# SoSECIE Webinar

Welcome to the 2021 System of Systems Engineering Collaborators Information Exchange (SoSECIE)



We will start at 11AM Eastern Time You can download today's presentation from the SoSECIE Website: <u>https://mitre.tahoe.appsembler.com/blog</u> To add/remove yourself from the email list or suggest a future topic or speaker, send an email to <u>sosecie@mitre.org</u>

# NDIA System of Systems SE Committee

### Mission

- To provide a forum where government, industry, and academia can share lessons learned, promote best practices, address issues, and advocate systems engineering for Systems of Systems (SoS)
- To identify successful strategies for applying systems engineering principles to systems engineering of SoS

### Operating Practices

 Face to face and virtual SoS Committee meetings are held in conjunction with NDIA SE Division meetings that occur in February, April, June, and August

NDIA SE Division SoS Committee Industry Chairs:

Mr. Rick Poel, Boeing

Ms. Jennie Horne, Raytheon

OSD Liaison:

Dr. Judith Dahmann, MITRE

# Simple Rules of Engagement

- I have muted all participant lines for this introduction and the briefing.
- If you need to contact me during the briefing, send me an e-mail at sosecie@mitre.org.
- Download the presentation so you can follow along on your own
- We will hold all questions until the end:
  - I will start with questions submitted online via the CHAT window in Teams.
  - I will then take questions via telephone; State your name, organization, and question clearly.
- If a question requires more discussion, the speaker(s) contact info is in the brief.

# Disclaimer

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## 2021-2022 System of Systems Engineering Collaborators Information Exchange Webinars

Sponsored by MITRE and NDIA SE Division

August 24, 2021 Communication Oriented Modeling of Evolving Systems of Systems Sean Kristian Remond Harbo

September 7, 2021 System of Systems Meta-Architecture Approach to Improve Legacy Metrorails for Enhanced Customer Experience Dr. Cihan Dagli and Maxwell Polley

> October 19, 2021 Resilience in Systems of Systems: Electrified Transport Systems Pontus Svenson, Kerstin Eriksson, and Sara Janhäll

November 2, 2021 Conceptual Models to Support Reasoning in Early Phase Concept Evaluation – a Subsea Case Study Siv Engen

November 16, 2021 A Design Method for Collaborative Systems of Systems Applied to Metropolitan Multi-Mode Transport System Pontus Svenson, Frida Reichenberg, and Jakob Axelsson

November 30, 2021 Should I Stay or Should I Go? How Constituent Systems Decide to Join or Leave Constellations in Collaborative SoS Pontus Svenson and Jakob Axelsson

https://www.mitre.org/capabilities/systems-engineering/collaborations/system-of-systems-engineering-collaborators





### OUSD(R&E) Mission Integration Overview SoSECIE- 10 August 2021

#### Mr. Elmer Roman, SES

Director, Mission Integration

Office of the Under Secretary of Defense for Research and Engineering

https://www.CTO.mil https://ac.cto.mil/engineering

@DoDCTO

Controlled by: OUSD(R&E) Controlled by: CL&S INFOSEC CUI Category(ies): PRVCY Limited Dissemination Control: FEDCON POC: Elmer Roman, 703-693-0398



### **Mission Integration Lines of Effort**



**Our Mission:** Mission Integration\* provides analytical engineering support to the Office of the Secretary of Defense, the Joint Staff, Combatant Commands, and Services to develop mission-based inputs for the requirements process, improve Joint Force capability integration, experimentation, and inform the development and maturation of Joint warfighting concepts and operational plans.

> **Primary Efforts:** MI brings together the technical infrastructure and expertise for Mission Engineering (ME) analysis, including the data, modeling and simulation, and training, to identify and refine end-to-end mission-based capability gaps to guide key enterprise

**Mission Engineering** – Leads Mission Engineering studies and analyses to answer key technical challenges identified by the OSD, Joint Staff, Services, and Combatant Commands; informs prototyping and experimentation plans and prioritization, and technological investment decisions in Defense modernization areas; provides quantitative results to support JWC and

technology maturation; promotes the state of practice in Defense Mission Engineering.

\*As directed in the FY 2017 NDAA Section 855(d) Mission Integration Management

#### **Concept Maturation**



**Mission Engineering** 



#### **Capability Integration**



**Capability Integration** – Leads development of the Nuclear Command, Control, Communication (NC3) Technology Development Plan; supports continuing evolution of the NC3 architecture; helps USD(R&E) re-engineer systems across their lifecycle to improve Joint mission effectiveness; advocate for systems interfaces and Modular Open Systems Approach (MOSA) to ensure innovation and interoperability.

Building the right things, the right way, and putting them in the hands of the right people.

Concept Maturation - Coordinate R&E-wide integration into the JCIDS to fulfill USD(R&E)'s role as Advisor to the JROC. Facilitate the alignment and integration of joint warfighting concepts with R&E activities through stakeholder engagement, analysis and wargaming.

technology investment decisions.



### **Advanced Capabilities Organization**







### **High Level Process**







### **Mission Engineering Focus**



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



#### **Goals & Objectives**

- Mission-focused threat-informed analysis to "engineer potential mission solutions" (i.e., what occurs when you insert a new technology into the thread?
- Curation of ME results will allow the Department to be proactive (vs. reactive) to maintain mission effectiveness of critical missions.
- On-going ME will help monitor capability gaps and forecast mission needs overtime by identifying new mission approaches to stay ahead of our adversaries
- ME recognizes that successful mission outcomes require multiple systems to effectively work together to execute mission tasks in operational environments
- Inform stakeholders on **building the right things, not just building things right**; align capability maturation relevant to the evolving threat and future warfighter needs



### **Mission Engineering Horizon**







# **FY21 Mission Engineering Studies**



- 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)
  - All Domain Effects
  - JADC2 Zero Trust Architecture
  - Autonomy (Efficacy of Swarming)
  - Offensive Cyber Operations









## Mission Engineering 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



## Mission Engineering Simulation Pyramid





**Command Professional Edition** is a commercial tool that provides wargaming, modeling, simulation, and analysis of operational plans, weapon systems, logistics, and energy consumption in direct support of today's Warfighter. Units are modeled to sub-components (e.g., sensors, engines, and C2 links). Scaling from a simple 1-vs-1 in real time to theatre-level strategic engagements.



**AFSIM** is a government tool that covers domains from sub-surface to space and is used for a broad spectrum of simulations, to include the engineering, engagement, mission, and "campaign-lite" level through the use of analytic wargaming and experimentation. **CAMPAIGN** (Days) Command PE, STORM, RCADE

**MISSION** (Many-on-Many) AFSIM, Brawler, STK, GIANT, EADSIM, Guardian

> ENGAGEMENT (One-on-One)

MOSAIC, ESAMS, RADGUNS, WEAPS, ESST, CBLP

ENGINEERING (System/Subsystem/Component)



**STORM** is a government model that provides a campaign analysis tool to aid in informing top-level decision makers on force structure, operational concepts, and military capabilities.



**GIANT** provides a "manyversus-many" constructive and repeatable simulation to determine GPS and Inertial Navigation System (INS) performance along with weapon system operational effectiveness in an optional GPS interference or noise jamming environment.

Mission Engineering leverages variety of digital tools to produce quantitative results.





- USD/R&E/AC Mission Integration is providing analytical ME support to OSD, the Joint Staff, Combatant Commands, and Services to develop mission-based inputs for requirements generation, maturation of Joint warfighting concepts and improving Joint Force capability integration
- ME should be a repeatable and iterative process as new technology is developed and fielded, and as new data is collected on emerging threats
- Curation of ME results will allow the Department to be proactive (vs. reactive) to maintain mission effectiveness of critical missions
- On-going ME will help monitor capability gaps and forecast mission needs overtime by identifying new mission approaches to stay ahead of our adversaries
- ME efforts are aimed at building the right things, not just building things right while aligning capability maturation relevant to the evolving threat and future warfighter needs
- OUSD(R&E) continues to collaborate with Service and Industry partners to improve MOSA-related acquisition activities for the benefit of the Warfighter



### **Points of Contact**



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