Role of Industry in Mission Engineering

INCOSE 2019 International Workshop

System of Systems Working Group

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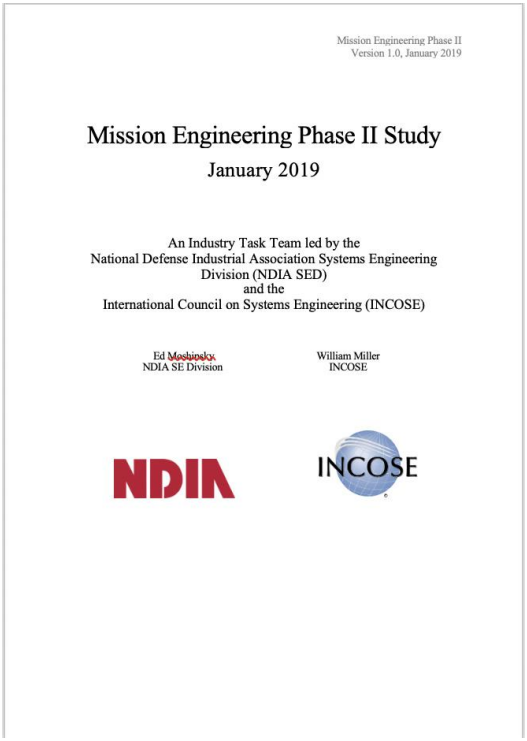
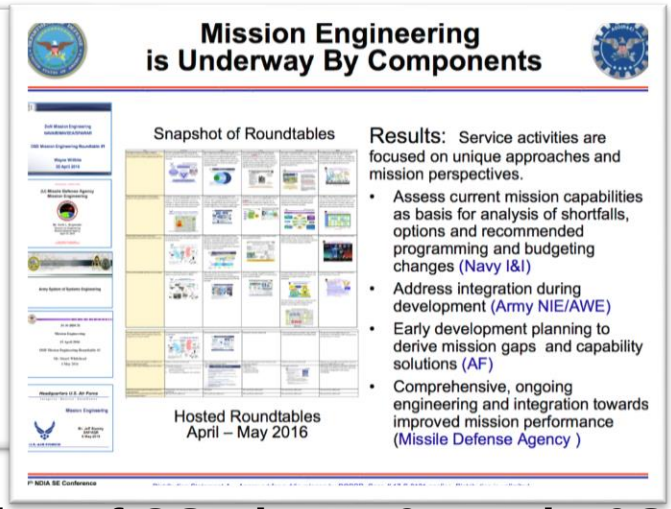


Bottom Line Up Front

- Systemic industry & government issues identified in 2011 report on development planning remain unresolved
- Context of missions is critical to industry role – calling for an engagement model among contractors and industry, especially in concepting and “devops”
- Industry has detailed knowledge of their constituent systems below the level of the technical baseline
- Leverage IR&D to support mission assurance
- Establish mechanisms for information sharing such as OTAs to deal with OCI issues
- Industry support Digital Engineering implementation
- Address both opportunities and risks for both industry and government
- Anticipate further questions including both new, original questions and refinements of questions addressed in this report

Context

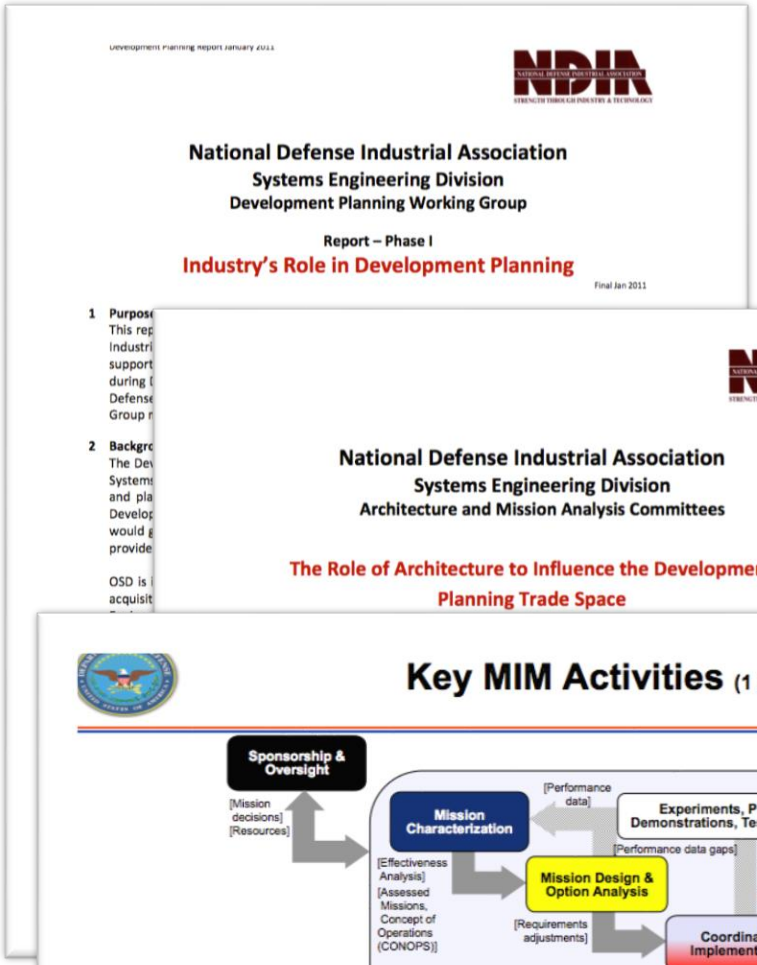
- **2009 WSARA – real or perceived OCI of non-SETA contractors**
- **2017 NDAA – mission engineering**



- **2018 Reorganization of OSD into R&E and A&S**
- **Undersecretary of Defense for R&E**
  - **Digital Engineering Strategy**
  - **Mission Engineering separate from Systems Engineering**

Foundational Work

NDIA



National Defense Industrial Association
Systems Engineering Division
Development Planning Working Group

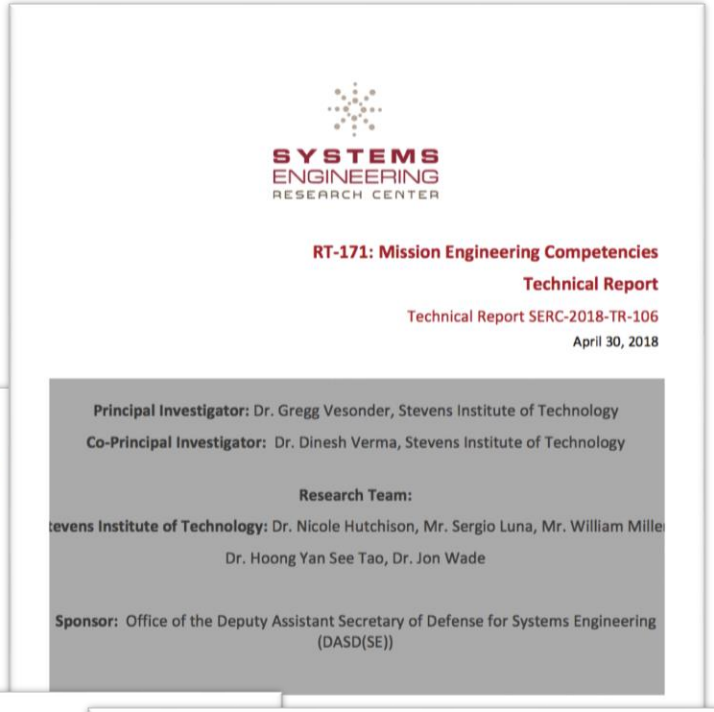
Report – Phase I

Industry's Role in Development Planning

Final Jan 2011

National Defense Industrial Association
Systems Engineering Division
Architecture and Mission Analysis Committees

The Role of Architecture to Influence the Development Planning Trade Space



SYSTEMS ENGINEERING RESEARCH CENTER

RT-171: Mission Engineering Competencies

Technical Report

Technical Report SERC-2018-TR-106

April 30, 2018

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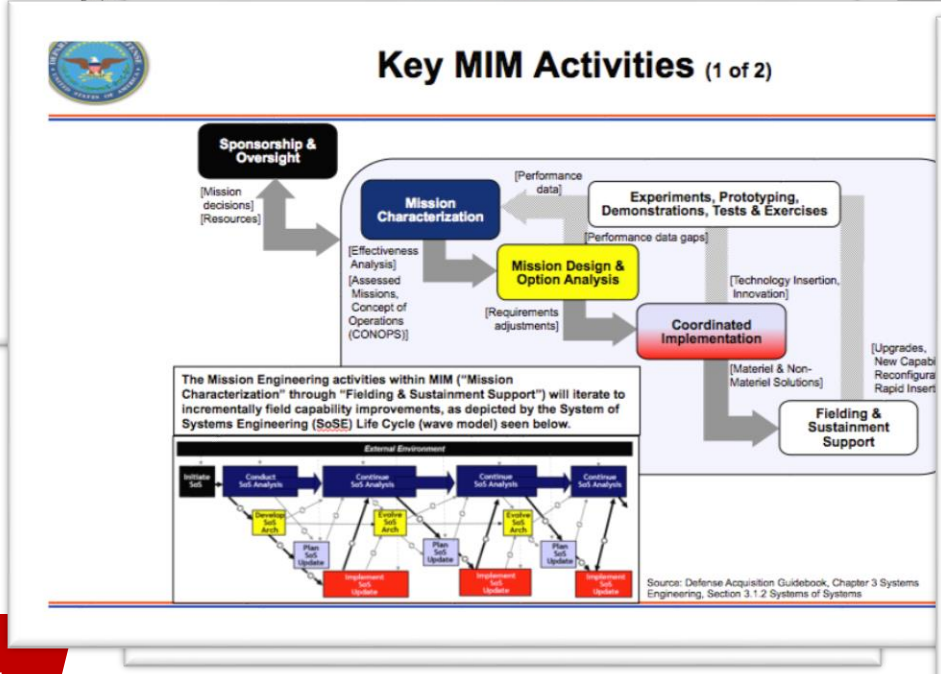
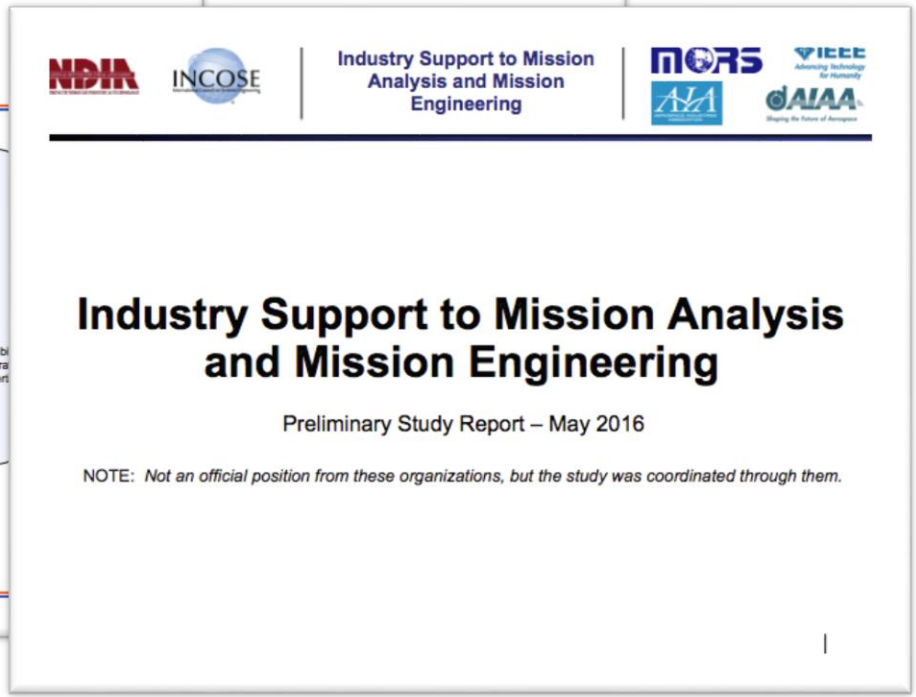
Sponsor: Office of the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE))



Key MIM Activities (1 of 2)

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



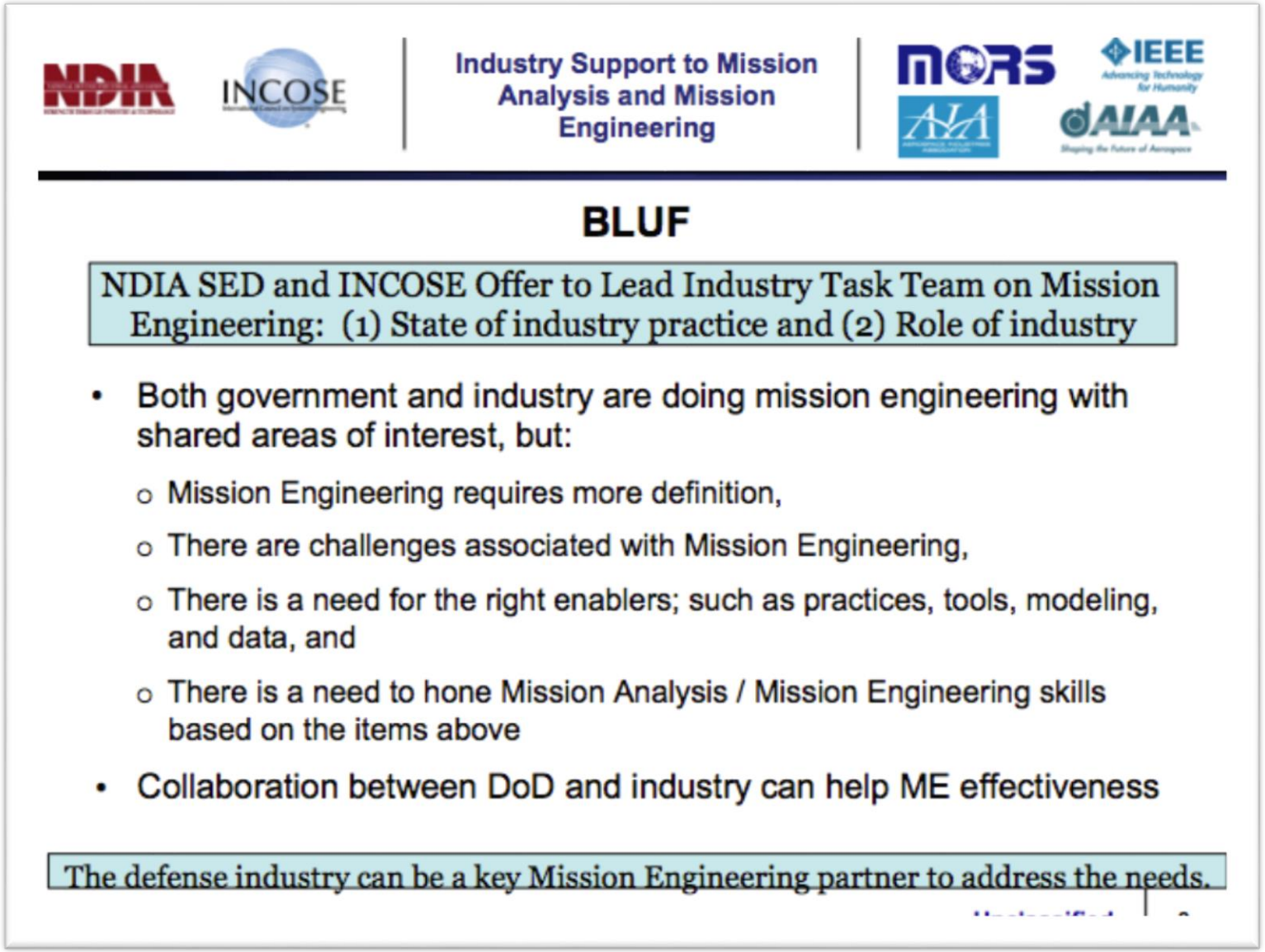
NDIA INCOSE | Industry Support to Mission Analysis and Mission Engineering | MORS AIAA IEEE

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.*

BLUF from 2016 Industry Survey



Role of Industry – Issues

- **Issue 1:** In-Depth Industry Knowledge of Current Systems and Technology
- **Issue 2:** Industry IR&D on Innovative Mission Approaches & Systems Technologies
- **Issue 3:** Facilitating Cross-Industry Mission Engineering Engagement
- **Issue 4:** Technical Approaches to Mission Engineering and Analysis
- **Issue 5:** Government Actions to Incentivize Industry Mission Engineering Engagement

1 In-Depth Industry Knowledge of Current Systems and Technology

- Questions
  - Under what circumstances will it be critical to have industry input to understand options and implications of making changes in how a system is used to support changes in the SoS supporting a mission?
  - How would this type of engagement be structured?
  - What would incentivize industry to participate?
- Analysis – Circumstances critical for industry involvement
  - Industry capturing their own internal detailed knowledge
  - Government developing a standard approach
  - Obtaining information from the Government early
- Recommendations – Engagement Structure
  - Developing Government / Industry engagement model
  - Ability to review Government models

2 Industry IR&D on Innovative Mission Approaches & Systems Technologies

- Questions
  - How could industry IR&D contribute to new mission concepts and approaches or new systems techniques to foster improved mission effectiveness?
  - What information or insights would industry need to enable this?
  - What would incentivize industry to invest IR&D in these areas?
  - What are the risks to industry (competition; IP)?
- Analysis
  - Industry has demonstrated the capability to investigate innovative approaches to addressing challenging defense problems bringing a fresh perspective and novel approaches. This opens the possibility of industry contributions to new ways to improve mission effectiveness or new systems approaches to support mission adaption under the Industry IR&D efforts.
- Recommendations
  - Industry IR&D Contributions
    - Government involving Industry earlier
    - Government providing directed IR&D
    - Developing a Government / Industry Governance Model
  - Information and Insights
    - Government getting Industry involved earlier
    - Government defining their responsibilities

3 Facilitating Cross-Industry Mission Engineering Engagement

- Questions
  - What are the issues in getting industry teams drawn from multiple companies to work together to support ME initiatives?
  - What are the incentives for industry?
  - What models (e.g. MDA National team) exist and how could these be adapted to support ME?
  - What are the pros and cons of different approaches?
  - What are the risks to industry?
- Analysis
  - Missions are supported by systems of systems which are developed by different industry providers. Mission engineering efforts involving industry will naturally need to include teams from different, often competing companies. To effectively engage industry in ME activities, there needs to be a way to facilitate constructive cross-industry engagement with a focus on operational mission outcomes.
- Recommendations
  - Mitigating OCI
  - Establishing teaming arrangements
  - Developing the SoS architecture collaboratively
  - Developing a national team-like concept of operations
  - Assessing teaming considerations

4 Technical Approaches to Mission Engineering and Analysis

- Questions
  - What type of mission engineering related technical experience and resources does industry have which could benefit DoD mission engineering efforts?
  - How can industry progress in digital engineering provide a foundation for mission engineering?
  - How could these be shared with government?
  - What is the incentive for industry to share these? What are the risks?
- Analysis
  - The 2016 Industry Task Force report on ME indicated that industry conducts ME for various purposes and has a base of experience in ME technical modeling and analysis approaches which could benefit DoD ME efforts. These include environments which could be used for ME experimentation and analysis, technical digital approaches for representation of SoS, and analysis of mission impacts. This industry technical base could form a focus for government industry ME technical exchange and implementations.
- Recommendations for Industry
  - Understanding Industry technical expertise and resources
  - Presenting Industry technical expertise and resources
  - Providing training on the digital engineering strategy
  - Developing an input-output criteria framework
  - Participating in the DEIX Working Group
  - Contributing and participating in other activities
  - Sharing with the Government

5 Government Actions to Incentivize Industry Mission Engineering Engagement

- Questions
  - What set of incentives have been identified for the set of topics related to industry's role in ME?
  - What type of information or insights could government provide which would motivate industry to engage in ME?
  - What can government do to reduce risks for industry to engage in ME?
- Analysis
  - For industry to engage in an activity like ME, there needs to be some clear potential benefits. It has been noted that if industry perceives that the government is committed to implementation of MIM and fund industry to develop capabilities resulting from MIM/ME efforts, they will be encouraged to commit time and effort to engage and support government efforts. Questions of incentives have been raised for all the topics above, which could usefully be summarized under this topic, but beyond this, there may be general actions the government could take which would incentivize industry to support new ME efforts.
- Recommendations for Government
  - Applying modularity and openness principles
  - Conducting pre-work
  - Ensuring systems are mission effective
  - Providing links to industry
  - Working together with industry
  - Using the market place to share information
  - Providing clear definitions to OCI boundaries

Clarification on Government Owning the Technical Baseline

Owning the Technical Baseline for Acquisition Programs in the U.S. Air Force: A Workshop Report (2016)

- ***Technical baseline*:** Data and information that provide the program office knowledge to establish, trade off, verify, change, accept, and sustain functional capabilities, design characteristics, affordability, schedule, and quantified performance parameters at the chosen level of the system hierarchy.
- ***Owning the technical baseline*:** Air Force program managers and personnel have sufficient technical knowledge of their engineering development programs to enable program success by *making informed, timely, and independent decisions*5 to manage cost, schedule, and performance risk while ensuring disciplined program execution. Owning the technical baseline allows the Air Force to respond knowledgeably and have minimal disruption to mission success. [emphasis added]

Owning the technical baseline does not require the Government to own all the technical data for a program.

Core Team and Workshop Participants

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Thank you