Concept Development & Enterprise Architecting
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Agenda

• The Concept Development Challenge
• Ongoing Enterprise Architecture Efforts
• Lessons Learned
Early Decisions Impact Overall System Life Cycle Cost

Cumulative LCC

- Percent of Baseline LCC Incurred
- Percent of Baseline LCC Committed

Cost to Fix
100%

10000X

1000X

100X

50%

Cost to Identify & Resolve a Defect, and Incorporate Change

Adapted from Boeing study on ICBM Life Cycle Cost, 1973
**AF Vision for Systems Engineering**

- **Disciplined, repeatable processes** from JCIDS CBA (pre-ICD) to AoA that result in Concept Characterization and Technical Descriptions (CCTD)
  - Inform decision makers on technical feasibility of prospective concepts for materiel solutions
  - Initial integrated risk assessment addressing both operational and programmatic issues

- **Support realistic program formulation through application of early Systems Engineering**
  - Robust and disciplined up-front technical planning
  - Solid technical foundation for the future program
  - Reduce the chances of poorly planned concepts emerging from AoA with relatively high rankings

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**Clear, Actionable Policy & Process**
THE CHALLENGE
Filling the Space Between CBA and MDD

Currently little if any “Space” between ICD and MDD

DEMANDS APPLICATION OF EARLY SE
Using CCTD elements to support “Concept Maturity”

- CBA (DOTMLPF) – Concept Development (prospective materiel solutions)
- MDD
- User Need, Validated Rqmt
  - JCIDS outputs (if available)
  - Capability shortfall
  - Others
- Authorization to Proceed
  - Tradespace Characterization
  - Capability - Based Assessment
- CCTDs
  - Draft AoA Study Plan
  - Pre -AoA Report
- Release Approval
- Programmatic Analyses
- AoA Study Guidance
- Final Concepts Review
- Candidate Solution Sets Characterization
- Candidate Solution Sets Selection
- Concept Characterization Review
- Initial Concepts Review

ICD – Initial Capabilities Document
AFRB – Air Force Review Board
DOTMLPF – Doctrine, Organization, Training, Materiel, Leadership & Education, Personnel, Facilities
DCR – DOT_LP Change Recommendation
JROC / AFROC – Joint / Air Force Requirements Oversight Council
Concept Characterization and Technical Description (CCTD)

- Essentially the “concept spec” or initial technical baseline
- Evolves into the Technical Requirements Document / System Requirements Document (TRD / SRD)
- Principal Elements:
  1. Mission / Capability Need Statement / CONOPS
  2. Concept Overview
  3. Trade Space Definition / Characterization
  4. Studies, Analyses, Experiments
  5. Concept Characterization / Design
  6. Program Characterization
  7. Risk Assessment
  8. DOT_LPFImplications
  9. Conclusions (Capability Description; Traceability to Need Statement)

Annex A, Early Systems Engineering Guidebook, 31 March 09
For the ILCM Business Machine, How do we keep track of…

- Who is tinkering with the machine at any given time?
- What parts of the machine they are tinkering with?
- The interactions between tinkering of the various teams?
- The incremental changes implemented in the machine?
Layered Architectural Framework

USAF/DoD Oversight & Control Activities

Capability Planning, Acquisition & Sustainment, Technology Development Activities

Supporting Business Practices & Rules

Tools, Environments, Organizations, Language
ILCM Decision Framework Tool

 Capability Based Planning  Concept Development  Materiel Solution Analysis  Technology Development  Engineering & Manufacturing Development  Production and Deployment  Operations and Support

 Continuous Capability Planning
 Technology Development
 Life Cycle Management (Acquisition and Sustainment)

Concept Development Phase
3170/5000.02 Baseline

Program Management
DoD 5000.02

Enabling

Governing

Core

AOA Study Guidance

JROC

ICD

AOA Study Preparation

Proposed AOA Study Guidance

MDD

ADM
Concept Development Phase
AFMC/AFSPC DP, D&SWS CCP Additions

- CBP
  - Concept Development
    - JROC
    - SEP
    - MAJCOM Materiel Analysis
  - ICD

- MSA
  - MDD

- Governing
  - JROC
  - SEP
  - MDD

- Enabling
  - Program Management
    - DP Guide
    - DoDI 5000.02
    - CCP Guide

- Core
  - AOA Study Preparation
  - Proposed AOA Study Guidance
ILCM Tool – Process Improvement
Change Visibility

CBP

Concept Development

MSA

Governing

Core

Enabling

Program Management

Systems Engineering

Analysis

JROC

SEP

CSSS

CSR

CAR

MDD

MAJCOM Materiel Analysis

Trade Space Char.

Candidate Solution Char

AOA Study Preparation

Programmatic Analysis

AOA Study Guidance

CCTD

Proposed AOA Study Guidance

Concept Devel Report

Con EP

AOA Study Guidance

ADM

ICD

DP Guide

DoDI 5000.02

CCP Guide

AQ MDD MEMO

Early SE Guide

Early SE Guide
Roadmap of AFMC Initiatives Transforming Processes View

See everything going on and planned

Roadmap of AFMC Initiatives Transforming Processes

Pre-MDD
- Process_0
- Process_1
- Process_2
  - Initiative_1
  - Initiative_2

Materiel Solution Analysis
- Process_3
  - Initiative_3

Technology Development
- Process_4

Engineering & Manufacturing Development
Production & Deployment
Operations & Support
Lessons Learned Along the Way

• Single AF leadership vision is essential
• Development Planning efforts ongoing at Materiel Enterprise level -- CCTDs must “feed” these processes
• Engagement with MDA and D,CAPE is necessary to scope technical analysis expectations and efforts for each prospective program prior to its MDD
• Ease of tool use essential for business process management (web based, intuitive)
• We need an environment to develop collaborative solutions (user/materiel team/cost/others)

Architecture is the Critical Underpinning
QUESTIONS?