

Kickoff Meeting
NDIA SE Division
Mission Engineering Initiative

March 2, 2018



Agenda – March 2 Kickoff



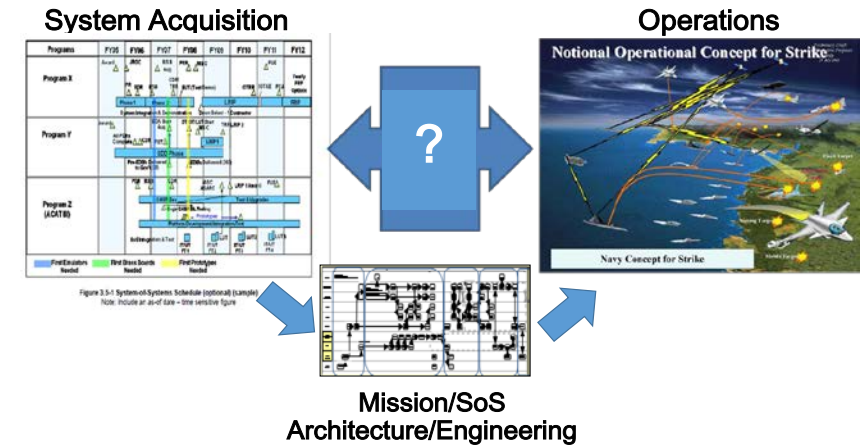
- 1:00 Welcome and introductions**
- 1:15 Motivation for Mission Engineering initiative and proposed way ahead**
- 1:30 Presentation from Rob Gold on current DoD direction of Mission Integration Management and Mission Engineering**
- 2:00 Open discussion on initiative goals and activities**

Systems of Systems (SoS) Committee

Mission Engineering (ME) Initiative



- Increasing attention to application of systems engineering to supporting operational mission capabilities
- Congressional direction to establish mission integration management (NDAA 855)
- Interest across the NDIA Systems Engineering Division in mission engineering (ME) and its implications
- SoS Committee will focus 2018 activities on ME, **welcomes engagement from other committees**



Mission Engineering is the deliberate planning, analyzing, organizing, and integrating of current and emerging operational and system capabilities to achieve desired warfighting mission effects

Systems of Systems (SoS) Committee ME Initiative - Proposed Way Ahead

- **Proposed goals**

- Develop a shared understanding of mission engineering: current practices, challenges and opportunities
- Define **the role** of industry in ME

- **Potential Activities**

- Presentations from current organizations on practice of ME
- Presentations on 2016 Industry Task Force on ME





Mission Integration Management NDAA 2017 Section 855

Mr. Robert Gold
Director, Engineering Enterprise
Office of the Deputy Assistant Secretary of Defense
for Systems Engineering

20th Annual NDIA Systems Engineering Conference
Springfield, VA | October 25, 2017

NDIA ME Conference
Oct 25, 2017 | Page 1Distribution Statement A - Approved for public release by DODPR, Case # 15-0-004 applies. Distribution is unlimited.



Mission Engineering is Underway By Components



Results: Service activities are focused on unique approaches and mission perspectives.

- Assess current mission capabilities as basis for analysis of shortfalls, options and recommended programming and budgeting changes (Navy I&I)
- Address integration during development (Army NIE/AWE)
- Early development planning to derive mission gaps and capability solutions (AF)
- Comprehensive, ongoing engineering and integration towards improved mission performance (Missile Defense Agency)

Hosted Roundtables
April - May 2016

NDIA ME Conference
October 24-27, 2016 | Page 6Distribution Statement A - Approved for public release by DODPR, Case # 17-0-0121 applies. Distribution is unlimited.



Industry Support to Mission Analysis and Mission Engineering

Preliminary Study Report - May 2016

NOTE: Not an official position from these organizations, but the study was coordinated through them.

Date: 18 May 2016 Unclassified | 1

Gold Presentation



Mission Integration Management NDAA 2017 Section 855

Mr. Robert Gold
Director, Engineering Enterprise
Office of the Deputy Assistant Secretary of Defense
for Systems Engineering

NDIA Systems of Systems Committee Meeting
March 2, 2108



NDAA FY17 Section 855 (1 of 3)

(National Defense Authorization Act for Fiscal Year 2017)



Mission Integration Management (MIM) Legislation

SEC. 855. MISSION INTEGRATION MANAGEMENT.

(a) **IN GENERAL.**—The Secretary of Defense shall establish mission integration management activities for each mission area specified in subsection (b).

(b) **COVERED MISSION AREAS.**—The mission areas specified in this subsection are mission areas that involve multiple Armed Forces and multiple programs and, at a minimum, include the following:

- (1) Close air support.
- (2) Air defense and offensive and defensive counter-air.
- (3) Interdiction.
- (4) Intelligence, surveillance, and reconnaissance.

(5) Any other overlapping mission area of significance, as jointly designated by the Deputy Secretary of Defense and the Vice Chairman of the Joint Chiefs of Staff for purposes of this subsection.

(c) **QUALIFICATIONS.**—Mission integration management activities shall be performed by qualified personnel from the acquisition and operational communities.

(d) **RESPONSIBILITIES.**—The mission integration management activities for a mission area under this section shall include—

(1) development of technical infrastructure for engineering, analysis, and test, including data, modeling, analytic tools, and simulations;

(2) the conduct of tests, demonstrations, exercises, and focused experiments for compelling challenges and opportunities;

(3) overseeing the implementation of section 2446c of title 10, United States Code;

(4) sponsoring and overseeing research on and development of (including tests and demonstrations) automated tools for composing systems of systems on demand;

(5) developing mission-based inputs for the requirements process, assessment of concepts, prototypes, design options, budgeting and resource allocation, and program and portfolio management; and

(6) coordinating with commanders of the combatant commands on the development of concepts of operation and operational plans.

**Four recommended mission areas
with options for additional areas**

Six 'Responsibility' areas

<https://www.congress.gov/114/crpt/hrpt840/CRPT-114hrpt840.pdf>



NDAA FY17 Section 855 (2 of 3)



(e) SCOPE.—The mission integration management activities for a mission area under this subsection shall extend to the supporting elements for the mission area, such as communications, command and control, electronic warfare, and intelligence.

(f) FUNDING.—There is authorized to be made available annually such amounts as the Secretary of Defense determines appropriate from the Rapid Prototyping Fund established under section 804(d) of the National Defense Authorization Act for Fiscal Year 2016 (Public Law 114–92; 10 U.S.C. 2302 note) for mission integration management activities listed in subsection (d).

(g) STRATEGY.—The Secretary of Defense shall submit to the congressional defense committees, at the same time as the budget for the Department of Defense for fiscal year 2018 is submitted to Congress pursuant to section 1105 of title 31, United States Code, a strategy for mission integration management, including a resourcing strategy for mission integration managers to carry out the responsibilities specified in this section.

855 Scope, Funding, and Strategy



NDAA FY17 Section 855 (3 of 3)



10 USC 2446c is

- Put in place by the Acquisition Agility Act (NDAA FY17 Sections 805-809)
- A tasking to acquisition programs to employ a Modular Open Systems Approach and Prototyping
- MIM responsibility (d)(3) in Section 855 regarding Management of Interfaces (e.g. overseeing implementation of Section 805)

“§ 2446c. Requirements relating to availability of major system interfaces and support for modular open system approach

“The Secretary of each military department shall—

“(1) coordinate with the other military departments, the defense agencies, defense and other private sector entities, national standards-setting organizations, and, when appropriate, with elements of the intelligence community with respect to the specification, identification, development, and maintenance of major system interfaces and standards for use in major system platforms, where practicable;

“(2) ensure that major system interfaces incorporate commercial standards and other widely supported consensus-based standards that are validated, published, and maintained by recognized standards organizations to the maximum extent practicable;

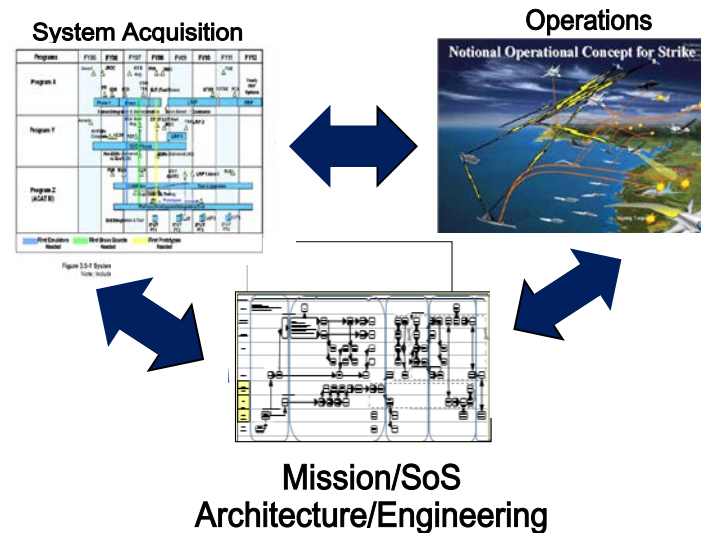
“(3) ensure that sufficient systems engineering and development expertise and resources are available to support the use of a modular open system approach in requirements development and acquisition program planning;

“(4) ensure that necessary planning, programming, and budgeting resources are provided to specify, identify, develop, and sustain the modular open system approach, associated major system interfaces, systems integration, and any additional program activities necessary to sustain innovation and interoperability; and

“(5) ensure that adequate training in the use of a modular open system approach is provided to members of the requirements and acquisition workforce.”.



Mission Engineering (ME)



Mission Engineering is the deliberate planning, analyzing, organizing, and integrating of current and emerging operational and system capabilities to achieve desired warfighting mission effects

- Mission engineering treats the end-to-end-mission as the 'system'
- Individual systems are components of the larger mission 'system'
- Systems engineering is applied to the systems of systems (SoS) supporting operational mission outcomes
- Mission engineering goes beyond data exchange among systems to address cross cutting functions, end to end control and trades across systems
- Technical trades exist at multiple levels; not just within individual systems or components
- Well-engineered composable mission architectures foster resilience, adaptability and rapid insertion of new technologies



Impacts of ME on the DoD Enterprise



- **Defines mission outcomes to identify and frame the correct problem**
- **Develops an accepted end state for mission success with defined mission success factors to drive the performance requirements for individual systems**
- **Aligns the affected stakeholders – Users, Operators, Acquirers, Testers, Sustainers – with the desired mission and capability outcomes**
- **Develops an assessment framework to measure progress toward mission accomplishment through end-to-end system integration of test & evaluation of mission threads**



ME Is Not the Same as SE



- **Meta-Functions exist across the SoS**
- **Situational Awareness and Command/Control are more complex due to multiple ways to accomplish mission – must evolve alongside military Concept of Operations (CONOPs)**
- **Technology issues aren't always obvious**
- **Resiliency and mission hardening requirements must be collectively assessed**
- **Testing will be expensive if not unaffordable**
- **Resource management techniques don't scale – Engineers, development/test facilities etc.**
- **Emergent behaviors difficult to anticipate or assess**
- **Synchronization of budgets and implementation is difficult at best**



Challenges Faced Today (1 of 2)



- **Limited corporate/leadership demand for ME**
- **Lack of integration of ME considerations and results into Systems Engineering Technical Reviews (SETRs), Milestone reviews, resourcing decisions**
- **Cost/benefit of conducting mission engineering and analysis**
- **Large scope and complexity of missions**
 - Cross multiple portfolios and organizations
 - Multiple complex, system interdependencies
- **Lack of dedicated ME resources (funding, people, tools, data)**
 - Availability and development of ME skills
 - Development of effective ME processes and practice
- **Methods, tools and data (next page)**



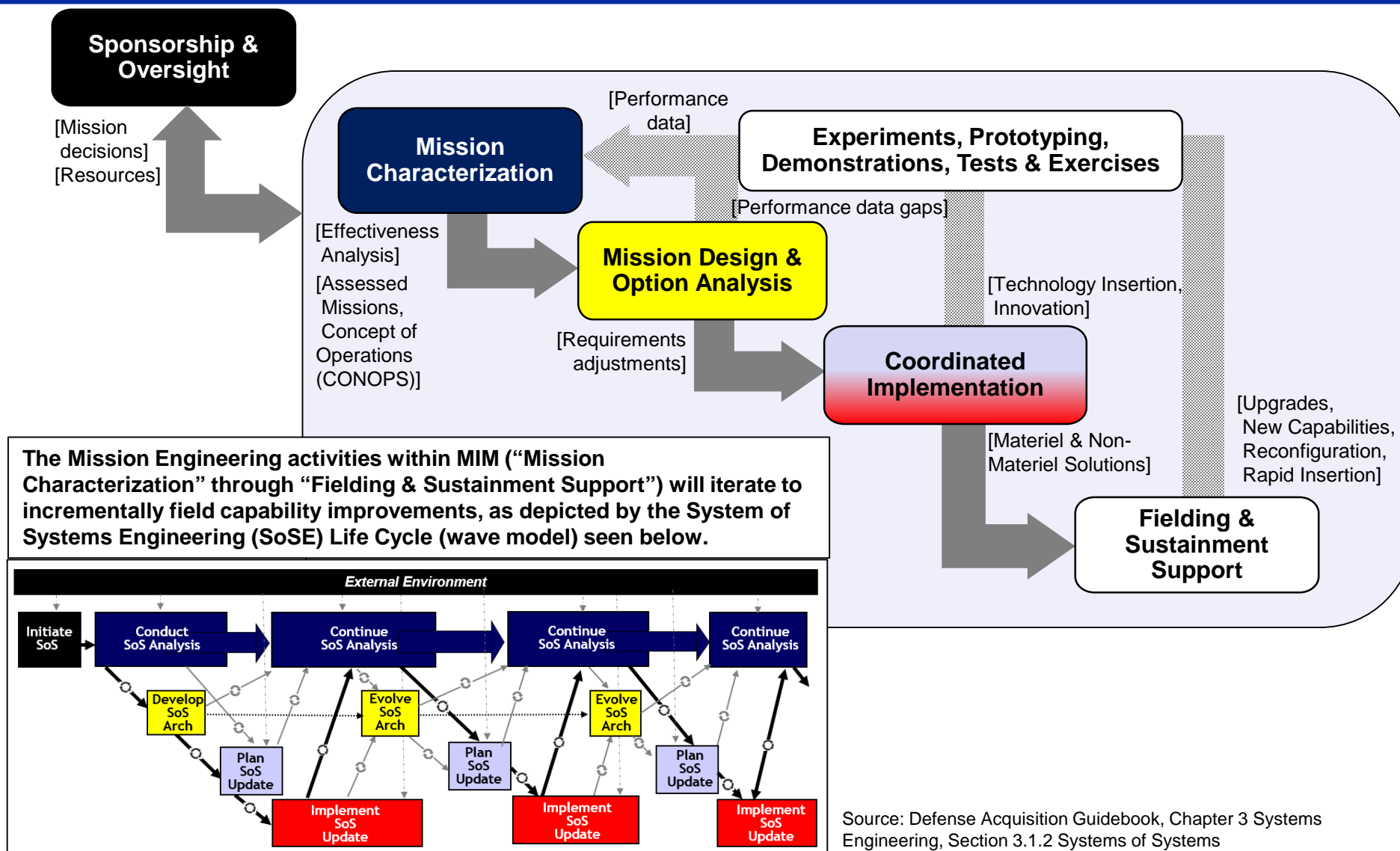
Challenges Faced Today (2 of 2)



- **Methods, tools and data**
 - Challenges of developing integrated analysis capabilities that bridge engineering and mission effects
 - Limits on the available analysis methods to address complexity and dynamics
 - Difficult to link changes in systems or SoS engineering models with impacts on missions in operational or mission simulations
 - Tools address only subset of issues, making complex analysis and engineering trades manpower intensive and time consuming, are difficult to use together
 - Need for data on missions, systems, interfaces, interactions and interdependencies
 - Very distributed, maintained in various forms by different organizations
 - Focus on specific system needs and don't address interdependencies and interactions
 - Even when available, can be hard to locate or access
 - Current system models are developed for different purposes which can challenge their effective use in addressing mission level issues



Key MIM Activities (1 of 2)



Source: Defense Acquisition Guidebook, Chapter 3 Systems Engineering, Section 3.1.2 Systems of Systems



Key MIM Activities (2 of 2)

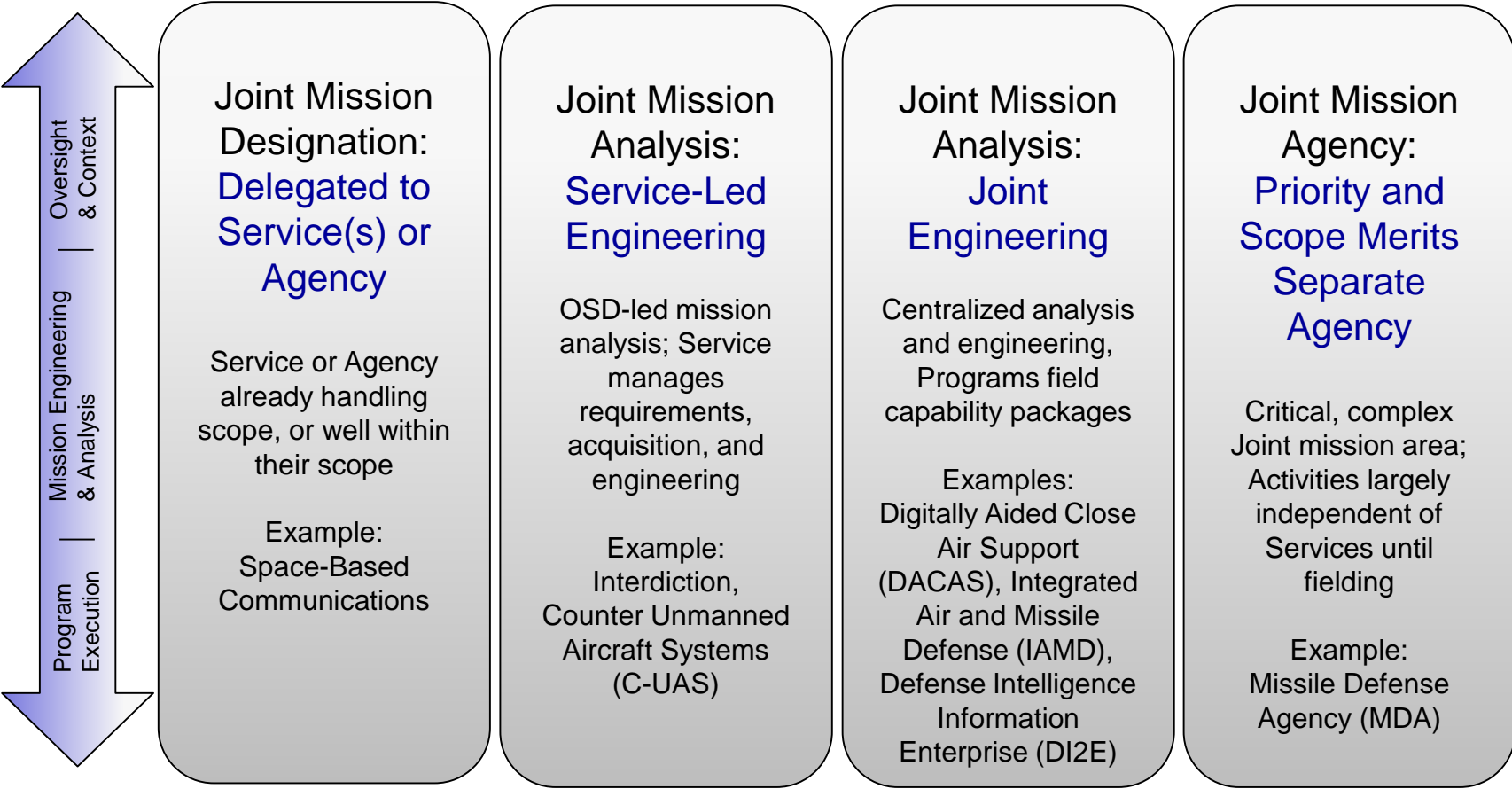


- **Sponsorship & Oversight**
 - Deputy Secretary of Defense/Vice Chair, Joint Chiefs of Staff (DEPSECDEF/VCJCS) prioritize Joint mission areas; USD(R&E) to coordinate prioritization and establish the approach, coordination, and resourcing for MIM
- **Mission Characterization**
 - Coordinate with Joint Staff (JS) to set Joint operational context, leverage Concept of Operations (CONOPS) Development & Operational Plans, develop mission based inputs and options for requirements process, prototypes, resources, and mission design.
 - Identify data needs to assess capability performance
- **Mission Design & Option Analysis**
 - Establish, with Services, technical infrastructure and engineering activities for Joint mission specific improvements, define Joint mission architectures, and coordinate with industry to include DARPA/Component Research Labs on gap-eliminating technologies
 - Review designs and configurations for modularity and establish Joint Configuration Control Board to address coordinated implementation priorities; Services develop prototypes and evaluate in mission context
- **Coordinated Implementation**
 - USD(R&E) and Services establish and synchronize opportunities for prototyping and technology insertion and testing mission improvements through operationally relevant tests and exercises
 - USD(A&S) and Services field coordinated packages of materiel and non-materiel changes to improve mission capabilities
- **Fielding & Sustainment Support**
 - MIM activities sustain mission capabilities while continuing to evaluate & assess, plan, design, and field future improvements
 - Mission gaps and opportunities are addressed through technology insertion, rapid reconfiguration, and legacy upgrades on new capability fielding



Joint Mission Governance Pattern Examples

MIM governance and activities will be tailored to the operational, technical, and organizational needs of the mission. The range of options include, but are not limited to:





Outcomes of ME and MIM



- **Planning, Programming, Budgeting, and Execution (PPBE) informed by gaps created by dis-investment decisions or unfunded mission critical components**
- **Cross-cutting capabilities performing as required or desired**
 - Development and engineering synchronized
 - Fielding expectations documented and promulgated
 - Sustaining activities prepared to support fielding
- **Stakeholders of capabilities are identified with greater potential to:**
 - Improve coordination of management actions
 - Resolve or avoid system conflicts
- **Opportunity for much greater and more effective savings when trades & analyses are performed at a mission or portfolio level**



Systems Engineering: Critical to Defense Acquisition



Defense Innovation Marketplace
<https://www.defenseinnovationmarketplace.mil>

DASD, Systems Engineering
<https://www.acq.osd.mil/se>



For Additional Information



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Discussion Topics



- **Are these the right goals for this initiative?**
 - Develop a **shared understanding** of mission engineering (ME): current practices, challenges and opportunities
 - Define **the role** of industry in ME
 - Product: Recommendations on industry contributions to ME (White Paper?)
 - Target audience?
- **Are these prospective activities a good way ahead?**
 - Presentation on 2016 Industry Task Force on ME
 - Presentations from current organizations on their practice of ME and the role of industry
 - What other topics should we be addressing? Other actions?
 - E.G. What capabilities will be needed for ME and how can industry contribute?
- **How do we engage the broader industry community?**
 - Partner with other organizations ? MORS, AIA, INCOSE?
 - Workshops at SE events? Interim results by October SE Conference?
- **Volunteers to form a core team for the initiative? Other opportunities to engage? Monthly reviews?**