NDIA
AT THE HEART OF THE MISSION

2021 VIRTUAL **SYSTEMS & MISSION ENGINEERING** CONFERENCE

Systems & Mission Engineering Transformation and Modernization

December 6 – 8 | NDIA.org/vSME21

TABLE OF CONTENTS

WHO WE ARE

The National Defense Industrial Association is the trusted leader in defense and national security associations. As a 501(c)(3) corporate and individual membership association, NDIA engages thoughtful and innovative leaders to exchange ideas, information, and capabilities that lead to the development of the best policies, practices, products, and technologies to ensure the safety and security of our nation. NDIA's membership embodies the full spectrum of corporate, government, academic, and individual stakeholders who form a vigorous, responsive, and collaborative community in support of defense and national security. For more than 100 years, NDIA and its predecessor organizations have been at the heart of the mission by dedicating their time, expertise, and energy to ensuring our warfighters have the best training, equipment, and support. For more information, visit **NDIA.org**

GET INVOLVED

Learn more about NDIA's Divisions and how to join one at **NDIA.org/Divisions**

DIVISION LEADERSHIP

Holly Dunlap
Division Chair

John Daly
Division Vice Chair

Chris Schreiber
Division Vice Chair

Dr. Patricia Griffin
Conference Chair

SYSTEMS ENGINEERING DIVISION

WHO WE ARE

The Systems Engineering Division advocates for the widespread use of systems engineering in the Defense Department acquisition process to achieve affordable, supportable, and interoperable weapon systems that meet the needs of military users. In addition to supporting the open exchange of ideas and concepts between government and industry, the Division works for a new understanding of a streamlined systems engineering process.

CONFERENCE PURPOSE

The purpose of this conference is to focus on Systems and Mission Engineering Transformation and Modernization to improve defense program acquisition and system performance. It addresses emerging concepts such as digital engineering, modeling, product line engineering, iterative development methods, new risk models to ensure system survivability and cyber resiliency, and shifting test earlier in the system development lifecycle.

This year, the NDIA Systems Engineering Division is partnering with our Test & Evaluation Division and Integrated Program Management Division, and is supported by the Office of the Under Secretary of Defense for Research & Engineering, the IEEE Aerospace and Electronic Systems Society, the IEEE Systems Council, and the International Council on Systems Engineering.

WELCOME TO 2021 VIRTUAL SYSTEMS & MISSION ENGINEERING CONFERENCE

On behalf of the National Defense Industrial Association's Systems Engineering Division, we would like to extend a very warm welcome to the 24th Annual Systems & Mission Engineering Conference. The defense industry has been working together on systems engineering topics for over 20 years. We continue to have extensive opportunities to modernize our approaches, processes, tools, and techniques to provide the most sophisticated and technologically advanced capabilities to our US and Allied Nation warfighters.

Our defense community includes industry, government, FFRDCs, and academia, all of whom collaboratively challenge the status quo. We work to address barriers and seek opportunities to transform Systems Engineering, and in doing so improve efficiencies, affordability, quality, safety, security, as well as ensure overall system mission success.

NDIA offers a unique opportunity for everyone to have a voice regardless of years of experience, and to propose new ideas and innovative ideas to make us better. This forum provides a great opportunity to hear from senior executive leaders as well as subject matter experts in diverse areas of systems engineering.

We are very pleased this year to partner with the NDIA Test & Evaluation Division and Integrated Program Management Division to complement our Systems Engineering Division. We appreciated everyone's flexibility and willingness to work with us as we adapted to uncertain times and transitioned from a face-to-face to virtual environment. We have impressive keynotes speakers, with over 120 live presentations, and 30 pre-recorded on-demand presentations. These presentations will be recorded and available for 30 days after the event. This provides an incredible opportunity to view other presentations or review presentations later for where you may have focused interest.

We encourage each of you to be actively present, ask questions, learn something new, and offer insights and mentoring to those newer to our community. As you participate in the conference, please consider becoming an active NDIA Systems Engineering Committee member throughout the year by joining one of our 13 committees. Please reach out to the track chairs for more information. And if there is anything that the conference committee, the undersigned, or the outstanding NDIA staff can do to assist you, please let us know.

Holly Dunlap
Raytheon Missiles & Defense
NDIA Systems Engineering Division Chair

Pat Griffin
NDIA Systems Engineering Division
Transformation & Communication Chair, Clear-Com

EVENT INFORMATION

SURVEY AND PARTICIPANT LIST

You will receive via email a survey and list of participants (name and organization) after the conference. Please complete the survey to make our event even more successful in the future.

EVENT CONTACT

Meredith Mangas
Associate
Director, Meeting
(703) 247-9467
mmangas@NDIA.org

Jae Yu
Director, Divisions
(703) 247-2564
jyu@NDIA.org

Allison Carpenter
Director,
Exhibits & Sponsorships
(703) 247-2573
ahcarpenter@NDIA.org

SPEAKER GIFTS

In lieu of speaker gifts, a donation is being made to the Fisher House Foundation.

HARASSMENT STATEMENT

NDIA is committed to providing a professional environment free from physical, psychological and verbal harassment. NDIA will not tolerate harassment of any kind, including but not limited to harassment based on ethnicity, religion, disability, physical appearance, gender, or sexual orientation. This policy applies to all participants and attendees at NDIA conferences, meetings and events. Harassment includes offensive gestures and verbal comments, deliberate intimidation, stalking, following, inappropriate photography and recording, sustained disruption of talks or other events, inappropriate physical contact, and unwelcome attention. Participants requested to cease harassing behavior are expected to comply immediately, and failure will serve as grounds for revoking access to the NDIA event.

EVENT CODE OF CONDUCT

NDIA's Event Code of Conduct applies to all National Defense Industrial Association (NDIA), National Training & Simulation Association (NTSA), and Women In Defense (WID) meeting-related events, whether in person at public or private facilities, online, or during virtual events. NDIA, NTSA, and WID are committed to providing a productive and welcoming environment for all participants. All participants are expected to abide by this code as well as NDIA's ethical principles and practices. Visit NDIA.org/CodeOfConduct to review the full policy.

ANTITRUST STATEMENT

The NDIA has a policy of strict compliance with federal and state antitrust laws. The antitrust laws prohibit competitors from engaging in actions that could result in an unreasonable restraint of trade. Consequently, NDIA members must avoid discussing certain topics when they are together at formal association membership, board, committee, and other meetings and in informal contacts with other industry members: prices, fees, rates, profit margins, or other terms or conditions of sale (including allowances, credit terms, and warranties); allocation of markets or customers or division of territories; or refusals to deal with or boycotts of suppliers, customers or other third parties, or topics that may lead participants not to deal with a particular supplier, customer or third party.

JOIN THE CONVERSATION

@NDIAToday | @NDIAMembership | NDIA.org/LinkedIn | @NDIAToday | @NDIAToday

TRACK INFORMATION

Agile

John Daly
Booz Allen Hamilton

Agile usage is becoming more prevalent within the government space. Lessons learned and ideas for implementation can be shared with those who are experienced in using Agile concepts. This track brings together practitioners with experience applying agile methods in a variety of disciplines and domains, with the goal of collaboration to expand their effective use in systems engineering and on defense programs.

Architecture

Bob Scheurer
The Boeing Company

Ed Moshinsky
OUS (R&E) SE

Architecture is a key element in systems engineering. This track addresses architecture frameworks, strategies, and applications to improve system design, test, operations, and support.

Digital Engineering

Chris Schreiber
Lockheed Martin Space Systems Company

Digital Engineering is an emerging set of practices for Systems Engineering and other engineering disciplines, which has—at its core—the use of models (data, algorithms, and/or processes) as a technical means of communication. When used properly, models can provide cohesiveness across engineering activities and with acquisition activities. When coupled with computational capabilities, resultant data from simulations can be used in decision-making at all echelons and an increased level of insight. Moreover, risk reduction in the end item can be achieved.

Engineered Resilient Systems

Lois Hollan
Potomac Institute

Engineered Resilient Systems (ERS) is a Department of Defense priority initiative that seeks to transform engineering environments so that warfighting systems are more resilient and affordable across the acquisition lifecycle. The track will present new results across the ERS initiative, including anchor technologies and computational representation.

Education & Training

Robert Raygan
Defense Acquisition University

The Education & Training track for 2020 is an excellent collection of presentations from government, industry, and academia. The presentations describe a wide range of systems engineering (SE) workforce development activities covering the core of SE, agile approaches, an MBSE learning environment, modular online open education, and the future of SE.

Environment, Safety, & Occupational Health

Sherman Forbes
U.S. Air Force

Diane Dray
Booz Allen Hamilton

Engineering design considerations included under the DoD acronym "ESOH," as defined in MIL-STD-882E, the DoD Standard Practice for System Safety. Mr. David Asiello, the Acquisition ESOH lead in the Office of the Assistant Secretary of Defense for Sustainment will make the ESOH Track's keynote presentation. He will provide an overview of the Office of the Secretary of Defense's (OSD) reorganization that has separated Systems Engineering from Acquisition & Sustainment and has separated Safety & Health Management from Environmental Management. He will also emphasize the importance of incorporating ESOH risks and requirements management into Acquisition & Sustainment as a way to promote readiness and summarize the new Defense Acquisition System (DAS) Adaptive Acquisition Framework and its challenges to Systems Engineering and ESOH policy. The remainder of the ESOH track presentations will address specific acquisition ESOH issues, to include integrating ESOH risks and requirements management into Digital Engineering and the new Middle Tier Acquisition framework, specifically ESOH system design issues, hazardous materials management, and acquisition and sustainment programs' lessons learned.

Human Systems Integration

Dr. Matthew Risser
Pacific Science & Engineering

Randi Rohrer
The Boeing Company

The HSI track focuses on the human component in systems development to ensure systems are usable, useful, and support operational needs. The goal is to demonstrate value by aligning HSI processes with acquisition and systems engineering processes, in accordance with DoD HSI policy, standards, and guidance. Topics include HSI methods and best practices, standards and guidance, process innovation, metrics, applications, and approaches to program integration.

Mission Engineering

Dr. Judith Dahmann
The MITRE Corporation

Rick Poel
The Boeing Company

John Daly
Booz Allen Hamilton

Jennie Horne
Raytheon

Mission Engineering (ME) is the deliberate planning, analyzing, organizing, and integrating of current and emerging operational and system capabilities to achieve desired warfighting mission effects. This track focuses on current directions in Defense ME and approaches to applying SoS and SE approaches to ME.

Model-Based Systems Engineering

Dave Allsop
The Boeing Company

Jon Backhausr
Lockheed Martin Corporation

The Modeling & Simulation (M&S) Track highlights the use of models and simulations in the Systems Engineering process. Included are presentations on integrated environments, tools and technologies, and M&S applications in several Systems Engineering process phases. Topics focused specifically on Digital Engineering/Digital Thread/Model-Based Systems Engineering are also covered in this track.

Integrated Program Management

Linda Adams
Pratt & Whitney

Stewart Tague
Lockheed Martin Corporation

Program managers and chief systems engineers should be the "joined-at-the-hip" leads on all programs that wish to be successful. This session will address some of the issues that our program managers face in the execution of programs.

Test & Evaluation

Jeff Bilco
The Boeing Company

The Test and Evaluations (T&E) track will focus on the increasing importance of developmental, operational live-fire T&E processes in both private and public sectors on defense.

Modular Open Systems Approach

Edward Moshinsky
OUSD, R&E

Modular Open Systems Approach (MOSA) is an integrated acquisition and design strategy, consisting of technical architectures, that adopts open standards and supports a modular, loosely coupled, and highly cohesive system structure. The MOSA Track will feature technical sessions highlighting new methods to develop assessment criteria, implementing digital engineering, and mission-level optimization.

System of Systems

Dr. Judith Dahmann
The MITRE Corporation

Rick Poel
Boeing

John Daly
Booz Allen Hamilton

Jennie Horne
Raytheon

The System of Systems (SoS) Track will feature papers highlighting the development of SoS engineering approaches, particularly SoS SE application areas, as well as SoS tools and modeling, including SoS SE applied to defense missions in mission engineering. See directly related track in Mission Engineering & Assurance, above.

System Security Engineering

Cory Ocker
Raytheon Technologies

System Security Engineering has become one of the most important aspects in the design of DoD systems. This track will focus on system security engineering and a holistic approach to program protection.
It includes the integration and risk management of all the security specialties to include: system security engineering, cybersecurity, anti-tamper, software assurance, hardware assurance, cyber supply chain risk management, and general program security throughout the system development lifecycle.
This holistic approach will ensure battlefield system survivability for system mission success.

AGENDA

MONDAY, DECEMBER 6

9:00 – 9:10 am

OPENING REMARKS

Gen Hawk Carlisle, USAF (Ret)
President & CEO, NDIA

Holly Dunlap
Raytheon Missiles & Defense
NDIA Systems Engineering Division Chair

9:10 – 10:00 am

SYSTEMS ENGINEERING TRANSFORMATION AT THE F-35 JOINT PROGRAM OFFICE

Lt Gen Eric Fick, USAF
Program Executive Officer, F-35 Lightning II Joint Program Office, Department of Defense

10:00 – 10:15 am

NETWORKING BREAK

10:15 – 10:55 am

KEYNOTE SPEAKER

Honorable Heidi Shyu
Under Secretary of Defense for Research and Engineering (OUSD(R&E))

11:00 – 11:40 am

TRANSFORMING ACQUISITION

David Cadman
Acting Deputy Assistant Secretary of Defense and Director, Acquisition Data and Analytics, OUSD A&S

11:45 am – 12:25 pm

HOW DIGITAL DESIGN IS DRIVING CHANGE IN DEFENSE

Wes Kremer
President, Raytheon Missiles & Defense

12:25 – 1:00 pm

NETWORKING LUNCH BREAK

1:00 – 1:40 pm

REVOLUTIONIZING OPERATIONAL TEST & EVALUATION BY 2025

Dr. Raymond O'Toole
Acting Director, Office of the Secretary of Defense, Operational Test and Evaluation (DOT&E)

1:45 – 2:05 pm **FERGUSON AND T&E AWARD CEREMONY**

CONCURRENT BREAKOUT SESSIONS

	1C1 – Digital Engineering	1C2 – Model-Based Systems Engineering (MBSE)	1C3 – Systems Security Engineering	1C4 – Test & Evaluation
Moderator	Chris Schreiber	David Allsop	Cory Ocker	Jeff Bilco
2:10 – 2:40 pm	23751 Model Readiness Levels: A Mathematical Construct for Validation and Trust **Dr. Darryl Ahner** STAT COE Director and Interim Dean for Research, Air Force Institute of Technology (AFIT)	MBSE Panel	23951 System Security Committee & Track Welcome **Cory Ocker** Raytheon Technologies, System Security Engineer	23764 Mission Engineering and Digital Engineering Enabling a Unified Evaluation Framework **Dr. Suzanne Beers** Department Manager, Defense System Engineering & OUSD(R&E) D,DTE&A DEF Technical Lead, Mitre
2:45 – 3:15 pm	23766 Integrating Digital Engineering and Modeling and Simulation to Support Technology Adoption in Department of Defense Systems **Philomena Zimmerman** Director, ET&E OUSD (R&E) **John Daly** Senior Engineer (Support), OUSD(R&E)		23823 Technology and Program Protection in the Department of Defense **Melinda Reed** Resilient Systems Director, STPE OUSD RE	23797 Digital Development and Test Transformation **Vu Hoang** Consulting Engineer System Architect, Northrop Grumman **Shailesh Sujanani** Manager Software Engineering, Northrop Grumman
3:20 – 3:50 pm	23772 Concept for Establishing Consistent System Digital Representation Across the System Lifecycle at All Required Fidelities **Dr. Charles Sanders** M&S SME, Army Modeling and Simulation Office	23720 An Argument for Why the Future of Requirements Lies in Model-Based Systems Engineering **Chris Swickline** Systems Architect, Northrop Grumman	23773 Agile Authorizations Approach to Risk Management Framework **Daniel Holtzman** USAF Director, Cyberspace Innovation, SAF/CN	23816 The Automation Framework: Using Data Volume, Variety, and Veracity to Accelerate DevSecOps **Kevin Visalli** Director of Software Products, Epsilon Systems Solutions, Inc.
3:55 – 4:15 pm	**NETWORKING BREAK**			

	1D1 – Digital Engineering	1D2 - Model-Based Systems Engineering	1D3 - Systems Security Engineering	1D4 – Test & Evaluation
Moderator	Chris Schreiber	David Allsop	Cory Ocker	Jeff Bilco
4:15 – 4:45 pm	23784 Ontologies for Engineering with Examples: A Pragmatic Perspective **Dr. Mark Blackburn** Senior Research Scientist, Stevens Institute of Technology	23721 A Vision for High Fidelity Multi-Disciplinary Simulation Built Surrogates Influencing the Design and Assessment of Military Systems **Dr. Scott Morton** Associate Director, DoD HPCMP, U.S. Army ERDC/ITL	23872 Army Cyberspace Survivability **Matthew Picerno** Chief Cyber Acquisition Officer, U.S. Army, ASA(ALT)	23839 Capabilities Based Acquisition **Ken Senechal** Director for Naval Capabilities Based T&E, Vice Systems Engineering
4:50 – 5:20 pm	23963 Acquisition and Sustainment Data Package (ASDP) and Contractual Language **Nicholas Shouse** AFLCMC/EZSI SE TA / AFMC LOE 2431 Co-lead, AFLCMC/EZSI - AFMC Digital Campaign	23776 MBSE Placeholder Pattern **Michael Reynolds** Systems Engineer, L3Harris Corp **David Wood** Senior Systems Engineer, Applied MBSE	23825 System Security Engineering and Anti-Tamper in the DoDI 5000.02 Operation of the Adaptive Acquisition Framework Policy Series **Randy Woods** System Security Engineering & Anti-Tamper Director, STPE, OUSD RE	23829 Developmental Test and Evaluation (DTE&A) and Cyberattack Resilient Systems **Dr. Peter Beling** Professor and Associate Director, Virginia Tech Intelligent Systems Laboratory
5:25 – 5:55 pm	23970 Advancing the State of R&M Engineering Practice to Deliver Reliable, Maintainable, and Supportable Advanced Capabilities to the Warfighter **Chris DeLuca** Director, Specialty Engineering OUSD(R&E)	23878 Lessons Learned in the Creation a Digital Thread **Dr. Steven Dam** President and COO, SPEC Innovations	23743 Recommendations for Systems Analysis in Support of Secure Architecture in Acquisition **Rich Kutter** Technical Advisor, Embedded Computing, AFLCMC Engineering Directorate	Test & Evaluation Panel MBSE as an enabler for Navy Capabilities Based Test & Evaluation **Introductions: Mike Rabens** Chair, Industrial Committee on Test and Evaluation **Moderator: Joe Manas** Raytheon Missiles & Defense **Ken Senechal** Director for Naval Capabilities Based T&E, Vice Systems Engineering **Virginia Aguilar** Raytheon Missiles & Defense **Kelly Zimmerman** Boeing **Policarpio Soberanis** Northrop Grumman **David Harrison** Lockheed Martin
6:00 – 6:30 pm		23757 Integrating Digital Engineering Technical Models with MBSE Cost Models **Dr. Mark Blackburn** Senior Research Scientist, Stevens Institute of Technology	23774 Cyber Supply Chain Risk A System Security Engineering Requirement **Holly Dunlap** Senior Principal Engineer, System Security Engineering, Raytheon Missiles & Defense NDIA Systems Engineering Division Chair	

TUESDAY, DECEMBER 7

CONCURRENT BREAKOUT SESSIONS

	2A1 – Digital Engineering	2A2 - Model-Based Systems Engineering	2A3 - Systems Security Engineering	2A4 – Integrated Program Management
Moderator	**Chris Schreiber**	**David Allsop**	**Cory Ocker**	**Stewart Tague** **Linda Adams**
9:00 – 9:30 am	INCOSE Digital Engineering Information Exchange Working Group **Sean McGervey** DEIXWG Chairperson	23799 Measurement Framework Design for Digital and Model-Based Engineering **Kaitlin Henderson** PhD Candidate, Virginia Tech	23810 Managing Supply Chain Complexity with the Acquisition Security Framework **Dr. Carol Woody** Principal Researcher, SEI	23739 A Rocket Scientist's Approach to Launch Vehicle Flight Risk Management **Leo Childs** Chief Engineer, Mission Assurance Branch Space Systems Command – Launch Enterprise **Andy Inkeles** Senior Manager, Risk and Innovation Management Space Systems Command – Launch Enterprise **Col John Strizz, USAF** Chief Engineer Space Systems Command – Launch Enterprise
9:35 – 10:05 am	23742 Information Security Marking for MagicDraw® Models **Tom Alberi** Chief Scientist, Johns Hopkins University Applied Physical Lab	23740 Guide for Best Practices for Model Portfolio Management **Misak Zetilyan** Senior Project Engineer, The Aerospace Corporation **Jordan Howie** Member of Technical Staff, The Aerospace Corporation	23717 Right to Left and Outside-In: Systems Engineer's Role in Software-Dominant Organizations of the 21st Century – Special Emphasis on Cyber Security and the DoD **Dr. Kenneth Nidiffer** Professor, George Mason University	23901 The Most Important Trades Often Happen During Project Planning: Using Set-Based Practices to Optimize Those Trade-Off Decisions **Brian Kennedy** CTO, Targeted Convergence Corporation
10:10 – 10:40 am	23853 Leveraging the Digital Thread for ESOH Acquisition and Design **Dirk Zwemer** President, Intercax LLC	23836 Integrating MBSE and Product Lifecycle Management **David Segal** Senior Director, Federal, Aerospace and Defense, PTC	23847 Software Modernization and the Joint Federated Assurance Center **Bradley Lanford** Software Assurance Lead, OUSD(R&E) / SAIC	The Negatively Pressurized Conex (NPC) Program – How Acquisition and Systems Engineering Agility Delivered Capability to United States Transportation Command in 95 Days **Lt Col Paul Hendrickson, USAF** Materiel Leader, AF CBRN Defense Systems
10:40 – 11:00 am	**NETWORKING BREAK**			

	2B1 - Digital Engineering	2B2 - Model-Based Systems Engineering	2B3 - Systems Security Engineering	2B4 - Integrated Program Management
Moderator	Chris Schreiber	David Allsop	Cory Ocker	Stewart Tague Linda Adams
11:00 – 11:30 am	23756 The Importance of Metadata for the Discovery of Digital Engineering Artifacts **Dr. James Coolahan** Chief Technology Officer, Coolahan Associates, LLC	23837 The MBSE Digital Thread for Systems Failure Prediction **David Segal** Senior Director, Federal, Aerospace and Defense, PTC	23782 Security in the Future of Systems Engineering (FuSE), a Roadmap Review of Foundation Concepts **Rick Dove** Strategist, Independent	23900 Incorporating Technical Measures of Performance into Project Metrics **Chris Hassler** Software Support Specialist, SNA Software, LLC **Nick Pisano** President and CEO, SNA Software, LLC
11:35 am – 12:05 pm	23791 Taking Authority Over Your Modeling Enterprise: ManTech's Elastic Model Governance Approach **Dr. Heidi Davidz** Intelligent Systems Engineering SME, ManTech International Corporation		23852 Closing the Systems to Silicon Gap: MBSE-Enabled Digital Electronics Verification **Dr. Lisa Murphy** Technology Consultant, Siemens Industry Software	23752 Agile Program Management - Moving From Predictive Planning to Empirical Planning **Robin Yeman** Chief Technical Officer, Catalyst Campus
12:10 – 12:40 pm		23848 Use of SysML for Launch System Reliability and Availability Modeling **Myron Hecht** Senior Project Leader, Aerospace Corp	23869 Exemplar Design Patterns for Cyber Resilience **Brooke Guare** Cybersecurity Engineer, JHU/APL	23842 Conflict Is Your Friend - Managing Healthy Conflict in the Systems Engineering Workplace **Zane Scott** Vice President, Professional Services, Vitech

12:40 – 1:10 pm	NETWORKING LUNCH BREAK			
	2C1 – Digital Engineering	**2C2 - Model-Based Systems Engineering**	**2C3 – Systems Security Engineering**	**2C4 -System of Systems**
Moderator	Chris Schreiber	David Allsop	Cory Ocker	Dr. Judith Dahmann
1:10 – 1:40 pm	23948 Latest Developments with the Semantic Broker **Mark Schriner** Chief Digital Engineer, SAIC	23877 Modeling and Analysis of Standard Operating Procedures **Dr. Steven Dam** President and COO, SPEC Innovations	23763 Panel Discussion: Zero Trust for Hardware Security **Donald Davidson (moderator)** Director, Cyber-SCRM Programs, Synopsys **Dr. Zachary Collier** President, Collier Research Systems **Michael Bear** Technical Director - Systems Engineering, BAE Systems **David Pentrack** Senior Electronics Engineer, Defense Microelectronics Activity **Daniel Dimase** President & CEO, Aerocyonics	23809 Feature-based Product Line Engineering in Aerospace and Defense **Dr. Charles Krueger** CEO, BigLever Software
1:45 – 2:15 pm	23949 DID Modeling to Support the DoD Program Life Cycle **Robert Wojcik** Senior Member of the Technical Staff, Software Solutions Division, Software Engineering Institute, Carnegie Mellon University	23899 Application of Agile MBSE on EMD Program **Tamara Hambrick** Director Systems Engineering, Northrop Grumman Corporation		23903 Leveraging Set-Based Practices to Make Agile Practices More Effective for System-of-Systems Engineering **Brian Kennedy** CTO, Targeted Convergence Corporation
2:20 – 2:50 pm	23906 Intellectual Property Considerations in Digital Engineering Implementation for Acquisition in the DoD **John Daly** Chief Engineer, Booz Allen Hamilton	23807 A State-Based Approach for ESOH Analysis **Michael Vinarcik** Chief Systems Engineer, SAIC	**Architecture** **Edward Moshinsky** Moderator 23973 OUSD(R&E) Systems Engineering Modernization Strategy **Nadine Geier** Director, Systems Engineering OUSD (R&E) **Dr. Kelly Alexander** Chief Engineer, Systems Engineering Modernization (OUSD R&E)	23926 Tilting at Windmills: Value Chains, Risk, Opportunity, and the 2021 Texas Electricity Grid Failure **Matthew Hause** Principal, SSI
2:55 – 3:25 pm	23930 – Embry Digital Engineering Requirements for Evolving Design and Analysis Tools **Paul Embry** Digital Engineering, L3Harris Technologies	23911 Product Line Engineering in the New Age of Digital Engineering **Dr. Charles Krueger** CEO, BigLever Software	23731 Overview of the Revised Standard on Architecture Description – ISO/IEC 42010 **Dr. James Martin** Principal Engineer, The Aerospace Corporation	23961 Systems of Systems and Complexity: INCOSE Initiative **Dr. Judith Dahmann** Technical Fellow, MITRE
3:25 – 3:45 pm	NETWORKING BREAK			

	2D1 – Digital Engineering	2D2 - Model-Based Systems Engineering	2D3 - Architecture	2D4 – Human Systems Integration
Moderator	Chris Schreiber	David Allsop	Edward Moshinsky	Matthew Risser
3:45 – 4:15 pm	23928 A View of The Digital Engineering Process **Jeffery Bryson** Systems Engineer, Northrop Grumman		23916 Air Force Government Reference Architectures: Strategy, Approach, Challenges, and Path Forward **Robert Bond** Plans and Program Engineer, Systems Engineering Division (AFMC/ENS)	
4:20 – 4:50 pm	23965 Digital Engineering Competency Framework (DECF) **Dr. Nicole Hutchison** Research Engineer, Systems Engineering Research Center	23915 The Impact of Technical Debt in Requirements on Product Lines and Composable Components **Larri Rosser** RIS Chief Architect, Raytheon Intelligence and Space	23732 Enterprise Architecture Guide for the Unified Architecture Framework (UAF) **Dr. James Martin** Principal Engineer, The Aerospace Corporation	23918 Human Systems Centered Digital & Mission Engineering (HSCDME) within a Model Based Human Systems Engineering (MBHSE) Approach **Dr. C.J. Hutto** Senior Research Scientist, Georgia Tech Research Institute
4:55 – 5:25 pm	23793 An Elastic Approach to Digital Engineering **Matthew Taylor** Intelligent Systems Engineering SME, ManTech International	23941 Feature Based Product Line Engineering: What, Why, and How to Do It Best! **Rowland Darbin** Working Group Chair, INCOSE	23855 UAF in Practice **Eran Gery** WW A&D Solutions Lead, IBM Engineering Solutions	23749 Mission Engineering Approach for Influencing Warfighter Actions using Computational Social Sciences (IWACSS) **Dr. Paul Hershey** Principal Engineering Fellow, Raytheon Technologies
5:30 – 6:00 pm	23765 Updating DoD Policy and Guidance for Modeling and Simulation (M&S) Verification, Validation and Accreditation (VV&A) **Philomena Zimmerman** Director, ET&E OUSD (R&E) **Joseph Carnell** Systems Engineer (Support), OUSD(R&E)	23978 Model-Based Requirement Authoring Approach to Improve Efficiencies in the DoD RFP Process **Richard Wise** Senior Research Engineer, Georgia Tech Research Institute	23894 Defining Architecture Requirements for Results that Deliver: Open, Flexible, Scalable, Sustainable **Gordon Hunt** Vice President of Skayl, LLC	

WEDNESDAY, DECEMBER 8

CONCURRENT BREAKOUT SESSIONS

	3A1 – Engineered Resilient Systems: Program Achievements	3A2 – Mission Engineering	3A3 — Architecture	3A4 – Education & Training
Moderator	Lois Hollan	Dr. Judith Dahmann	Robert Scheurer	Dr. Robert Raygan
9:00 – 9:30 am	Engineered Resilient Systems: Digital Engineering and Computational Testing **Dr. Robert Wallace** ERDC ITL and ERS Technical Director	Mission Engineering Panel - Importance and Advancement of Mission Engineering **Elmer Roman** Director Mission Integration, OUSD (R&E) **Christopher O'Donnell** Performing the Duties of the Assistant Secretary of Defense for Acquisition, OUSD (A&S) **Dr. Paul Dreyer** Corporate Director of Modeling, Simulation, and Analysis, Northrup Grumman Corporation **Representative Joint Staff J8**	23929 AI for Meta-Systems Architecting Meta-System Architecting for AI **Dr. Cihan Dagli** Professor, Missouri University of Science & Technology	
9:35 – 10:05 am	Government Built, Production Quality, Multi-Disciplinary, Multi-Fidelity Software for Acquisition Engineering Support **Dr. Scott Morton** Associate Director, DoD HPCMP		23806 Encapsulating Variability: Applying Design Structure Matrices to Righting Software's Principles **Michael Vinarcik** Chief Systems Engineer, SAIC	23724 A Systems Engineering Approach to Cyber SCRM **Alexander Wright** Computer Scientist, U.S. Air Force
10:10 – 10:40 am	Transforming Design Requirements and Evaluation Through Effectiveness-Based Design Measures **Dr. Ian Dettwiller** Program Manager, U.S. Army ERDC Information Technology Lab		23922 You Can't Touch This: Logical Architectures in the MBSE and the UAF **Matthew Hause** Principal, SSI	23843 Making Your Case-Negotiation and Persuasion for The Systems Engineer **Zane Scott** Vice President for Professional Services, Vitech
10:40 – 11:00 am	**NETWORKING BREAK**			

	3B1 - Engineered Resilient Systems: DARPA CRANE Project	3B2 - Mission Engineering	3B3 – Architecture	3B4 – Education & Training
Moderator	Lois Hollan	Dr. Judith Dahmann	Robert Scheurer	Dr. Robert Raygan
11:00 – 11:30 am	DARPA Control of Revolutionary Aircraft with Novel Effectors (CRANE) Program Philosophy and Achievements **Dr. Alexander Walan** Program Manager, DARPA Tactical Technology Office (TTO)	23974 Overview of R&E Mission Analysis and Methodology **Marc Goldenberg** Chief Engineer, Mission Engineering, OUSD(R&E) **Dr. Judith Dahmann** Technical Fellow, MITRE	23898 DEWS Open Reference Architecture Development **Dr. Steven Davidson** Chief Scientist for Systems Architecture, MITRE Corporation	23844 The Overlooked Power of Systems Thinking **Zane Scott** Vice President, Professional Services, Vitech
11:35 am – 12:05 pm	Unique Public-Private Partnerships Provide HPC-Enabled, High-Fidelity Design and Analysis Techniques for Industry Engineering Teams T that Speed Development **Dr. Justin Foster** Research Mechanical Engineer, U.S. Army ERDC Information Technology Lab	23769 Mission Engineering Digital Ecosystem **Dr. Owen Eslinger** Computer Scientist, U.S. Army Engineer Research and Development Center (ERDC) **Darryl Howell** Engineering Tools and Environments, OUSD(R&E)	23876 Implementing SysML 2.0 **Dr. Steven Dam** President and COO, SPEC Innovations	23866 Toxic Substances Control Act (TSCA) Risk Management Impacts to the Defense Industrial Base (DIB) **Drew Rak** Senior Environmental Health Scientist, Noblis
12:10 – 12:40 pm	Incorporating Active Flow Control Technology into Aircraft Design for DARPA's CRANE Program **Juan Montoro** Manager, Conceptual Design and ADP Program Manager, Lockheed Martin Aeronautics	23957 Mission Engineering Landscape – A Federally Funded Research and Development Center (FFRDC) View **Dr Judith Dahmann** Technical Fellow, MITRE **Meg Adams** Technical Fellow, MITRE		23802 Scaled Agility in the DoD Acquisition Environment **Dr. Michael Orosz** Research Director/ Professor, USC Information Sciences Institute
12:40 – 1:10 pm	**NETWORKING LUNCH BREAK**			

	3C1 - Engineered Resilient Systems	3C2 - Mission Engineering	3C3 – Modular Open Systems Approach	3C4 – Education & Training
Moderator	Lois Hollan	Dr. Judith Dahmann	Edward Moshinsky	Dr. Robert Raygan
1:10 – 1:40 pm	23846 Using Value Engineering to Propel Cyber-Physical Systems Acquisition **Alfred Schenker** Software Solutions Division, Carnegie Mellon University/ Software Engineering Institute	23975 Reusable Digital Engineering Environment to Support Mission Engineering Studies **Marc Goldenberg** Chief Engineer, Mission Engineering, OUSD(R&E) **Dr. Judith Dahmann** MITRE **Michael Pennock** MITRE **Gabriela Driscoll** MITRE	23971 Assessing MOSA – New Methods to Develop Quantitative Assessment Criteria **Nadine Geier** Director, Systems Engineering, OUSD(R&E) **John Tindle** Systems Engineer, OUSD (R&E)	Education and Training Panel: Transformation of Defense Workforce **Stephanie Possehl** Acting Deputy Director for Engineering (DD, ENG), OUSD Research and Engineering **Dr. Laura Milham** Deputy Director, Advanced Distributed Learning Initiative, OUSD Personnel and Readiness **Dr. Cliff Whitcomb** Systems Engineering Professor, Naval Postgraduate School / INCOSE Systems Engineering Editor **RADM (Ret) Mike Manazir** Vice President, Government Services Sales Boeing Global Services / Chair, National Defense University Executive Committee **Dave Pearson** Director, Engineering and Technology and Test & Evaluation Centers, Defense Acquisition University
1:45 – 2:15 pm	23856 Protection of Software for the Adaptive Acquisition Framework **Bradley Lanford** Software Assurance Lead, OUSD(R&E) / SAIC	23890 Implementing Digital Engineering Environment for Mission Engineering **Jon Kim** Principal, Business and Technology Strategist, MITRE Corporation **Zach Moore** JS J8 JIAMDO/ Systems Engineer	23908 Intellectual Property Considerations for Modular Open Systems (MOSA) Implementation in the DoD **Patrick Bains** Engineer, Booz Allen Hamilton	
2:20 – 2:50 pm	23824 Application of Criticality Analysis to Risk Based Engineering Design **Randy Woods** System Security Engineering & Anti-Tamper Director, STPE, OUSD RE	23939 Towards Mission Engineering in a MOSAIC Warfare Context using Explainable AI **Dr. Daniel DeLaurentis** Professor, Purdue University	23972 DoD MOSA Community of Practice (CoP) Update **Nadine Geier** Director, Systems Engineering, OUSD(R&E) **Nathaniel Barley** Systems Engineer, OUSD (R&E)	
2:55 – 3:25 pm		23864 Mission-Level Optimization: A New Method for Designing Successful Systems **Dr. Brian Chell** Postdoctoral Researcher, Systems Engineering Research Center		
3:25 – 3:45 pm	**NETWORKING BREAK**			

	3D1 - Agile	3D2 – Mission Engineering	3D3 – Environment, Safety, & Occupational Health	3D4 – Education & Training
Moderator	John Daly	Dr. Judith Dahmann	Sherman Forbes Diane Dray	Dr. Robert Raygan
3:45 – 4:15 pm	23753 Agile Across the Value Stream **Robin Yeman** Chief technical Officer, Catalyst Campus	23804 Network Digital Twins for 21st Century Wargaming **Jeremy Smith** Account Manager, Navy and Marine Corps, SCALABLE Network Technologies	23813 Best of Both Worlds: Implementing The National Defense Strategy In A Resilient, Safe and Sustainable Way **David Asiello** Program Manager OUSD (A&S)/ODASD(E&ER)	
4:20 – 4:50 pm	23792 USAF Digital Campaign Think Big, Start Small, Scale Fast **Chris Garrett** Technical Advisor for SE, AFLCMC/EN-EZ	23889 Model Based Systems Engineering in a Digital Environment: Creating a Virtual Testbed for Complex System Architectures **Claudeliah Roze** Technical Director, Mission Modernization Solutions	23950 Revising MIL-STD-882 **Lee Wood** Booz Allen Hamilton	23822 Cyber Resilient Weapon System Body of Knowledge (CRWS-BoK) **Burhan Adam** Program, Policy, Guidance, and Standards Director - STPE, OUSD RE **Angela Lungu** CRWS-BoK Project Lead Senior System Security Engineer, Support to OUSD(R&E), Resilient Systems **Madison Rudy** CRWS-BoK Lead Analyst, Support to OUSE(R&E), Resilient Systems
4:55 – 5:25 pm			23937 Lessons Learned from Implementing New NAS411 Requirements **Yvonne Pierce** Engineer, The Boeing Company	23966 Individual and Organizational Systems Engineering Effectiveness **Dr. Nicole Hutchison** Research Engineer, Systems Engineering Research Center
5:30 – 6:00 pm	23814 Agile Insight - Gating Alternatives for Agile Programs **Larri Rosser** Engineering Fellow, Raytheon Intelligence and Space	23892 Probabilistic Graphical Models to Support Trade Study Evaluation and Scoring to Support Navy POM Budget Assessments **Jason Baker** Research Engineer, Georgia Tech Research Institute	23895 Impact of the American Innovation and Manufacturing Act on DoD **Peter Mullenhard** Environmental Engineer, DoD ODS Subcommittee (BMT)	23770 Developing a Digital Engineering Body of Knowledge for the DoD **Philomena Zimmerman** Director, ET&E OUSD (R&E) **Mary Davidson** Engineering Tools and Environments, OUSD(R&E) **Frank Salvatore** Engineering Tools and Environments, OUSD(R&E)

LIVE SESSIONS

Model Readiness Levels: A Mathematical Construct for Validation and Trust

1C1 – Digital Engineering • 23751

Dr. Darryl Ahner

Model validation is a contentious and ill-defined practice within DoD. Development of a Model Readiness Level (MRL) Framework serves two purposes: 1) provides developers a clear standard to develop their models, and 2) provides decision makers a better construct to understand risk to make decisions.

Model-Based Systems Engineering Panel

1C2 – Model-Based Systems Engineering

Jonathan Backhaus | David Allsop

System Security Committee & Track Welcome

1C3 – Systems Security Engineering • 23951

Cory Ocker

The National Defense Industrial Association (NDIA) System Security Engineering Committee's mission is to promote System Security Engineering integration into the Systems Engineering and Mission Assurance processes in the Department of Defense (DoD) acquisition of weapon systems. The committee fosters the development of System Security Engineering methods, tools, techniques, and processes required for the role of System Security Engineers, and provides a forum for the open exchange of ideas and concepts between government, industry, FFRDC and academia. The committee also works to develop a new understanding of System Security Engineering and the critical role it plays to ensure system survivability in a cyber contested environment. This briefing will introduce the audience to the committee, provide a status update on completed, ongoing, and future projects as well as invitations/ opportunities for additional engagement.

Mission Engineering and Digital Engineering Enabling a Unified Evaluation Framework

1C4 – Test & Evaluations • 23764

Dr. Suzanne Beers

The OSD DTE&A, DOT&E, and Service T&E communities have come together to develop a Unified Evaluation Framework (UEF) to guide evaluation-focused full continuum test planning to inform decision-making throughout adaptive acquisition framework (AAF) system life cycles.

Integrating Digital Engineering and Modeling and Simulation to Support Technology Adoption in Department of Defense Systems

1C1 – Digital Engineering • 23766

Philomena Zimmerman | John Daly

This presentation will discuss the benefits, challenges, and emerging concepts that meet the challenges in integrating digital engineering with modeling and simulation to improve technology adoption in defense systems.

Technology and Program Protection in the Department of Defense

1C3 – Systems Security Engineering • 23823

Melinda Reed

The recently published Department of Defense Instruction (DoDI) 5000.83, "Technology and Program Protection to Maintain Technological Advantage" establishes the overarching technology protection policy for both DoD-sponsored research and technology activities and defense acquisition programs. This presentation addresses the new policy changes and efforts underway to implement the policy including the impact of the new Acquisition Pathways.

Digital Development and Test Transformation

1C4 – Test & Evaluations • 23797

Vu Hoang | Shailesh Sujanani

Over the last few decades little has changed in the design, test, and build processes in the Aerospace Defense Industry. Due to this the Department of Defense (DoD) has challenged companies by contractually obligating them to be Agile and conform to the DoD Enterprise DevSecOps Reference Design. The motivation behind this shift comes out of the need to keep up with our adversaries and to tackle the challenges of first time quality and reduced delivery time.

Concept for Establishing Consistent System Digital Representation Across the System Lifecycle at All Required Fidelities

1C1 – Digital Engineering • 23772

Dr. Charles Sanders

This presentation proposes a concept for digital engineering infrastructure for the collection, curation, and sharing of systems digital representation across the system lifecycle.

An Argument for Why the Future of Requirements Lies in Model-Based Systems Engineering

1C2 – Model-Based Systems Engineering • 23720

Chris Swickline

This paper presents an argument for why our approach to requirements must or will change as a result, in part, of the Digital Engineering movement.

Agile Authorizations Approach to Risk Management Framework

1C3 – Systems Security Engineering • 23773

Daniel Holtzman

Applying an agile foundational Systems Engineering / Systems Engineering approach to the Risk Management Framework Execution, via the DAF Fast Track Process. Assessing Risk of Use in an informed operational context.

The Automation Framework: Using Data Volume, Variety, and Veracity to Accelerate DevSecOps

1C4 – Test & Evaluations • 23816

Kevin Visalli

This presentation will discuss The Automation Framework (TAF), describing how it accelerates the DevSecOps process by automating software testing. TAF is equipped to handle the volume and variety of very large modern datasets, while ensuring the veracity, accuracy, and reliability of that data. Mr. Visalli will address the problems that TAF solves, how it benefits various programs, and the future of TAF in the transformation and modernization of today's defense landscape.

Ontologies for Engineering with Examples: A Pragmatic Perspective

1D1 – Digital Engineering • 23784

Dr. Mark Blackburn

This presentation will explain and demystify the fundamental aspect of ontologies, and how they enable technologies referred to as semantic web technologies (SWT). This is a key enabler for realizing the intent of the Digital Engineering Strategy. Given that tool-to-tool integration is fragile and cannot be sustained, Ontologies allow us to realize semantically consistent and rich interoperability at the data level. This presentation will provide examples that discuss how ontologies and SWT can be used to support engineering analysis and design.

A Vision for High Fidelity Multi-Disciplinary Simulation Built Surrogates Influencing the Design and Assessment of Military Systems

1D2 – Model-Based Systems Engineering • 23721

Dr. Scott Morton

This presentation describes a software infrastructure to support a vision for a digital transformation of US DoD acquisition using Physics Based Analytics, Data Driven Analytics, Surrogates, and Decision Support Apps being developed by the DoD High Performance Computing Modernization Program (HPCMP) Computational Research and Engineering Acquisition Tools and Environments (CREATE) program available to the government and industry.

Army Cyberspace Survivability

1D3 – Systems Security Engineering • 23872

Matthew Picerno

Implementing systems security engineering to enable Army Multi-Domain Operations through a total force arsenal that is survivable in cyberspace.

Capabilities Based Acquisition

1D4 - Test & Evaluations • 23839

Kenneth Senechal

Capabilities Based Acquisition (CBA) is fundamentally changing how we do acquisition. Using a model based system-engineering construct, we utilize warfare analysis and mission engineering to understand the concept of employment (CONEMP) to fight the future war. We then leverage our partnership with our operational test agency to build the final exam to provide the foundation that breaks down the tasks, conditions, systems, and performance attributes required for our acquisition programs to win that future war. The requirements/behaviors derived via this methodology are all captured in a SysML model. The linking of system models allows for gap identification along with early and ongoing trade space analysis. Likewise, our training and sustainment communities leverage the same CONEMP to build an overarching training curriculum and sustainment plan to enable the fleet to employ and sustain the new capabilities when delivered.

Acquisition and Sustainment Data Package (ASDP) and Contractual Language

1D1 – Digital Engineering • 23963

Nicholas Shouse

For successful digital transformation, the model-based acquisition and systems engineering processes need to be understood and the enterprise data architecture must be defined. The government must ensure weapon system program model-based data content is delivered by contract and useable across the tools in the Air Force's Integrated Digital Environment (IDE). To do this, we must be able to consistently dictate the appropriate data requirements on contract via the SOW, CDRLs and DIDs.

MBSE Placeholder Pattern

1D2 – Model-Based Systems Engineering • 23776

David Wood | Mike Reynolds

This presentation describes a modeling pattern that, coupled with a component library, accelerates the development of a system model and allows architectural trades and analysis to be completed early in the development lifecycle

System Security Engineering and Anti-Tamper in the DoDI 5000.02 Operation of the Adaptive Acquisition Framework Policy Series

1D3 – Systems Security Engineering • 23825

Randy Woods

As the Department of Defense Instruction (DoDI) 5000.02 Adaptive Acquisition Framework (AAF) Series policies are implemented, this presentation will discuss how Systems Security Engineering (SSE) and Anti-Tamper (AT) are accounted for under the updates. This presentation will focus on how the DoDI 5000.83 provides for both SSE and AT protections for various pathways.

Developmental Test and Evaluation (DTE&A) and Cyberattack Resilient Systems

1D4 – Test & Evaluations • 23829

Dr. Peter Beling

The research objective is to normalize expectations, enhance quality, and create reuse opportunities associated with the development of test plans related to achieving operational cyber-attack resilience for physical systems.

Advancing the State of R&M Engineering Practice to Deliver Reliable, Maintainable, and Supportable Advanced Capabilities to the Warfighter

1D1 – Digital Engineering • 23970

Chris DeLuca

This presentation will discuss modernized reliability and maintainability (R&M) practices such as instantiating digital engineering into R&M and advancing software development practice to provide reliable, maintainable, and supportable capabilities to the warfighter.

Lessons Learned in the Creation a Digital Thread

1D2 – Model-Based Systems Engineering • 23878

Dr. Steven Dam

For Digital Engineering to become a reality, many people envision that this requires systems and design engineering tools be fully integrated. This paper will discuss some of the lesson learned so far in developing a digital thread for a DoD customer.

Recommendations for Systems Analysis in Support of Secure Architecture in Acquisition

1D3 – Systems Security Engineering • 23743

Rich Kutter

Cybersecurity is often viewed through a risk and issue lens. Traditional systems engineering is founded on the integration of system analysis and design trades throughout the system life cycle. We will discuss how to leverage an understanding of cyber adversity into the systems engineering framework via systems analysis and trades. We will address understanding of the architectural contributions to the technical risks and issues to be addressed in the development of a Cyber Secure Resilient and Survivable Architectures for a weapon system.

Test & Evaluation Panel: MBSE as an enabler for Navy Capabilities Based Test & Evaluation

1D4 – Test & Evaluations

Mike Rabens | Ken Senechal | Virginia Aguilar | Joe Manas | Kelly Zimmerman | Policarpio Soberanis | David Harrison

MBSE as an enabler for Navy Capabilities Based Test & Evaluation

Integrating Digital Engineering Technical Models with MBSE Cost Models

1D2 – Model-Based Systems Engineering • 23757

Dr. Mark Blackburn

The presentation summarizes Digital Engineering modeling methods that produce artifacts for a "full stack" of technical models that are linked with a Cost Model using a Model-Based Systems Engineering (MBSE) methodology. We discuss this method using a NAVAIR Surrogate Pilot use cases for a search and rescue mission, and a hypothetical unmanned air vehicle (UAV) system called Skyzer. The "Full Stack" of models include mission, system and a contractor request for proposal response models (i.e., technical models).

Cyber Supply Chain Risk A System Security Engineering Requirement

1D3 – Systems Security Engineering • 23774

Holly Dunlap

This presentation will introduce Cyber Supply Chain Risk Management (SCRM). Cyber SCRM requires a partnership between System Security Engineers (SSE) and Supply Chain. Cyber SCRM manages the inherent risks of the global supply chain threats and vulnerabilities to system mission critical functions and system mission critical components we procure from our suppliers and suppliers' suppliers. We will review DoD policy, customer requirements, and NIST standards.

NCOSE Digital Engineering Information Exchange Working Group

2A1 – Digital Engineering

Sean McGervey

The INCOSE Digital Engineering Information Exchange Working Group (DEIXWG) has been working closely with the US DoD, industry partners, and academic organizations to advance a critical aspect of Digital Engineering: how to exchange digital work products between organizations in a semantically meaningful way. Since its inception in late 2017 due to the support of OSD(R&E), the DEIXWG has been modeling a conceptual ontology for describing digital work products and the information they contain. With that ontology in hand, the DEIXWG has been soliciting stakeholder needs from the broader community in the form of desired information exchange scenarios that require combining data from a variety of different digital sources. This presentation will provide an overview of the DEIXWG's ongoing activities and a look ahead at future efforts.

Measurement Framework Design for Digital and Model-Based Engineering

2A2 – Model-Based Systems Engineering • 23799

Kaitlin Henderson

A causal model is presented that links the primary benefits of Digital Engineering (DE) transformation to benefit measures and related enterprise adoption measures. The causal model is being used to develop a community set of standard DE measurement specifications. This presentation will discuss the development of the causal model and subsequent use to design standard measurement processes for DE.

Managing Supply Chain Complexity with the Acquisition Security Framework

2A3 – Systems Security Engineering • 23810

Dr. Carol Woody

In systems design, we see engineers decompose the system into its technology components and delegate requirements to these various pieces. In many cases these pieces may be bought, reused, or downloaded to meet programmatic needs driven by cost and schedule without consideration of the inherited risks these options bring to the overall system. To make the challenge more difficult, the number of disparate pieces and participants continue to expand to ever more specialized groups and third-party suppliers. These complexities in conjunction with the evolving threat environment require that new methods be deployed to help manage systems across their lifecycle. The Acquisition Security Framework (ASF) which is built on proven approaches to acquisition, engineering and deployment provides innovative approaches that can help with managing these challenges and complexities. The ASF is collection of cybersecurity practices that an acquisition program should perform when acquiring a software-intensive system.

A Rocket Scientist's Approach to Launch Vehicle Flight Risk Management

2A4 – Integrated Program Management • 23739

Leo Childs | Andy Inkeles | Col John Strizzi

The United States Space Force's (USSF) National Security Space Launch (NSSL) organization developed a Technical Issue Resolution Process (TIRP) as a standard to consistently assess and determine flight risk due to specific Launch Vehicle (LV) technical issues. If not adequately addressed, these technical issues may result in a launch failure. This presentation will describe and provide unique insights into the NSSL methodology for assessing the potential of launch failure (i.e., flight risk) as driven by an identified technical issue on the NSSL Program.

Information Security Marking for MagicDraw® Models

2A1 – Digital Engineering • 23742

Tom Alberi

A description and demonstration of the latest version of Johns Hopkins University Applied Physics Laboratory's Information Security Plugin for the MagicDraw® modeling tool.

Guide for Best Practices for Model Portfolio Management

2A2 – Model-Based Systems Engineering • 23740

Misak Zetilyan | Jordan Howie

The Model Portfolio Management (MPM) guide identifies goals and practices necessary to manage an organization's portfolio of models. It defines the specific actions and work products to ensure that the collection of models meet organizational needs, are maintained, and integrated. The goal is to streamline and organize the management of models across a portfolio so that models are accessible, relevant, and the full breadth of models is known.

Right to Left and Outside-In: Systems Engineer's Role in Software-Dominant Organizations of the 21st Century – Special Emphasis on Cyber Security and the DoD

2A3 – Systems Security Engineering • 23717

Dr. Kenneth Nidiffer

This presentation leverages the work of an international team that has examined key challenges in finding meaningful roles for systems engineering in the secure joint development and operations (briefly, Dev/Sec/Ops)-dominant software engineering/computer science

world. It addresses the systems engineer's role in software-dominant organizations of the 21st Century with a special emphasizes on cyber security and the DoD.

The Most Important Trades Often Happen During Project Planning: Using Set-Based Practices to Optimize Those Trade-Off Decisions

2A4 – Integrated Program Management • 23901

Brian Kennedy

Some of the most critical design decisions are locked in during the project planning effort, before trade studies have typically been run. Project managers should leverage set-based practices to reverse that, so they can properly optimize those critical trade-off decisions.

Leveraging the Digital Thread for ESOH Acquisition and Design

2A1 – Digital Engineering • 23853

Dirk Zwemer

State-of-the art practices in digital transformation MBSE and DevOps support the effective incorporation of ESOH issues in defense programs.

Integrating MBSE and Product Lifecycle Management

2A2 – Model-Based Systems Engineering • 23836

David Segal

Model-Based Engineering (MBE) is an "approach to engineering that uses models as an integral part of the technical baseline that includes the requirements, analysis, design, implementation, and verification of a capability, system, and/or product throughout the acquisition life cycle." This includes system development from concept through to manufacturing and distribution. MBE is wide in scope in that it encompasses the entire lifecycle process. This approach requires integrated digital engineering tools that provide traceability, interoperability and exchange throughout the development lifecycle including between systems engineering and Product Lifecycle Management (PLM)"

Software Modernization and the Joint Federated Assurance Center

2A3 – Systems Security Engineering • 23847

Bradley Lanford

With the adoption of the DoD Adaptive Acquisition Framework (AAF) and rapid modernization of DoD software, the Joint Federated Assurance Center (JFAC) must also modernize its approach to assurance. This presentation will review JFAC's 2021 accomplishments and provide an overview of how these 2021 efforts are being used to support JFAC's modernization.

The Negatively Pressurized Conex (NPC) Program – How Acquisition and Systems Engineering Agility Delivered Capability to United States Transportation Command in 95 Days

2A4 – Integrated Program Management

Lt. Col. Paul Hendrickson, USAF

In March 2020, US Transportation Command issued a Joint Urgent Operational Need for the High Capacity Airlift of COVID infected passengers. The NPC team took an idea to a prototype, tested it, proved it, and achieved certifications for Air Worthiness and Bio-Containment | fielding the systems for their first operational mission in less than 95 days."

The Importance of Metadata for the Discovery of Digital Engineering Artifacts

2B1 – Digital Engineering • 23756

Dr. James Coolahan

This presentation will discuss the importance of discovery metadata for Digital Engineering. After showing an example digital collaborative environment for a system, the presentation will illustrate how a metadata standard such as one currently evolving within the Simulation Interoperability Standards Organization, can be applied to this use case.

The MBSE Digital Thread for Systems Failure Prediction

2B2 – Model-Based Systems Engineering • 23837

David Segal

Systems Failure Prediction is based on the analysis of components to predict and calculate the rate at which a product or system will fail. When failure is imminent, the component can be replaced by a larger system failure. Analysis techniques can identify the leading contributors to system failure and measure the impact of environment and stress on the system and its components. System failure prediction has most recently been enabled by the availability of actionable data via the Internet of Things (IoT) combined with Artificial Intelligence (AI) and Machine Learning in an integrated digital thread. The main emphasis for these techniques is in the deployed operational system. Achieving additional benefits will require integration with the Model-Based Systems Engineering (MBSE) digital thread.

Security in the Future of Systems Engineering (FuSE), a Roadmap Review of Foundation Concepts

2B3 – Agile • 23782

Rick Dove

The Future of Systems Engineering (FuSE) is an INCOSE-led multiorganizational collaborative initiative encompassing a number of topic areas with active projects to shape the future of systems engineering. The work discussed here addresses the FuSE Security topic area and provides a roadmap of eleven foundational concepts for building the future security vision.

Incorporating Technical Measures of Performance into Project Metrics

2B4 – Integrated Program Management • 23900

Chris Hassler | Nick Pisano

The presenters will demonstrate that the emphasis in project performance must include work and effort expended across the entire project life cycle, that incorporates all of the essential disciplines that constitute the project effort. In particular, the presenters will provide a methodology applied in a live proof-of-concept in a hybrid development program for new flying propulsion technologies that incorporated integration and contextualization of technical performance, risk, and uncertainty into their project measures.

Taking Authority Over Your Modeling Enterprise: ManTech's Elastic Model Governance Approach

2B1 – Digital Engineering • 23791

Dr. Heidi Davidz

As the digital ecosystem swells, there is a heightened challenge to robustly govern heterogeneous linked models across disciplines and across contractual boundaries. In addition, as more advanced analytics, automation, and artificial intelligence are used by the enterprise, the linked models also need to comply with enterprise data protocols. ManTech's Elastic Model Governance Approach is shown as an example for providing robust authority over the actual modeling enterprise throughout the full model lifecycle, integrating proven practices with mechanisms for flexibility, scalability, and automated validation.

Closing the Systems to Silicon Gap: MBSE-Enabled Digital Electronics Verification

2B3 – Agile • 23852

Dr. Lisa Murphy

Exploiting developments in MBSE and Electronics Design Automation (EDA), we show how microelectronics verifications can be traced from the system level models down through the full EDA design stack with a seamless flow. Use of virtual verification capabilities in this context helps achieve trust in microelectronics design by discovering potential issues to be addressed earlier.

Agile Program Management – Moving from Predictive Planning to Empirical Planning

2B4 – Integrated Program Management • 23752

Robin Yeman

I will describe why complex safety critical systems are the ideal place to leverage Agile and how to successfully implement for a large scale Cyber Physical System

Use of SysML for Launch System Reliability and Availability Modeling

2B2 – Model-Based Systems Engineering • 23848

Myron Hecht

Use of SysML for Launch System Reliability and Availability Modeling This presentation describes how to integrate reliability and availability modeling and prediction into Model Based Systems Engineering (MBSE) using SysML

Exemplar Design Patterns for Cyber Resilience

2B3 – Agile • 23869

Brooke Guare

In order to serve as a basis for developing solutions to a variety of cybersecurity challenges and/or cyber requirements, the Johns Hopkins University Applied Physics Laboratory (JHU/APL) has developed and compiled design patterns that have proven successful in past systems. By doing so, we hope to aid engineers in applying intuitive principles to system designs to meet cybersecurity requirements, in addition to complying with cybersecurity policy.

Conflict Is Your Friend- Managing Healthy Conflict in the Systems Engineering Workplace

2B4 – Integrated Program Management • 23842

Zane Scott

Conflict is the engine that drives innovation and it should be constructively managed rather than “resolved.”

Latest Developments with the Semantic Broker

2C1 – Digital Engineering • 23948

Mark Schriner

SAIC has previously shown the promise of the Semantic Broker. This presentation will showcase the latest capabilities available for use on programs.

Modeling and Analysis of Standard Operating Procedures

2C2 – Model-Based Systems Engineering • 23877

Dr. Steven Dam

This ½ day tutorial describes how to model SOPs and perform SOP analysis using MBSE and provides a hands-on opportunity to explore new technologies in assessing SOP viability.

Panel Discussion: Zero Trust for Hardware Security

2C3 – Systems Security Engineering & Architecture • 23763

Donald Davidson | Dr. Zachary Collier | Michael Bear | David Pentrack | Daniel Dimase

This panel discussion will bring together experts in the defense microelectronics field to discuss the core tenets of Zero Trust and Quantified Assurance, and lay out a path forward, that includes the development of industry standards, policy, and guidance.

Feature-based Product Line Engineering in Aerospace and Defense

2C4 -System of Systems • 23809

Dr. Charles Krueger

Feature-based Product Line Engineering is the subject of a new ISO standard (ISO/IEC 26580). Although the standard is new, Feature-based PLE has been around for over two decades, and in service in the A&D sector for nearly all of that time, resulting in tens to hundreds of millions of dollars in cost avoidance each and every year. It is in widely used by most of the top ten defense contractors in the United States. This presentation shows how the approach has earned its stripes by rising to the realities and hard challenges that are emblematic of the extremely challenging A&D sector: High-security systems, safety-critical systems, multi-contract funding, export control compliance, working with agile and digital engineering, and more.

DID Modeling to Support the DoD Program Life Cycle

2C1 – Digital Engineering • 23949

Robert Wojcik

This presentation will discuss an effort to develop guidelines that a contractor would use to develop models based on DOD Data Item Descriptions (DID) requirements to support System Engineering Technical Review (SETR) events

Application of Agile MBSE on EMD Program

2C2 – Model-Based Systems Engineering • 23899

Tamara Hambrick

We will focus on our Engineering, Manufacturing, and Development contract start-up phase for the first 9 months of infusing these agile systems engineering principles to produce systems engineering governance products

Leveraging Set-Based Practices to Make Agile Practices More Effective for System-of-Systems Engineering

2C4 -System of Systems • 23903

Brian Kennedy

We present a number of key hurdles that you will likely encounter when trying to apply Agile Practices, which have proven very effective in the development of software systems, to system-of-systems engineering. We then show how Set-Based Practices can be leveraged to overcome those hurdles.

Intellectual Property Considerations in Digital Engineering Implementation for Acquisition in the DoD

2C1 – Digital Engineering • 23906

John Daly

Rapidly advancing Digital Engineering (DE) capabilities being adopted by the Department bring some unique challenges, and possibilities. In a move from paper-based acquisition to digital systems engineering (fueled by adoption of Model Based Systems Engineering (MBSE) methodology and tools), re-thinking of Intellectual Property (IP) is stimulated in an effort to be more efficient and agile in DoD acquisition.

A State-Base Approach for ESOH Analysis

2C2 – Model-Based Systems Engineering • 23807

Michael Vinarcik

The continuing transformation of systems engineering from a document-intensive (DISE) to model-based (MBSE) discipline is enabling richer systems analysis. System models are inherently unambiguous and rigorous representations of design intent (especially when supplemented with automated validation rules that detects errors, inconsistencies, and gaps). They enable direct analysis by specialty engineering (such as reliability & maintainability, ESOH, and cybersecurity). State-machine behavioral representations are particularly useful for ESOH and cybersecurity analysis. This presentation builds upon techniques described in prior NDIA papers on failure mode and effects analysis, cybersecurity, and pragmatic hazard identification and risk management to demonstrate the value that can be extracted from a system model in support of these stakeholders.

OUSD(R&E) Systems Engineering Modernization Strategy

2C3 – Systems Security Engineering & Architecture • 23973

Nadine Geier | Dr. Kelly Alexander

OSD is pursuing an SE Modernization effort that will review and assess the combined impact the SE focus areas have on SE technical and technical management processes. The OSD SE Modernization effort will also assess SE roles and responsibilities relative to the SE acquisition workforce. The Systems Engineering Modernization effort will also develop Best Practices and use cases from a wholistic perspective that is inclusive of the combined impact of several emerging and mature SE focus areas. A briefing on the emerging OSD SE Modernization approach will be provided.

Tilting at Windmills: Value Chains, Risk, Opportunity, and the 2021 Texas Electricity Grid Failure

2C4 -System of Systems • 23926

Matthew Hause

The 2021 Texas electricity grid failure was caused by a multitude of failures including lack of winterization, over-reliance on renewable energy, and poor planning. Mostly however, it was due to value chains and trade-off analysis that did not make preparation profitable. This presentation examines the problems and possible solutions.

Digital Engineering Requirements for Evolving Design and Analysis Tools

2C1 – Digital Engineering • 23930

Paul Embry

The AIA has been outlining the challenges and key requirements that will need to be addressed in the software tools environment to achieve the vision of an interoperable, integrated product development and delivery ecosystem across the supply chain. Our data must be mobile and collaborative. Perspectives will include those of how requirements for data sharing, interoperability will need to evolve current state of software tools.

Product Line Engineering in the New Age of Digital Engineering

2C2 – Model-Based Systems Engineering • 23911

Dr. Charles Krueger

This presentation will provide an introduction and overview of the new ISO/IEC 26580 standard on Feature-based PLE and how it has become an essential element in the new age of digital engineering. In addition, it will describe how Feature-based PLE specializes and removes the unintentional complexity of previous approaches to PLE, give examples of where and how it is being used by the top aerospace and defense organizations in the world, and show the economic model behind its success.

Overview of the Revised Standard on Architecture Description – ISO/IEC 42010

2C3 – Systems Security Engineering & Architecture • 23731

Dr. James Martin

An updated version of the international standard for Architecture Description is expected to be published in 2021 as the new version of ISO/IEC/IEEE 42010. This paper provides an overview of the key concepts defined by this standard and the rationale for them.

Systems of Systems and Complexity: INCOSE Initiative

2C4 -System of Systems • 23961

Dr. Judith Dahmann

This presentation will describe a cooperative effort between the INCOSE SoS and Complexity working groups to leverage work coming from the complexity community to address the challenges of SoS complexity

A View of The Digital Engineering Process

2D1 – Digital Engineering • 23928

Jeffery Bryson

A simple definition of the problem DE is solving, how DE can be used to solve the problem, and an overview of the needed technologies required to implement the solution.

Air Force Government Reference Architectures: Strategy, Approach, Challenges, and Path Forward

2D3 – Architecture • 23916

Robert Bond

Government Reference Architectures (GRAs), built on open architecture principles and consensus-based standards, are designed to guide and constrain system designs to produce highly modular and interoperable systems. These GRAs yield great benefits to both the government and industry but are all too often managed through disparate and disconnected initiatives with little enterprise perspective. This presentation will discuss the latest breakthroughs in Air Force and Space Force GRA development, current challenges, lessons learned, and ongoing activities.

Digital Engineering Competency Framework (DECF)

2D1 – Digital Engineering • 23965

Dr. Nicole Hutchison

Digital Engineering Competency Framework Overview and Assessment of Existing Training Resources

The Impact of Technical Debt in Requirements on Product Lines and Composable Components

2D2 – Model-Based Systems Engineering • 23915

Larri Rosser

The technical debt metaphor provides a common, easily understandable framework for discussing deficiencies in our systems and elements that impact productivity and quality in product realization. This presentation focuses on the ways in which technical debt manifests in requirements with examples, and how requirements debt impacts product lines and composable components.

Enterprise Architecture Guide for the Unified Architecture Framework (UAF)

2D3 – Architecture • 23732

Dr. James Martin

This paper describes a workflow for creating Enterprise Architecture (EA) views in accordance with the Unified Architecture Framework (UAF) standard published by the Object Management Group (OMG). This workflow will be the foundation for a new EA Guide to be published as part of the OMG standard. The nine steps of the workflow are laid out in alignment with the stakeholder domains in the UAF for producing the requisite UAF views in each of those domains.

Human Systems Centered Digital & Mission Engineering (HSCDME) within a Model Based Human Systems Engineering (MBHSE) Approach

2D4 – Human Systems Integration • 23918

Dr. C.J. Hutto

This presentation discusses advancements on a human centered digital approach to mission engineering developed by GTRI to support tradespace analysis across the DoD. The approach includes a paradigm of mission performance oriented total system modeling (where the total system comprises humans, hardware, and software). A digital/computational analytical framework is introduced which assimilates well-established human performance constructs like situation awareness, human error/reliability, workload, and risk together with explicit consideration of mission engineering concerns into generalized formalisms capturing their quantitative interrelationships, providing data science analytics and visualizations for tradespace analysis and decision support.

An Elastic Approach to Digital Engineering

2D1 – Digital Engineering • 23793

Matthew Taylor

Groups can become so enthralled with Digital Engineering (DE) and connecting information, that this becomes the end goal, rather than using DE to support the mission within planned cost. This presentation summarizes current understanding of optimized DE sizing, use of elastic methods, and relevant organizational transformation literature, then provides guidance for an elastic DE approach using ManTech's fleX-engineering™ framework.

Feature Based Product Line Engineering: What, Why, and How to Do It Best!

2D2 – Model-Based Systems Engineering • 23941

Rowland Darbin

The state of the practice for Product Line Engineering is significantly more advanced than many people realize, with a growing body of knowledge, an increasing focus on system family engineering in industry, and a growing body of success in the Aerospace and Defense sector. INCOSE's International Working Group on Product Line Engineering is an important resource for advancing industry awareness and building a strong community of practitioners to share knowledge and collaborate on PLE best practices.

UAF in Practice

2D3 – Architecture • 23855

Eran Gery

We will present and demonstrate a concrete SoS scenario and how it is modeled with UAF and integrated tooling such as requirements management and planning tools.

Mission Engineering Approach for Influencing Warfighter Actions using Computational Social Sciences (IWACSS)

2D4 – Human Systems Integration • 23749

Dr. Paul Hershey

In this paper, we present mission engineering method and system for Influencing Warfighter Actions using Computational Social Sciences (IWACSS) to fill the gap in both in traditional DoD wargaming and in emerging Computational Social Science. IWACSS incorporates the social domain into battle management where real-time analysis is required to support timely decision-making. Our extensive research of prior literature and patents reveals that, although prior wargaming has incorporated aspects of social science, these attempts fail to provide calculated results derived from mathematically-based prediction that consider the effects (e.g., 1st, 2nd, and 3rd order effects) of social parameters on the outcome of the battle. In fact, for these approaches, the concept of applying predictive techniques is limited based on the perceived randomness of human social behavior. IWACSS overcomes this limitation by applying foundational stochastic mathematics and CSS techniques in combination with Reinforcement Learning (RL) to improve timely decision making and provide predictive results that include confidence levels.

Updating DoD Policy and Guidance for Modeling and Simulation (M&S) Verification, Validation and Accreditation (VV&A)

2D1 – Digital Engineering • 23765

Philomena Zimmerman | Joseph Carnell

This presentation describes the Office of the Under Secretary of Defense for Research and Engineering effort to update DoD policy for Modeling and Simulation Verification, Validation, and Accreditation (DoDI 5000.61) and associated guidance on best practices and documentation standards.

Model-Based Requirement Authoring Approach to Improve Efficiencies in the DoD RFP Process

2D2 – Model-Based Systems Engineering • 23978

Richard Wise

This presentation describes an effort exploring whether requirement templates expressed in the form of SysML modeling patterns coupled with semantic libraries can yield atomized, contextually bound, well-written model-based requirements when applied using a standard SysML modeling method. The aim is to ensure that the resulting requirements and authoritative model accompanying RFP documents are of a sufficient quality that contributes to the justifiable defense of offeror proposal selection within the RFP process.

Defining Architecture Requirements for Results that Deliver: Open, Flexible, Scalable, Sustainable

2D3 – Architecture • 23894

Gordon Hunt

We are experiencing a sea change in the world of systems architecture. Advances in technology, increasingly complex systems, and greater warfighter expectations require supporting architectures that deliver more than ever before. But how do we define the architectural requirements to ensure we meet these heightened demands? And, given a set of requirements, how do we test and measure them prior to implementation?

Engineered Resilient Systems: Digital Engineering and Computational Testing

3A1 – Engineered Resilient Systems

Dr. Robert Wallace

Design environments, particularly in novel materials and environments, require integration of modeling and simulation, data analyses, and scalable computation components. ERS has developed a Virtual Wind Tunnel capability used directly with industry acquisition projects which reduces time and risk."

Mission Engineering Panel: Importance and Advancement

3A2 – Mission Engineering

Senior Leaders in OSD, JS, and Industry

Meta-System Architecting for AI

3A3 – Architecture • 23929

Dr. Cihan Dagli

In this presentation interplay between AI and Meta-Architecting is introduced in connection with deep learning and heath care system architecting

Government Built, Production Quality, Multi-Disciplinary, Multi-Fidelity Software for Acquisition Engineering Support

3A1 – Engineered Resilient Systems

Dr. Scott Morton

This presentation will describe a set of software products and infrastructure to support a digital transformation of US DoD acquisition being developed by the DoD HPCMP CREATETM program available to the government and industry and show impact on current high priority DoD acquisition programs."

Encapsulating Variability: Applying Design Structure Matrices to Righting Software's Principles

3A3 – Architecture • 23806

Michael Vinarcik

The application of design structure matrices to systems architectures.

A Systems Engineering Approach to Cyber SCRM

3A4 – Education & Training • 23724

Alexander Wright

A new systems engineering approach to securing the cyber supply chain of cyber physical systems, firmware, and software.

Transforming Design Requirements and Evaluation Through Effectiveness-Based Design Measures

3A1 – Engineered Resilient Systems

Dr. Ian Dettwiller

The Engineered Resilient System's Decision Support Tool with Operational Analysis is facilitating a paradigm-shift in design through coupled conceptual design and operational analysis with automated workflows and remote computing.

You Can't Touch This: Logical Architectures in the MBSE and the UAF

3A3 – Architecture • 23922

Matthew Hause

Logical Architecture is an often misunderstood and misused concept. This presentation examines its benefits and best practices.

Making Your Case- Negotiation and Persuasion for The Systems Engineer

3A4 – Education & Training • 23843

Zane Scott

INCOSE's Competency Model lists "negotiation" as a competency essential to requirements management, verification and validation, and acquisition and supply. In this presentation, we will discuss the structure of persuasion and identify tools and techniques that will make us better communicators on both sides of the conversation- listening and expression.

DARPA Control of Revolutionary Aircraft with Novel Effectors (CRANE) Program Philosophy and Achievements

3B1 – Engineered Resilient Systems

Dr. Alexander Walan

The Control of Revolutionary Aircraft with Novel Effectors (CRANE) program aims to design, build, and flight test a novel X-plane that incorporates Active Flow Control (AFC) as a primary design consideration. Crane seeks to optimize the benefits of active flow control by maturing technologies and design tools, and incorporating them early in the design process. Active flow control could improve aircraft performance by removing jointed surfaces, which currently drive design configurations that increase weight and mechanical complexity. Demonstrating AFC for stability and control in-flight would help open the design trade space for future military and commercial applications.

Overview of R&E Mission Analysis and Methodology

3B2 – Mission Engineering • 23974

Marc Goldenberg | Dr. Judith Dahmann

OUSD(R&E)/ DDRE(AC)/ ENG Mission Integration is leading eight mission capability-focused studies in FY21. Each study addresses threat-informed technical challenges in OSD/ Joint Staff-prioritized mission threads. These studies inform modernization investment decisions, the integration of mature technologies, and the development and delivery of warfighting capability.

DEWS Open Reference Architecture Development

3B3 – Architecture • 23898

Dr. Steven Davidson

The technology behind Directed Energy Weapon Systems (DEWS) has matured to the point where DEWS is both operationally and technically viable, so that current Service DEWS are moving from the laboratory into the field | from Research and Development (R&D) to prototyping, and then on to early weapon systems. This crop of DEWS is custom designed for specific Service missions and platforms. They feature high levels of instance-unique optimization, long lead times for critical components due to custom design and manufacturing, and limited reuse of subsystems and subassemblies from one DEWS to the next. Reuse still requires redesign and modification.

The Overlooked Power of Systems Thinking

3B4 – Education & Training • 23844

Zane Scott

Systems thinking is the foundational element of our discipline. But, in practice, it is so revolutionary that it is often misunderstood or even overlooked. This presentation examines the causes and symptoms of our failure to move with the new paradigm into the age of systems. It suggests solutions to position us for success in solving the socio-technical problems of today and tomorrow with our new way of thinking about systems.

Unique Public-Private Partnerships Provide HPC-Enabled, High-Fidelity Design and Analysis Techniques for Industry Engineering Teams That Speed Development

3B1 – Engineered Resilient Systems

Dr. Justin Foster

In highly-computational design projects, the ERS-ERDC team has successfully embedded with industry partners under PEO sponsorship. The result is acceleration via the incorporation of HPC-enabled, high-fidelity design and analysis techniques for acquisition projects of interest to the DoD.

Mission Engineering Digital Ecosystem

3B2 – Mission Engineering • 23769

Dr. Owen Eslinger | Darryl Howell

This presentation will discuss an effort within OUSD(R&E) to create a DoD-owned Mission Engineering Digital Ecosystem (MEDE). The MEDE is providing a collaborative environment accessible to DoD Government and selected FFRDCs, contractors and academia.

Implementing SysML 2.0

3B3 – Architecture • 23876

Dr. Steven Dam

This paper shows an analysis of the prototype SysML 2.0 and how it's new ontology maps to other ontologies. Implementation issues result from this analysis.

Toxic Substances Control Act (TSCA) Risk Management Impacts to the Defense Industrial Base (DIB)

3B4 – Education & Training • 23866

Drew Rak

This session will highlight recent and anticipated risk evaluation and risk management issues relevant to U.S. Department of Defense (DoD) chemicals of concern and how DoD is engaging with the U.S. Environmental Protection Agency (EPA) and integrating the risk management determinations and proposed restrictions across the defense industrial base supply chain.

Incorporating Active Flow Control Technology into Aircraft Design for DARPA's CRANE Program

3B1 – Engineered Resilient Systems

Juan Montoro

Advanced technologies such as Active Flow Control (AFC) offer the potential to revolutionize next generation aircraft design through augmenting and enhancing aircraft control and operation. This presentation will discuss some of the challenges, solutions developed, and lessons learned to date in the incorporation of AFC in the design process.

Mission Engineering Landscape – A Federally Funded Research and Development Center (FFRDC) View

3B2 – Mission Engineering • 23957

Dr. Judith Dahmann | Meg Adams

This presentation provides the results of an initial examination of the 'landscape' of mission engineering activities across MITRE.

Scaled Agility in the DoD Acquisition Environment

3B4 – Education & Training • 23802

Dr. Michael Orosz

The University of Southern California Information Sciences Institute (USC/ISI) is undertaking a research and systems engineering analysis effort to explore the mission engineering methods, analysis, and metrics needed to transition from a traditional DoD 5000 waterfall software development environment to an Agile/DevSecOps environment. The transition includes an integration of emerging technologies and an Agile/DevSecOps related education program for the future workforce. Results from several projects will be presented.

Using Value Engineering to Propel Cyber-Physical Systems Acquisition

3C1 – Engineered Resilient Systems • 23846

Alfred Schenker

This analysis will identify the aspects of VE that can be applied to the acquisition and lifecycle of CPS employing embedded computing resources. Programs will be able to identify the future cost of change and the ability to ensure investments in modeling and analysis are preserved instead of traded off in the early stages of an acquisition when they do the most good.

Reusable Digital Engineering Environment to Support Mission Engineering Studies

3C2 – Mission Engineering • 23975

Marc Goldenberg | Dr. Judith Dahmann | Michael Pennock | Gabriela Driscoll

This presentation provides an implementation perspective on the development of a reusable digital engineering environment to support OUSD Research and Engineering Office of Engineering Mission Engineering studies.

Assessing MOSA – New Methods to Develop Quantitative Assessment Criteria

3C3 – Modular Open Systems Approach • 23971

Nadine Geier | John Tindle

Employing a Modular Open Systems Approach (MOSA) is mandated by law. In the past, the Department of Defense has used inconsistent qualitative means to assess MOSA. This presentation describes efforts to develop consistent, quantitative methods to assess the extent to which programs employ MOSA.

Education and Training Panel: Transformation of Defense Workforce

3C4 – Education & Training

Stephanie Possehl | Dr. Laura Milham | Dr. Cliff Whitcomb | RADM (Ret) Mike Manazir | Dave Pearson

Protection of Software for the Adaptive Acquisition Framework

3C1 – Engineered Resilient Systems • 23856

Bradley Lanford

The DoD Adaptive Acquisition Framework, Software Modernization Strategy, and adoption of software factories have changed the way the department develops software. The July 2020 issuance of Department of Defense Instruction (DoDI) 5000.83, established responsibilities and procedures for Science and Technology (S&T) managers and engineers to shape the way software is protected from adversarial attack.

Implementing Digital Engineering Environment for Mission Engineering

3C2 – Mission Engineering • 23890

Jon Kim | Zach Moore

The use of MBSE in conjunction with DE has led to the development of many innovative capabilities, including the use of virtual simulation environments that enable a digital representation of a system concept to be created, experimented with, and manipulated to achieve robust SoS solutions. With this Virtual Testbed, analyses can be performed that allow the end-user the ability to verify their end product and make architectural changes as needed.

Intellectual Property Considerations for Modular Open Systems (MOSA) Implementation in the DoD

3C3 – Modular Open Systems Approach • 23908

Patrick Bains

Modular Open Systems (MOSA) requirements for DoD acquisition have been steadily increasing since 2017 in successive National Defense Authorization Acts (NDAA) of Congress. MOSA is also driven by industry in the way modern capabilities and software are developed, manufactured, and fielded. In this evolution towards increased MOSA use in the Department, the critical importance of MOSA interface availability provides significant technical and programmatic/administrative challenges in the use, protection, and visibility of Intellectual Property (IP).

Application of Criticality Analysis to Risk Based Engineering Design

3C1 – Engineered Resilient Systems • 23824

Randy Woods

Utilizing an open source design, an end-to-end criticality analysis is performed that includes application of enterprise ICT supply chain risk management activities. The exemplar starts with the identification of Mission Critical Functions, Critical Components, and potential Critical Program Information. Potential mitigation methods and risk tracking are then applied to the system.

Towards Mission Engineering in a MOSAIC Warfare Context using Explainable AI

3C2 – Mission Engineering • 23939

Dr. Daniel DeLaurentis

Applying Mission Engineering and Design (ME&D) to a Mosaic warfare context as envisioned by DARPA, with rapid composition and adaptation of effects and strategies, ME&D becomes more challenging. The rise in applications of games, specifically real-time strategy (RTS) games, in engineering promises to provide test beds to support ME&D in a Mosaic warfare context. We believe that game balance is an important characteristic of a game environment that translates to a competitive ME&D. Our proposed framework leverages this knowledge of balance in an engagement to make decisions to support mission objectives in domains such as acquisition, scenario planning, and strategy execution.

DoD MOSA Community of Practice (CoP) Update

3C3 – Modular Open Systems Approach • 23972

Nadine Geier | Nathaniel Barley

The DoD MOSA CoP provides a collaborative environment supporting the community by collecting and sharing information, cultivating assistance groups through the development of tiger teams to sustain implementation across acquisition, and generating new knowledge to transform the application of MOSA.

Mission-Level Optimization: A New Method for Designing Successful Systems

3C2 – Mission Engineering • 23864

Dr. Brian Chell

This presentation describes research which proposes, tests, and validates a method for optimizing systems to maximize the probability of mission success.

Agile Across the Value Stream

3D1 – Agile • 23753

Robin Yeman

In order to decrease the lead time in delivery of mission critical capabilities we need to have a common vision with Agile practices across the entire delivery.

Network Digital Twins for 21st Century Wargaming

3D2 – Mission Engineering • 23804

Jeremy Smith

This paper describes the integration of a network digital twin with a wargaming simulator to provide a comprehensive platform for wargames capable of modeling all aspects of military missions, including communications performance and cyber effects. A Marine Corps Expeditionary Advanced Base Operations mission scenario is utilized to demonstrate the benefits of augmenting wargaming tools with network digital twin capabilities.

Best of Both Worlds: Implementing The National Defense Strategy in a Resilient, Safe and Sustainable Way

3D3 – Environment, Safety, & Occupational Health • 23813

David Asiello

Meeting the challenges of rapidly developing and deploying an enhanced warfighting capability while meeting resilience, system safety and sustainability goals.

USAF Digital Campaign Think Big, Start Small, Scale Fast

3D1 – Agile • 23792

Chris Garrett

Industry has realized the benefit of better decision making, agility, and savings by embracing digital transformation. Seeing the realized benefits in industry, the United States Air Force decided to digitally transform to keep up with ever-increasing rates of technical performance advances to stay ahead of its adversaries. The Air Force is a large and complex organization with an acquisition system forged out of the World War II-era Defense Industrial Base with a Vietnam War era-budgeting and resource allocation system. Weapon system acquisition complexity continues to grow and the Air Force is turning to digital transformation to quicken the speed of delivering weapon system capability to the warfighter. The Air Force has created a Digital Campaign to tackle this digital transformation for its acquisition enterprise. This paper advocates a strategy of “think big, start small, and scale fast” for the acquisition enterprise to achieve this transformation and meet the needs of the warfighter.

Model Based Systems Engineering in a Digital Environment: Creating a Virtual Testbed for Complex System Architectures

3D2 – Mission Engineering • 23889

Claudeliah Roze

The use of MBSE in conjunction with DE has led to the development of many innovative capabilities, including the use of virtual simulation environments that enable a digital representation of a system concept to be created, experimented with, and manipulated to achieve robust SoS solutions. With this Virtual Testbed, analyses can be performed that allow the end-user the ability to verify their end product and make architectural changes as needed.

Revising MIL-STD-882

3D3 – Environment, Safety, & Occupational Health • 23950

Lee Wood

DOD efforts stand up a working group to revise MIL-STD-882 or replace it with a non-governmental standard.

Cyber Resilient Weapon System Body of Knowledge (CRWS-BoK)

3D4 – Education & Training • 23822

Burhan Adam | Angela Lungu | Madison Rudy

The Cyber Resilient Weapon Systems Body of Knowledge (CRWS-BoK) is an educational browser supported repository for resources pertaining to researching, and developing, resilient systems. This presentation provides an overview of the resource's capabilities, and its anticipated impact on the greater community.

Lessons Learned from Implementing New NAS411 Requirements

3D3 – Environment, Safety, & Occupational Health • 23937

Yvonne Pierce

The abstract is pending Boeing Release approval.

Individual and Organizational Systems Engineering Effectiveness

3D4 – Education & Training • 23966

Dr. Nicole Hutchison

Overview of Helix Systems Engineering Effectiveness Model

Agile Insight – Gating Alternatives for Agile Programs

3D1 – Agile • 23814

Larri Rosser

Traditional stage-gate reviews are intended to provide insight and oversight to leaders, stakeholders and program participants, but the current structure and approach doesn't align well with agile product development. In this presentation, we will explore the challenges and potential solutions for overseeing agile programs and

Probabilistic Graphical Models to Support Trade Study Evaluation and Scoring to Support Navy POM Budget Assessments

3D2 – Mission Engineering • 23892

Jason Baker

Probabalistic Graphical Models in the form of Bayesian networks have shown great promise in capturing complex relationships and providing useful analysis. This presentation describes the implementation of PGMs as an aggregation and assessment tool when evaluating the utility of many proposed budget items in a multi-objective and constrained environment.

Impact of the American Innovation and Manufacturing Act on DoD

3D3 – Environment, Safety, & Occupational Health • 23895

Peter Mullenhard

A presentation on the impact of the hydrofluorocarbon (HFC) production phase down required under the American Innovation and Manufacturing Act.

Developing a Digital Engineering Body of Knowledge for the DoD

3D4 – Education & Training • 23770

Philomena Zimmerman | Mary Davidson | Frank Salvatore

The Digital Engineering Body of Knowledge (DEBoK) will serve as a reference for the DoD engineering community to use in implementing digital engineering. The community will be able to contribute content and build digital engineering solutions based on collective experience and knowledge.

ON DEMAND

Performing Mission and System Simulation Trades based on structure, behavior and performance

Modeling & Simulation • 23875

Mark Visco

This presentation will provide descriptions and demonstrations of the utilization and capabilities of unique technologies that provide Automated evaluation of Mission and Systems architectures, designs, validations and operational performance prediction, enhanced MDAO through the addition of automated variations to CONOPS to multi-disciplinary physics trades, Direct execution and linkage of all 4 elements of MBSE descriptive models with physics-based analysis and simulation tools.

Safety and Environmental Engineering Risks and Requirements Management for the DoD Adaptive Acquisition Framework (AAF)

Environment, Safety, & Occupational Health • 23796

Sherman Forbes

A proposed approach for how the six different Adaptive Acquisition Framework Pathways can identify and manage critical safety and environmental issues that can adversely impact the cost, schedule, and performance of systems across their life cycle. It also provides for a core safety and environmental data set for programs that are transitioning between pathways or using multiple pathways with the data being maintained within the core program data bases (e.g., HAZMAT data in the Logistics Product Data) to facilitate transition to Digital Engineering.

Conducting Safety Review Board Meetings in the Digital Engineering Environment

Environment, Safety, & Occupational Health • 23733

Bob Smith

The future impact of using digital engineering/model-based systems engineering on program interaction with safety review boards.

Leveraging Digital Transformation Initiatives to Optimize Readiness & Simulate Mission Performance Across the Fleet

Digital Engineering • 23805

Justin Woulfe

Over the past twenty years, siloed logistics and supply chain management systems throughout the DoD has led to disparate approaches to modeling and simulation, a lack of understanding of how one system impacts the whole, and issues with "optimal" solutions that are good for one organization but have dramatic negative impacts on another. Many different systems have evolved to try to understand and account for uncertainty and try to reduce the consequences of the unknown. As the DoD undertakes expansive digital transformation initiatives, there is an opportunity to fuse and leverage traditionally disparate data into a centrally hosted source of truth. With a streamlined process incorporating machine learning (ML) and artificial intelligence (AI), advanced modeling and simulation will enable informed decisions guiding program success through optimized operational readiness and improved mission success.

Distributed Integration Launch Assessment Approach

Agile • 23914

Tyle Peterson

In order to provide efficiency to Space Launch Systems, ManTech has developed an approach to complete early integration studies (EIS) that allows distributed organizations to collaborate and ensure mission success. The ManTech-Accelerated Digital Engineering Process Technology (MT-ADEPT) method provides a vendor agnostic fast, useful, and adaptable solution under a single secure ecosystem.

Applying optimization algorithms to system-level trade studies with MATLAB and System Composer

Model-Based Systems Engineering • 23887

Kirsten McCane | Becky Pettey

A design optimization problem is defined and trade analysis is performed using System Composer to identify an optional quadcopter solution

Methods to Evaluate System Resilience Across the Full System Design Lifecycle

Systems Security Engineering • 23790

Tom McDermott

We present methods to extend DoD Mission Focused Cyber Hardening programs to the development of new systems. The “Mission Aware” cyber resilience methodology and modeling approach is extended to support mission resilience analysis, operational simulation, and formal assurance case design.

Architecture for MOSA

Modular Open Systems Approach • 23883

Mike Stokes

This paper will focus on how a System Architecture is developed in a manner that supports the MOSA objectives.

The Convergence of Systems of Systems MBSE and EDA for Early Top-Level Specification Validation During Concept Design for Complex Dynamically Coupled DoD Networked Architectures

Digital Engineering • 23897

Robert Sarkissian

From Mission Architectures to Silicon Architectures. Today’s Mil Aero Systems consist of dynamically coupled architectures driven by the most sophisticated secure silicon devices. The interdependences and emergent behavior of these chips must be correlated to the mission specification and requirements during the concept stage to ensure first pass success. This paper provides a unified methodology for the convergence of MBSE tools and processes to EDA (Electronic Design Automation), proven to reduce risk and uncertainty on several large-scale full vehicle programs.

Modeling and Simulation Body of Knowledge: Collecting Information Critical to the Modeling and Simulation Enterprise

Modeling & Simulation • 23768

Ralph Gibson

Having a thorough knowledge base is vital to successful development, integration, and operation of modeling and simulation systems and federations. This presentation discusses the ongoing effort to build a comprehensive knowledge base to support modeling and simulation activities.

Space Range: Building a Cyber-Physical Digital Twin for Assessing Cyber Resilience

Digital Engineering • 23787

Steven Huang

Space is no longer uncontested. Our space systems must be resilient to not just physical threats but a growing number of cyber threats. ManTech has used its expertise in systems engineering, cyber, and information technology to develop a comprehensive approach to constructing, assembling, and curating comprehensive space system digital twins to execute robust cyber-physical analyses of space systems and concepts. These efforts provide customers a robust and deployable environment that maximally replicates their existing enterprise to perform cyber analysis, execute architectural forklifts, and to practice transformational architectural changes in a realistic and re-configurable environment to enable enhanced decision making.

Intro to S-Series Specifications: Integrated Product Support Data Exchange Strategy

Digital Engineering • 23874

Andre’ Evans

Organizations are at a critical juncture as they transition to a digital environment. The following presentation introduces the S-Series -- an international suite of specifications that uses .XML to author, manage, and exchange Integrated Product Support data across all phases of the product lifecycle.

Applying optimization algorithms to system-level trade studies with MATLAB and System Composer

Digital Engineering • 23887

Kirsten Mcane | Becky Pettey

A design optimization problem is defined and trade analysis is performed using System Composer to identify an optional quadcopter solution.

Leveraging Target Levels and Trade-Off Charts for a Richer Dialog on Customer Requirements (and Supplier Specs/RFQs)

Agile • 23902

Brian Kennedy

As system/mission complexity rises and become more optimized (closer to the edge of feasibility), we need to enable a much richer dialog between customer and supplier, sharing critical knowledge from each side to the other, so that the right trade-off decisions can be made. We propose a solution.

Digital Engineering with Model Based Product Line Engineering: Achieving a Composable Digital Twin

Digital Engineering • 23945

Dr. Bobbi Young

Digital Engineering practices have transformed how we design and build Missiles at Raytheon Missile and Defense Systems. Our digital engineering approach includes: (1) composability by designing modular common components connected through identified standards, (2) Model Based Product Line Engineering combining industry standard Feature-based Product Line Engineering (FbPLE) and Model Based Engineering (MBE) concepts and practices, and (3) implementing digital transformation through digital engineering capabilities to compose a missile’s digital twin. Much more ambitious than simply reusing existing component designs from previously built missiles, this approach involves automatic generation, exploration, and pruning of an automatically generated trade space of possible missile designs that satisfy a given set of requirements. The scope of this presentation is to share how we are applying a Model Based Product Line Engineering approach to digital engineering through a Digital Ecosystem to transform our design process and rapidly achieve the digital twin.

MOSA-sw:3d. Modular Open Systems Approach – Software: Data-processing, Development & Deployment

Model-Based Systems Engineering • 23841

Richard Halliger

Digital Engineering in the field: Pushing implementation and efficient development of data processing and "AI"-enhanced software via MOSA patterns.

Zero Trust – NSS PIT Systems / PIT (A Longstanding Requirement)

Systems Security Engineering • 23771

David Olmstead

Zero Trust is a "Sizzle" Moniker created by John Kindervag in 2010. Trust, without authentication and audit is a delicate brittle concept that is effortlessly broken. A useful Zero Trust state can only exist to a defined useful cryptographic strength based in authentication. This presentation will show from whence the requirement derives for NSS PIT Systems / PIT and how we know its strength.

Take Set-Based Design to the Next Level: Compute All Infinite Possibilities and then Completely Reverse the Design Process!

Agile • 23905

Brian Kennedy

Rather than do a set of point-based analyses to generate a set of point designs, you can do a set-based analysis that computes all infinite points. You can then reverse the design process by selecting the most desirable point and work backwards to determine the corresponding design inputs.

Zero Trust for Hardware Supply Chains: Moving from Absolute Trust to a Quantifiable Assurance Model

Systems Security Engineering • 23762

Joel Heebink

The Zero Trust security model has recently emerged as a strategy to protect electronic hardware. The core design principle of Zero Trust is that no component or actor in the system should be trusted by default or in isolation. Zero Trust should not mean that there is no trust in the system, but rather Zero Trust is about how to make risk-based decisions to grant limited trust in a system based on continuous monitoring and layered security.

Integrating Software and Systems Engineering Tools

Digital Engineering • 23879

Dr. Steven Dam

This paper discusses the integration of software engineering repository tools, such as GitHub, Jira, and Azure DevOps Server with systems engineering tools.

Link-16 Protocol stack modeling and analysis with AADL

Systems Security Engineering • 23854

Dr. Siddhartha Bhattacharyya

With the advancement of technology, the complexity of systems has increased, as a result, it is even more important today to integrate architecture modeling and analysis of systems much earlier in the design phase. Modeling and analysis supports capturing architectural inconsistencies, conflicts, security or safety violations before it becomes costlier to make a change. We discuss in our proposed approach to investigate the implementation of a layered modeling paradigm for Link-16 in Architecture Analysis and Design Language (AADL) with assume-guarantee based reasoning. AADL allows us to create an abstract representation of the link-16 stack protocol. With this representation, we can model properties of the individual stack layers such as security, latency, and quality of performance. When interlayer behaviors are incorporated, we allow for a higher-level analysis of these properties through the use of compositional verification which guarantees the behavior of a system whether it be mission-critical, safety-critical or security-critical.

Evaluating Chemical and Material (C/M) Content Data in the DoD Supply Chain

Environment, Safety, & Occupational Health • 23849

Emma Williams

This session features an overview of a pilot assessment conducted to evaluate two of the U.S. Department of Defense's (DoD) existing data systems to (1) search for needed environment, safety and occupational health (ESOH) data | (2) find gaps in policy implementation | and (3) develop a process to search for chemical and material content data with the current information technology (IT) resources available.

Reimagining the "Software Engineering Life Cycle" Due to DoD Digital Transformation

Software • 23767

Allan Dianic

Reimagining the software engineering (SwE) process requires reimagining the DoD acquisition process. Modernizing DoD SwE practices for rapid and continuous delivery demands that we engineer and acquire software-enabled systems differently that we have in the past.

Environment, Safety, & Occupational Health

Environment, Safety, & Occupational Health • 23896

Michael Bruckner

This session highlights the various aspects of sustainability analysis as detailed in the U.S. Department of Defense's (DoD) Sustainability Analysis Guidance: Integrating Sustainability into Acquisition Using Life Cycle Assessment including demonstrating the value added and identifying how the guidance remains integral to the defense acquisition community.

NAVIGATE-3D – The NEPA Analysis and Visualization Interactive Geospatial Alternatives Tool for the Environment

Environment, Safety, & Occupational Health • 23789

Jennifer Salerno

Under increasing scrutiny, Federal agencies are facing pressure to conduct environmental reviews—particularly for National Environmental Policy Act (NEPA) projects—in an expedited manner. Booz Allen's web-mapping tool, the NEPA Analysis and Visualization Interactive Geospatial Alternatives Tool for the Environment, or NAVIGATE-3D, is an easy-to-use 2D and 3D GIS tool to comprehensively help the user to visualize and identify environmental baseline conditions and potential impacts. Data outputs from the tool, such as maps and tables, allow the user to illustrate and document existing conditions easily and efficiently for environmental compliance reports.

Data Architecture and Strategy to Support Weapons Systems Engineers

David Stuart

Engineers have moved beyond the era of computer modeling and now entered the era of AI/ML where the amount of data needed is exploding, and the previous methodologies used to deal with data are no longer adequate. ERS has developed tools and strategies to support AI/ML projects for engineers.

A Systematic Mapping Study of Systems Security Engineering for Modular Open Systems

Architecture • 23835

Giselle Bonilla-Ortiz

This paper describes the design and execution of a systematic mapping study to identify security concerns, threat vectors and security mechanisms as described for modular open systems in literature. The aim is to build on this knowledge of security considerations to further the research in this area. Research questions will be presented as well as a data synthesis and driving conclusions based on the publications reviewed.

Introduction to Air Force Occupational and Industrial Hygiene Program: Electronic Safety Data Sheet Initiative

Environment, Safety, & Occupational Health • 23886

Jonathan Luu

The Air Force Occupational and Industrial Health Program aims to amplify the speed, precision and accuracy of Hazardous Material identification and communication.

Automatically Measuring Inter-Disciplinary Program Execution Metrics Using a Digital Thread

Digital Engineering • 23834

Kenneth Heyen

In this presentation we show how use of digital thread technology can result in the ability to automatically capture meta data regarding inter team collaboration and data transfer. We show how that data can be used in a way to enable data-based decision making by program leaders.

Synchronizing custom software middleware concepts between C++ source code and Magic Draw using a digital thread

Digital Engineering • 23833

Kenneth Heyen

This document does not contain technology or Technical Data controlled under either the U.S. International Traffic in Arms Regulations or the U.S. Export Administration Regulations. Traditional model based software engineering approaches have been able to achieve forward and reverse engineering operations between models and code for a number of years. However, these approaches are limited in that they only understand the standard features of a programming language. Advanced software concepts such as middleware, multi-threading and messaging patterns are commonly used across multiple industries. SysML and UML have the appropriate relationship and meta-class definitions to represent these patterns. Despite their prevalence, reverse and forward engineering support for these concepts are unsupported out-of-box by traditional model based software toolsets. This occurs because these concepts often use third party software packages that are not part of the C++ language standard. Since each implementation of these concepts follows its own pattern it would be extremely difficult, if not impossible for vendors to maintain support. In this paper we show that we can maintain synchronization between source code and a cameo model by teaching a model based semantic broker about these concepts. Enabling synchronization via this method requires a few steps. First, creating an ontology that describes the concepts we want to synchronize. Second, enabling “reverse” code engineering by indexing of the source code via an open source indexer (ANTLR). Third, enabling “forward” generation via a template engine (JINJA). Finally we show that once the semantic broker is enabled we can easily synchronize between the source code and the model of the software. We will then show how this technique can be used to maintain traceability between the software requirements and the software itself.

BIOGRAPHIES

LT GEN ERIC FICK, USAF

Program Executive Officer
F-35 Lightning II Joint Program Office

Lt. Gen. Eric T. Fick is the Program Executive Officer for the F-35 Lightning II Joint Program Office in Arlington, Virginia. The F-35 Lightning II Joint Program Office is the DoD's agency responsible for developing, delivering and sustaining the F-35A/B/C, the next-generation strike aircraft weapon system for the Air Force, Navy, Marine Corps, seven international partners and six current foreign military sales customers.

Lt. Gen. Fick entered the Air Force in September of 1990 after graduating from the University of Notre Dame with a Bachelor's degree in Aerospace Engineering. He has served as a Logistics Plans and Programs Officer, F-16Fighting Falcon Mechanical Systems Engineer, Computational Fluid Dynamics Research Engineer, Joint System Program Office Chief of Test, Air Staff Branch Chief, Deputy Chief of the Air Force Senate Liaison Office and Director of Global Reach Programs, Office of the Assistant Secretary of the Air Force for Acquisition. Lt. Gen. Fick has commanded at the squadron and group level and previously served twice as an Air Force Program Executive Officer. Additionally, he has logged more than 350 hours in the T-38 Talon, F-15 Eagle, F-16 and other military and civilian experimental aircraft.

Prior to his current assignment, Lt. Gen. Fick was the Deputy Program Executive Officer for the F-35 Lightning II Joint Program.

HON HEIDI SHYU

Under Secretary of Defense for Research and Engineering (OUSD(R&E))
Department of Defense

Ms. Heidi Shyu is the Under Secretary of Defense for Research and Engineering (OUSD(R&E)). In this role, she serves as the Chief Technology Officer for the Department of Defense (DoD), mandated with ensuring the technological superiority of the U.S. military, and is responsible for the research, development, and prototyping activities across the DoD enterprise. She also oversees the activities of the Defense Advanced Research Projects Agency (DARPA), the Missile Defense Agency (MDA), the Defense Innovation Unit (DIU), the Space Development Agency (SDA), the DoD Laboratory and Engineering Center enterprise, and the Under Secretariat staff focused on developing advanced technology and capability for the U.S. military.

Previously, she served as the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)), from September 2012 to January 2016. Prior to this, she was Acting ASA(ALT) beginning in June 2011 and appointed the Principal Deputy in November 2010. As the ASA(ALT), she served as the Army Acquisition Executive, the Senior Procurement Executive, the Science Advisor to the Secretary of the Army, and the Army's Senior Research and Development official. She had principal responsibility for all Department of the Army matters related to logistics. Ms. Shyu also led the execution of the Army's acquisition function and the acquisition management system. Her responsibilities included providing oversight for the life cycle management and sustainment of Army weapons systems and equipment from research and development through test and evaluation, acquisition, logistics, fielding, and disposition.

Prior to her government service, Ms. Shyu was the Vice President of Technology Strategy for Raytheon Company's Space and Airborne Systems.

Ms. Shyu holds a Bachelor of Science Degree in Mathematics from the University of New Brunswick (UNB) in Canada, a Master of Science Degree in Mathematics from the University of Toronto, Master of Science Degree in System Science (Electrical Engineering) from UCLA, and the Engineer Degree from UCLA. She received an Honorary Doctorate of Science from the UNB. She is also a graduate of the UCLA Executive Management Course Program.

A member of the Air Force Scientific Advisory Board from 2000 to 2010, she served as the Vice Chairman from 2003 to 2005 and Chairman from 2005 to 2008. Ms. Shyu is a member of the National Academy of Engineering and AIAA Honorary Fellow.

WESLEY KREMER

President
Raytheon Missiles & Defense

Wesley D. Kremer is president of Raytheon Missiles & Defense, a business of Raytheon Technologies. He leads 31,000 employees and is responsible for a broad portfolio of air and missile defense systems, precision weapons, radars, command and control systems and advanced defense technologies.

Kremer, an electrical engineer and U.S. Air Force veteran, has decades of executive experience in aerospace and defense. He held multiple leadership positions at Raytheon Company prior to its merger with United Technologies Corporation in 2020, including president of both the Raytheon Missile Systems and the Integrated Defense Systems businesses. In the U.S. Air Force, he served as a weapon systems officer on F-111 and F-15E aircraft and flew more than 90 combat sorties in Iraq and Bosnia.

He holds a bachelor's degree in electrical engineering

DR. RAYMOND O'TOOLE JR.

Acting Director, Operational Test and Evaluation
Office of the Secretary of Defense

Dr. O'Toole is the Acting Director, Operational Test and Evaluation as of January 20, 2021. Dr. O'Toole was appointed as the Principal Deputy Director, Operational Test and Evaluation in February 2020. In this capacity he is the principal staff assistant for all functional areas assigned to the office. He participates in the formulation, development, advocacy, and oversight of policies of the Secretary of Defense and in the development and implementation of test and test resource programs. He supports the Director in the planning, conduct, evaluation and reporting of operational and live fire testing. He serves as the Appropriation Director and Comptroller for the Operational Test and Evaluation, Defense Appropriation and the principal advisor to the Director on all Planning, Programming, and Budgeting System matters.

Dr. O'Toole is the former Deputy Director for Naval Warfare within DOT&E. He oversaw the operational and live-fire testing of ships and submarines and their associated sensors; combat and communications systems, and weapons. He was also responsible for overseeing the adequacy of the test infrastructure and resources to support operational and live-fire testing for all acquisition programs across the Defense Department.

Dr. O'Toole was previously an employee of the Naval Sea Systems Command as the Deputy Group Director of Aircraft Carrier Design and Systems Engineering. Prior to that, he was the Director of Systems Engineering Division (Submarines and Undersea Systems) where he led a diverse team of engineers who supported all Submarine Program Managers. His other assignments include being a Ship Design Manager/Navy's Technical Authority for the USS VIRGINIA Class submarines during design and new construction and for Amphibious Ships, Auxiliary Ships, and Command & Control Ships during in-service operations.

Dr. O'Toole has also held other positions within the Department of Defense such as Deputy Program Executive Officer (Maritime and Rotary Wing) at the United States Special Operations Acquisition Command, Staff to the Deputy Assistant Secretary of the Navy for Research, Development & Acquisition (Ship Programs), and Deputy Director of Regional Maintenance for COMPACFLT (N43).

In addition, Dr. O'Toole has over 30 years of experience as a Naval Officer (Active and Reserve) retiring at the rank of CAPTAIN. His significant tours include 5 Commanding Officer tours.

DAVID CADMAN

Acting Deputy Assistant Secretary of Defense, Acquisition Enablers
Department of Defense

Mr. David S. Cadman is currently serving as the Acting Deputy Assistant Secretary of Defense, Acquisition Enablers. He also serves as the Director for Acquisition Data and Analytics (ADA) where he is responsible for the development and implementation of acquisition portfolio based analytical methods focused on data analytics which includes but is not limited to data mining, simulation, machine and statistical learning, probability theory, mathematical optimization, and visualization of results. ADA establishes program management policy that applies these methods as appropriate to acquisition portfolios, Major Defense Acquisition Programs and business systems and functions.

Before the A&S reorganization, he served as Director for Performance Assessments and Root Cause Analyses (PARCA) and Deputy Director, Root Cause Analyses (RCA). Where he identified root causes on Major Acquisition Programs that had a critical Nunn-McCurdy cost breach or upon request of the Secretary of Defense.

Additional assignments Mr. Cadman has had while at the Office of the Secretary of Defense (OSD) include serving as Deputy Director for the Technology Security and Foreign Disclosure Office (TSFDO) within the Defense Technology Security Administration (DTSA) where he supported DoD's security cooperation efforts, to include international armaments cooperation, strategic planning, and Defense Technology and Trade Initiatives. Mr. Cadman also worked as the aviation sector lead for the Office of Industrial Policy in OSD where he was responsible for industrial base oversight. In this role, Mr. Cadman assessed the capabilities and overall health of the aviation industrial base upon which the Department of Defense relies for current and future war fighting capabilities.

Previously, Mr. Cadman served in the Joint Strike Fighter (JSF) Program Office as the Deputy Director, Air Vehicle where he oversaw government and contractor activities related to the F-35's vehicle systems, mission systems, airframe structures and materials, manufacture and build risk reduction. Mr. Cadman was accountable for cost, schedule, and performance on the $13 billion air vehicle design and the development effort of the multinational industry team. Mr. Cadman also served as the JSF X-program Science and Technology Coordinator developing requirements, assessing science and technology trends, and evaluating potential technology gaps. Mr. Cadman's other positions include a leading role on the F/A-18 E/F airframe development program and serving as an F-14 structural engineer at the Naval Aviation Depot. Prior to entering federal service, Mr. Cadman worked for Boeing Helicopter, performing dynamic analysis of developmental vertical lift aircraft.

Mr. Cadman holds a Bachelor of Science in Aerospace Engineering from the University of Maryland and a Master's of Science in National Resource Strategy from the Industrial College of the Armed Forces. Mr. Cadman is a graduate of the Defense Acquisition University Advanced Program Managers course and has Acquisition Workforce Level III certifications in Program Management; Systems Planning, Research and Engineering; and Production Quality and Manufacturing.

SPONSOR DESCRIPTIONS

PREMIER

SAIC® is a premier Fortune 500® technology integrator driving our nation's technology transformation. Our secure high-end solutions across the defense, space, civilian, and intelligence markets include engineering, digital, artificial intelligence, and mission solutions. Headquartered in Reston, Virginia, SAIC has more than 26,500 employees and annual revenues of about $7.1 billion.

ELITE

AMERICAN SYSTEMS is an employee-owned federal government contractor supporting national priority programs through our strategic solutions in the areas of: Enterprise IT, Test & Evaluation, Acquisition & Lifecycle Support, Engineering & Analysis, and Training. AMERICAN SYSTEMS is at the forefront of Research and Engineering modernization priorities to further our National Defense Strategy. We work with a broad portfolio of Science & Technology programs, liaise with Academia and Federally Funded Research Centers, and assist in the development of investment strategy through mission analysis in areas such as 5G, Microelectronics, Hypersonics, Directed Energy, and C4ISR. We develop and assess future joint warfighting concepts through digital engineering, modeling & simulation, data analytics, and wargaming. We support the services and Joint missions by modernizing legacy architectures through mission engineering of new capabilities and operations. For more information, please visit: www.AmericanSystems.com

HANDOUT AND VIDEO

Raytheon Missiles & Defense brings global customers the most advanced end-to-end solutions delivering the advantage of one innovative partner to detect, track, and intercept threats. With a broad portfolio of air and missile defense systems, precision weapons, radars, command and control systems and advanced defense technologies Raytheon Missiles & Defense solutions protect citizens, warfighters and infrastructure in more than fifty countries around the world.

REGISTRATION

From the mission to the microchip, AGI and Ansys software help transform your digital engineering enterprise at the speed of your needs. AGI's mission-level software helps engineers, operators, and analysts working on land, sea, air, and space systems. Our combined portfolio of simulation and analysis tools help aerospace and defense organizations make critical decisions faster throughout the life cycle — from concept design to operations and sustainment — in an operational context.

jama software®

CONTRIBUTING

Jama Software is focused on maximizing innovation success. Numerous firsts for humanity in fields such as fuel cells, electrification, space, autonomous vehicles, surgical robotics, and more all rely on Jama Connect® to minimize the risk of product failure, delays, cost overruns, compliance gaps, defects, and rework. Jama Connect® uniquely creates Living Requirements™ that form the digital thread through siloed development, test and risk activities to provide end-to-end compliance, risk mitigation, and process improvement. Our rapidly growing customer base of more than 12.5 million users across 30 countries spans the automotive, medical device, life sciences, semiconductor, aerospace & defense, industrial manufacturing, financial services, and insurance industries.

SPEC INNOVATIONS

VIDEO

SPEC Innovations (Systems and Proposal Engineering Company) has been a leader in mission systems engineering, since 1993. Our goal is to move the systems engineering discipline into the future. We developed and released the first collaborative cloud-native MBSE tool, Innoslate, in 2012. Since then, we have evolved Innoslate into a full lifecycle solution through requirements management to verification and validation.

SPEC Innovations continues to push the boundaries of the systems engineering discipline by recognizing that both program management and systems engineering must optimize cost, schedule, and performance for both the program and system, while identifying and managing risk. We do this by applying open standards, such as the Lifecycle Modeling Language (LML), and new technologies, such as cloud computing and artificial intelligence. We are the future of systems engineering, today. SPEC Innovations newest software product, Sopatra, develops and simulates SOP models from text using natural language processing.

Caltech

VIDEO

Systems engineering education for the national security enterprise

At Caltech, we customize unique learning experiences for organizations and their people, working one-on-one with leadership to design practical programs and certificate courses for teams and individuals alike.

With programs that span the systems spectrum, we drive digital readiness and scale teams of high-performance thinkers and doers who develop technologies and ideas to advance science, build connective systems, and secure a sustainable world.

Over 10,000 professionals have turned to Caltech for education tailored to the defense industrial base, government agencies, and research institutes across aerospace, electronics, energy, and life sciences.

#BuildingBetterInnovators

LEADING THE WAY IN ENGAGEMENT, NETWORKING, AND NATIONAL DEFENSE

PLAN AHEAD FOR SUCCESS | 2022 FEATURED MEETINGS, CONFERENCES, AND EVENTS

2022 VIRTUAL EXPEDITIONARY WARFARE CONFERENCE

February 8 – 10, 2022 | Virtual

Expeditionary | Strategic Sealift | Joint All Domain | Force Protection

2022 UNDERSEA WARFARE SPRING CONFERENCE

March 28 – 30, 2022 | San Diego, CA

Aviation USW | C4I | Mine Warfare | Undersea Sensors & Vehicles | Warfighter Performance

2022 AIRCRAFT SURVIVABILITY SYMPOSIUM*

February 15 – 17, 2022 | Monterey, CA

Combat Survivability | Concealment and Deception | Countermeasures | Urban Warfare | Vulnerability Reduction

2022 JOINT NDIA/AIA SPRING INDUSTRIAL SECURITY CONFERENCE

April 25 – 27, 2022 | Clearwater Beach, FL

Industrial Security | Insider Threat | Cybersecurity/CMMC | NISPOM Updates

2022 TACTICAL WHEELED VEHICLES CONFERENCE

February 28 – March 2, 2022 | Norfolk, VA

Autonomous Vehicles | Electric Drive | Modernization & Sustainment | Acquisition

22ND ANNUAL SCIENCE & ENGINEERING TECHNOLOGY CONFERENCE

April 26 – 28, 2022 | Miami, FL

Defense Research & Development | Science & Technology

2022 PACIFIC OPERATIONAL SCIENCE & TECHNOLOGY (POST) CONFERENCE**

March 7 – 8 (Open), **9 – 10** (Closed), **2022 | Honolulu, HI**

Regional Security | Science & Engineering Technology | Technology Engagement

65TH ANNUAL FUZE CONFERENCE

May 10 – 12, 2022 | Seattle, WA

Fuze | Missiles | Munitions Technology | Safety & Arming Devices | Warheads

36TH ANNUAL NATIONAL LOGISTICS FORUM

March 15, 2022 | Salt Lake City, UT

Defense Logistics | Logistics Management

2022 SPECIAL OPERATIONS FORCES INDUSTRY CONFERENCE & EXHIBITION (SOFIC)

May 16 – 19, 2022 | Tampa, FL

Communications | Light Vehicles | Small Arms | Special Operations

*All Classified | **Partially Classified

VISIT NDIA.ORG FOR MORE INFORMATION ON ALL OF OUR MEETINGS, CONFERENCES, AND EVENTS