SYSTEMS ENGINEERING RESEARCH CENTER

SERC TALKS

# WELCOME

***"The Practice of Mission Integration: How to focus and synchronize Department of Defense activities towards critical warfighter missions?"***

**December 9, 2020 | 1:30 PM ET**

Mr. Elmer Roman, Director, Mission Integration, Office of the Undersecretary of Defense for Research & Engineering, Advanced Capabilities| **CONTACT**

- ❑ Today's session will be recorded.
- ❑ An archive of today's talk will be available at: www.sercuarc.org/serc-talks/ as well as on the SERC YouTube channel.
- ❑ Use the Q&A box to queue questions, reserving the chat box for comments, and questions will be answered during the last 5-10 minutes of the session.
- ❑ If you are connected via the dial-in information only, please email questions or comments to SERCtalks@stevens.edu.
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# OUSD(R&E)
# Mission Integration

Mr. Elmer Roman

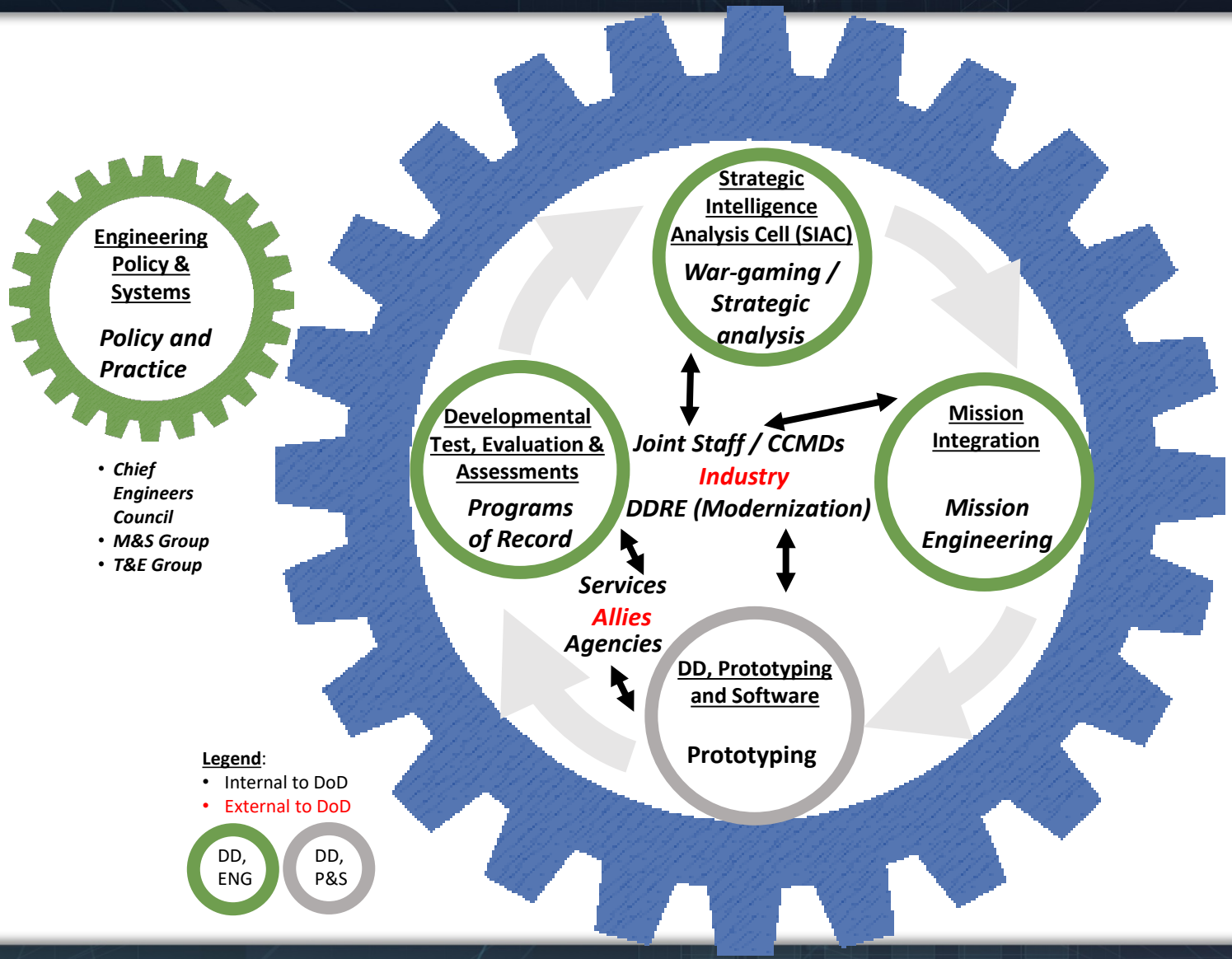
Director, Mission Integration

Office of the Under Secretary of Defense for
Research and Engineering



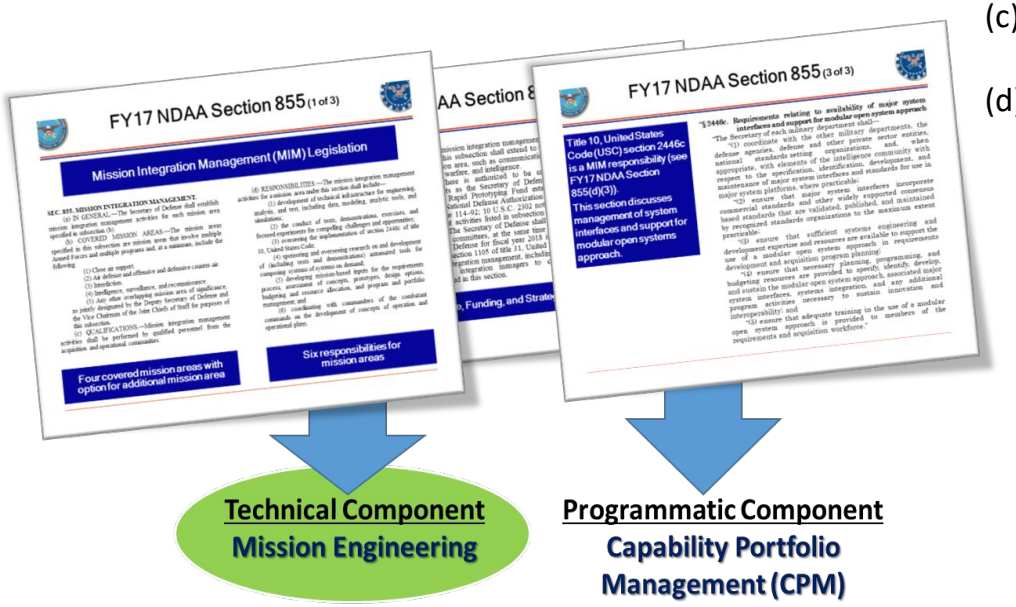
*https://www.CTO.mil*
*https://ac.cto.mil/engineering*
*@DoDCTO*

# Engineering Cycle



# Mission Integration Management

***Mission Integration*** *is the synchronization, management, and coordination of concepts, activities, technologies, requirements, programs, and budget plans to guide key enterprise decisions focused on the end-to-end mission.*




(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;

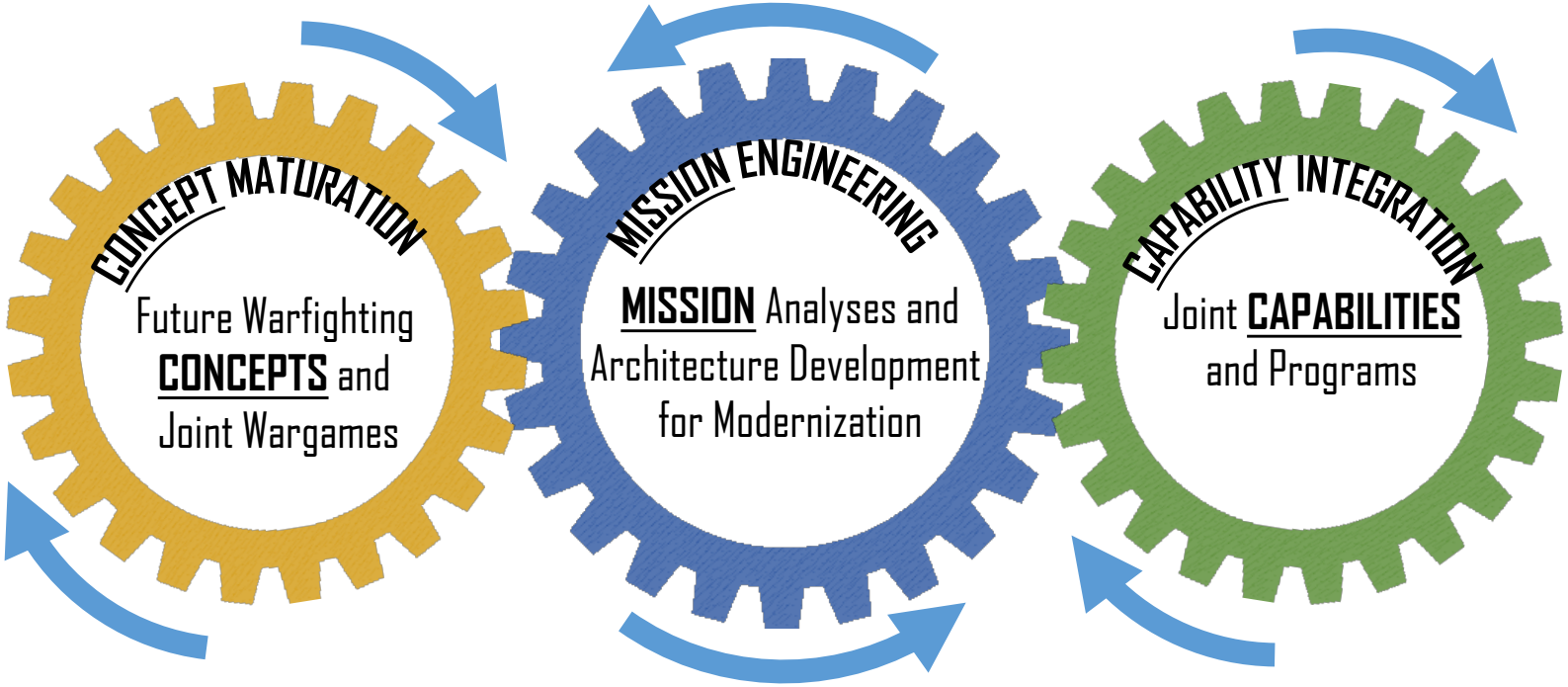
(4) sponsoring and overseeing research on and development of (including tests and demonstrations) automated tools for composing systems of systems on demand;

(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.

(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.

# Mission Integration Cycle




- Concept Maturation informs strategic concepts through critical thinking and technology solutions; supports Joint Staff.
- Mission Engineering informs technology roadmaps, investment decisions, and guides prototyping; supports PDs and AC modernization.
- Capability Integration informs roadmaps and endorses requirements for program development and modernization; supports programs and A&S.

***Mission Integration*** synchronizes concepts, technologies, requirements and programs to guide key enterprise decisions.

# Mission Integration Lines of Effort

**Definition:** *Mission Integration is the synchronization, management, and coordination of concepts, activities, technologies, requirements, programs, and budget plans to guide key enterprise decisions focused on the end-to-end mission.*

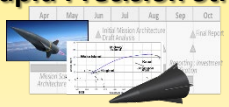
- **Disseminate Mission Engineering (ME) across the Department**
  - Develop and maintain ME Guide to include process / methodology
  - Define Government [Mission and Capability] Reference Architectures
  - Engage and provide technical guidance to DoD stakeholders to synergize missions, concepts, requirements, and technologies
  - Instantiate an environment / infrastructure for knowledge management and to perform ME analysis

- **Perform ME**
  - Lead studies to guide development and investment in future systems, capabilities and technologies; explore trade space, and examine mission utility, effectiveness and return on investment
  - Inform stakeholders on building the right things, not just building things right; align capability maturation relevant to the evolving future fight
  - Identify mission capability gaps, support portfolio management, and inform requirements

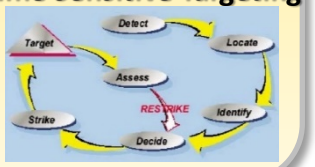
- **Support to development of Joint Warfighting Concept and Architectures**
  - Assist Joint Staff with development of innovative Joint Warfighting Concepts and Supporting Concepts
  - Ensure critical thinking when developing new strategic concepts and architectures for the future fight

- **Coordinate capability integration and technical solutions of strategic importance**
  - Joint-All Domain Command and Control (JADC2)
  - Missile Defense Agency (MDA)
  - Nuclear Command, Control, Communications (NC3)

**Rapid Precision Strike**

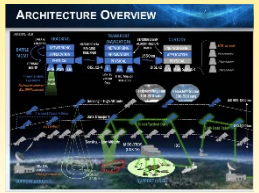


**Time Sensitive Targeting**




**Architectures**

**JADC2**



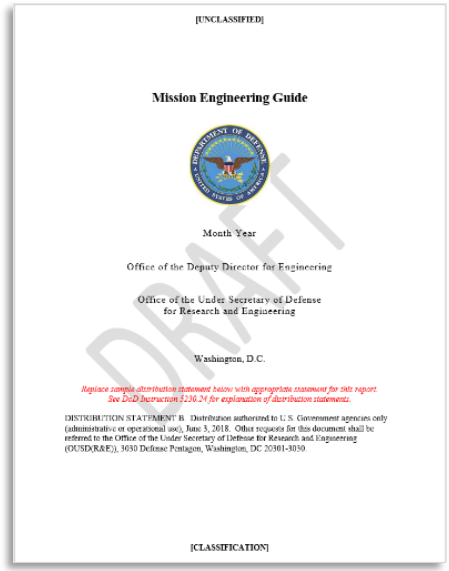

**Technology Solutions**

**NC3 Enterprise infrastructure recommendations**

**Inform requirements, programs, and investment decisions toward a more integrated and mission-focused solution with the underpinning of technical rigor and analyses.**

# ME Guide

- Speaks to a novice that is required to conduct ME
- Invokes critical thinking throughout the ME process
- Provides overarching guidance and information on ME by:
  - Explaining what is and what is not ME
  - Describing the best practices, principles, and attributes for ME
  - Elaborating on the benefits of using ME
  - Establishing a set of common terms and definitions
  - Provides standardized artifact templates used to present conclusions
- Enables practitioners to formulate problems and build a firm understanding of the main principles involved in performing analysis in a mission context
- Provides users with insight as to how to document and portray results or conclusions via a set of products that help inform key decisions (e.g., Government [Mission or Capability] Reference Architectures)
- OUSD(R&E) will promulgate ME guidance
  - This ME Guide will replace the draft version of the OUSD A&S Mission Engineering and Integration (ME&I) Guidebook
  - Additional efforts include development of ME training material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Mission Engineering Guide

Month Year

Office of the Deputy Director for Engineering

Office of the Under Secretary of Defense
for Research and Engineering

Washington, D.C.

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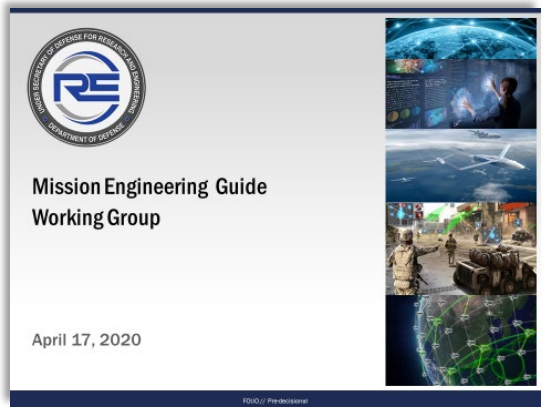
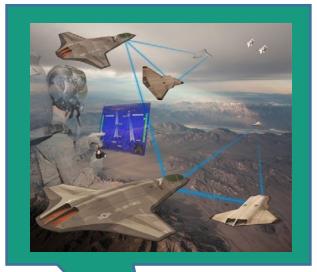


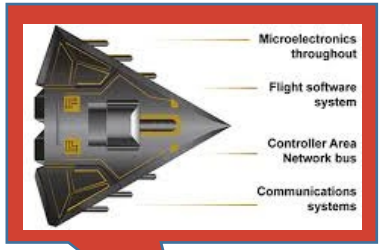
# ME Consumers

**Mission Engineering links concepts to relevant and timely delivery of capability**

Inform Technology Efficacy and Investment Decisions

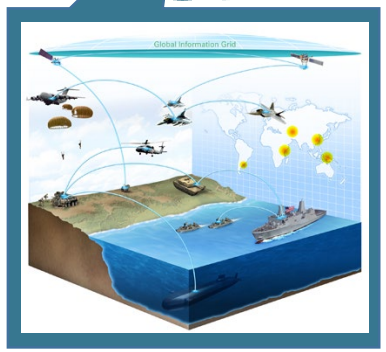


Inform Acquisition Requirements





## Mission Engineering Consumers




Inform Concept Maturation

Inform Prototypes

MS A
MS B
MS C
Rapid Acquisition

Enable Capability Portfolio Management (Inform Acquisition Decisions)

# Mission Engineering (ME)

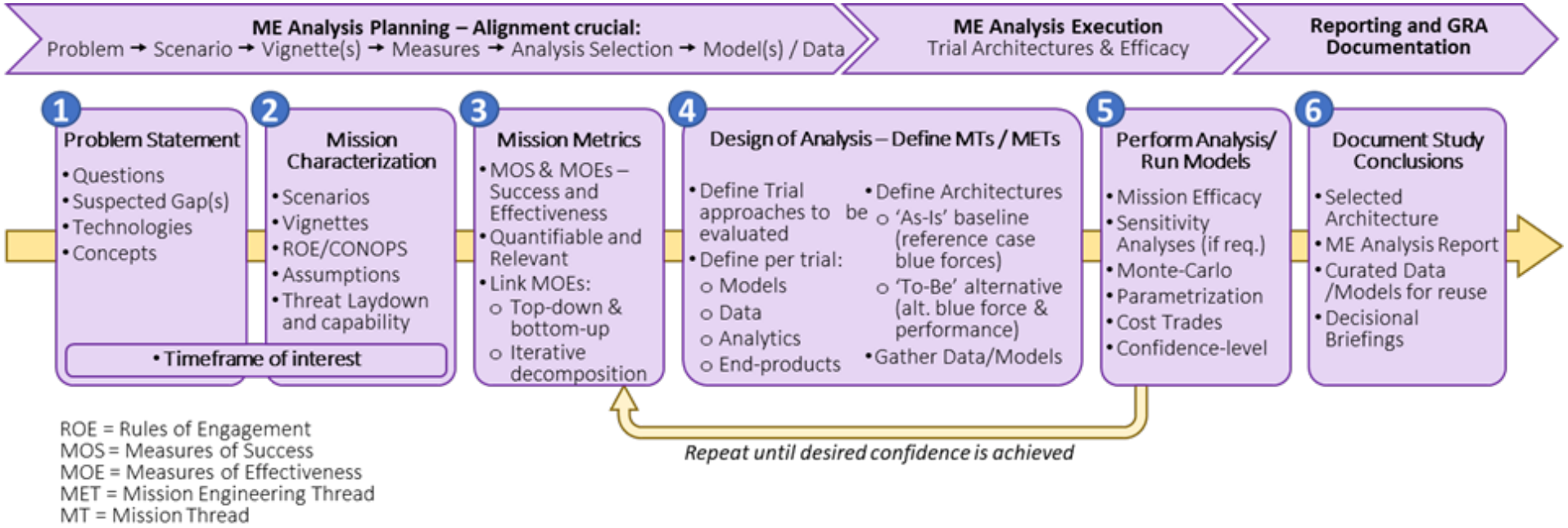
**Mission Engineering** is the deliberate planning, analyzing, organizing, and integrating of current and emerging operational and system capabilities to achieve desired warfighting mission effects.


## MISSION ENGINEERING OBJECTIVES

- Mission-focused threat-informed analysis to evaluate capability solutions, advise on development of requirements and inform technology investment decisions
- Identify enhanced capabilities, technologies, system inter-dependencies, and architectures to close mission gaps
- Develop Government Reference Architectures to guide technology development, prototypes, experiments, and system-of-systems portfolio management to achieve reference missions
- Inform stakeholders on building the right things, not just building things right; align capability maturation relevant to the evolving threat and future warfighter needs

**ME analyzes Systems and Systems of Systems in an Operational Mission context**

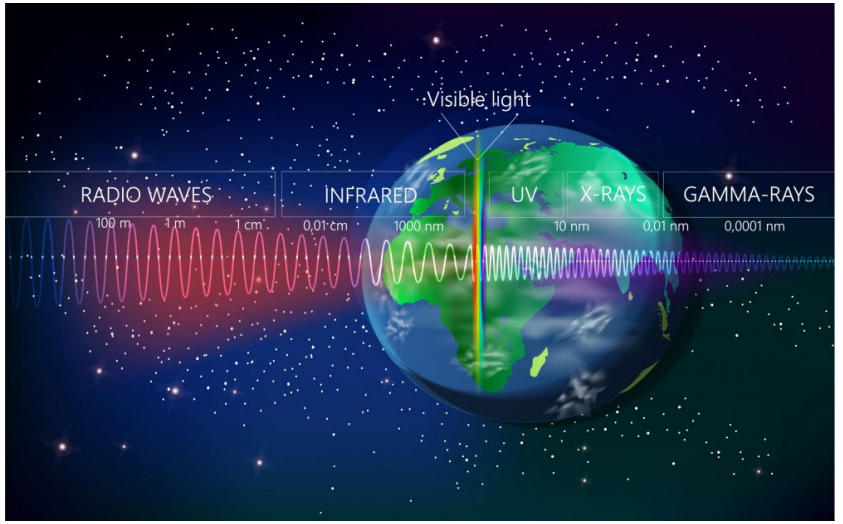
# ME Methodology



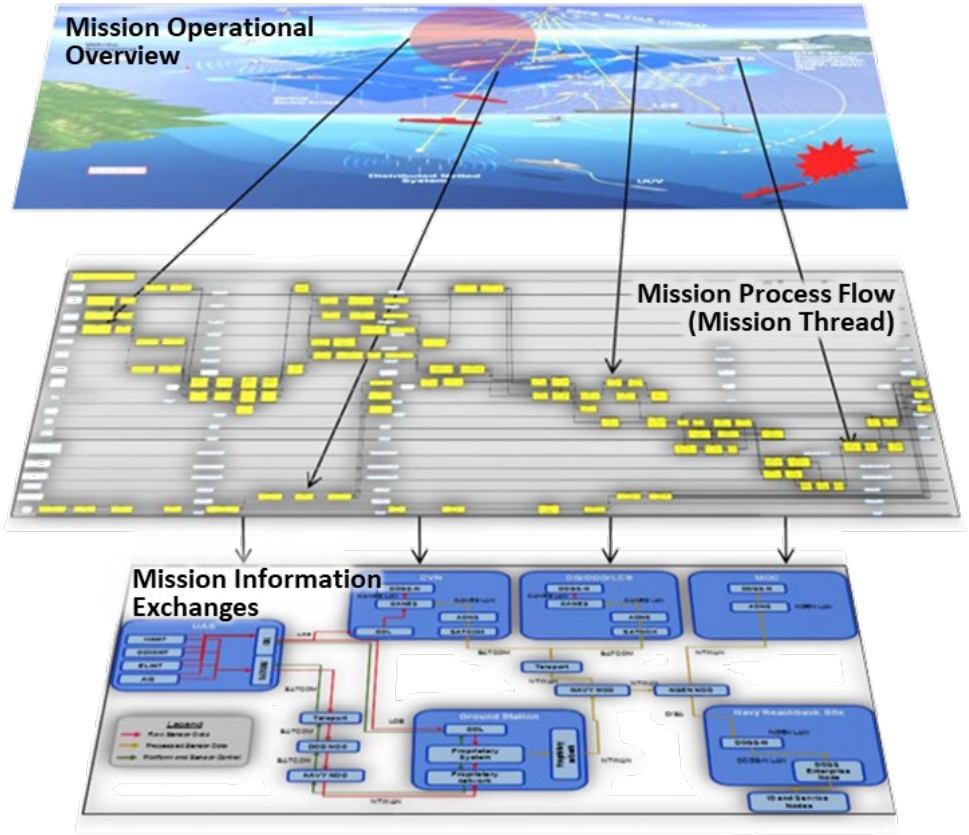

- The ME process involves:
  - A carefully articulated problem statement
  - The characterization of the mission and identification of metrics
  - Collection of data and models needed to analyze the mission
  - Documenting the outputs/results

# ME Studies – FY 2021

- FY21 Mission Engineering analyses and studies to inform POM 23 decisions
- Supports the Joint Staff, CCMDs, and OSD priorities
- Topics:
  - Electromagnetic Spectrum Maneuver / Mission Data Integration
  - High Energy Laser for Defense Against Cruise Missiles
  - Position, Navigation & Timing (PNT) in Highly Contested Environment
  - Hypersonics (Campaign Analysis)
  - Offensive Cyber Operations
  - All Domain Effects
  - JADC2 Zero Trust Architecture
  - Autonomy (Efficacy of Swarming)



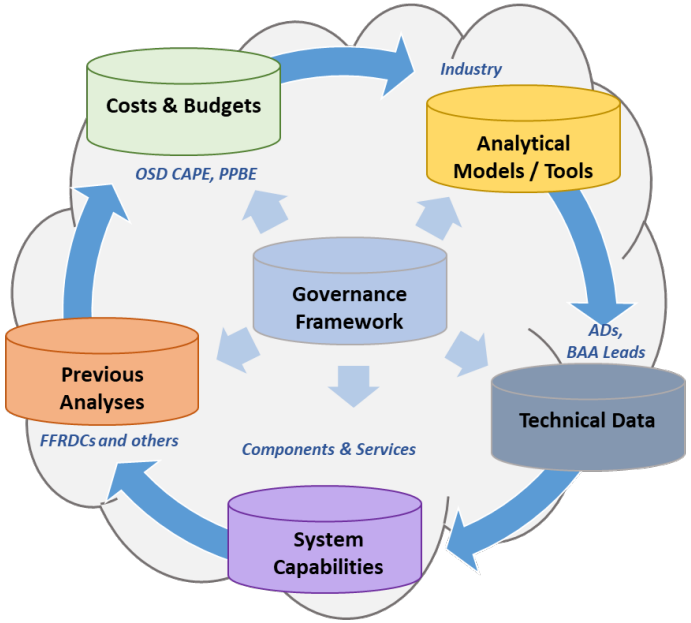

# ME Obstacles and Challenges

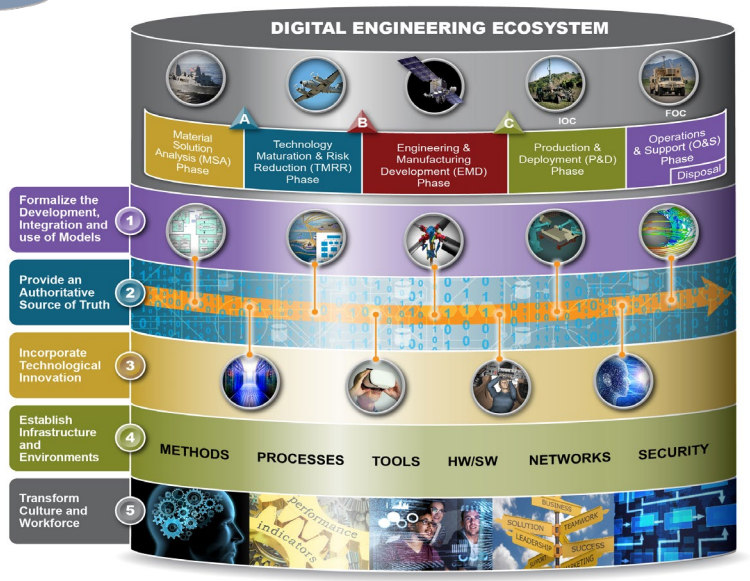



- How can we analyze System of Systems (SoS) across all domains using the tools that are available today?
- How do we evaluate complex operational and SoS architectures and perform trade space analysis?
- How can we ensure that ME is a repeatable process with reusable and trusted models and data?
- How does the department promote and utilize a Knowledge Management system across the engineering community?
- How can we drive the department to pursue and adopt a threat-informed, tops-down approach to improve mission outcomes and inform enterprise investment decisions?

# ME Knowledge Management

- Instantiation of a Digital Ecosystem for Mission Engineering activities
  - Transparency and sharing of data and models
  - Collaborative environment to install simulation and software tools for mission engineering analyses
  - Curation of trustworthy data — accuracy of analyses depends on pedigree of data




***Need collaborative environment, tailorable software tools, and authoritative models and data***

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# UPCOMING TALKS:

"Digital Engineering" Series

**Tentative Dates:**

**Wednesday, February 3, 2021**

**Wednesday, April 7, 2021**

**Wednesday, June 2, 2021**

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