed to assess Force Level safety risks in a Mission Level architecture. The goal would be to identify safety problems during the System Design and Development phase, not the Operational Test or Battleforce deployment phase.
Five Areas Influencing Mission-Level Architectures: Lead System Integrator

- Enable government engineers to take on the role of Lead System Integrators. ASN(RDA) CHSENG has a policy under development

- Challenge:
  - Support LSI policy development
  - Identify a process to grow LSIs and to evaluate process success
Five Areas Influencing Mission-Level Architectures: Improve Mission Engineering Guidance Documents


**Challenge:**

- These Guides are meant to be used together. Need to ensure that they are clear and complete enough for an SE to understand how to transition from platform level thinking to mission level thinking
- Need to ensure that the Guides are congruent with each other
Summary

- The value of architectures:
  - We resource individual systems/platforms, not capabilities, or missions
  - Mission area architectures provide for effective pre-MS A analysis
    - Systems requirements and mission-support requirements

- Mission area architectures
  - Developing system agnostic mission threads
    - Enables effective AoA analysis on DOTMLPF solutions
    - Prevents community bias from influencing solution
    - In a DON enterprise process, information can be entered once and used many times over by other agencies

- DON enterprise structure elements need to get in place
  - Coordinating with Joint Federation Working Group
  - Establishing a DON Metadata structure/database
QUESTIONS ?