2024 INCOSE Los Angeles and San Diego Chapters' Joint Technical Conference

WELCOME to the 2nd Joint Technical Conference by the Los Angeles and San Diego Chapters of INCOSE! ***Industry Applications of Systems Engineering and Systems Approaches***

November 9-10th, 2024 (Saturday and Sunday, 8am-4pm)

Keynote Speakers

Saturday 9am
Why Mars, Why Now?
– James Melton, PhD

Sunday 9am
Pros and Cons of Implementing MBSE at a Start-Up
– Mr. Mike Wallace, Virgin Galactic

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Key Information

Email Us → info@sdincose.org

Tech Conference Address

UC Irvine Interdisciplinary Science and Engineering Building (ISEB)
419 Physical Sciences Quad,
Irvine, CA 92697

Parking in Lot 12A or 16
Map Prepay

Eureka! Restaurant Address
4143 Campus Dr, Irvine, CA 92612

Conference Papers → here

Conf website

Saturday

Time	Room A	Room B	Room C
7:30-9am	**Registration / Breakfast / Sponsors (lobby)**		
9-10am	**Welcome and Keynote 1: "Why Mars, Why Now?" – James Melton, PhD**		
10:10 -11am	Systems Considerations in Designing a Stratospheric Early Warning Airship - Randall DeGering, A2 Systems Engineering	Engineering Disasters Unveiled: A Systems Engineers Perspective – Mitch Seime, NAVWAR	Integrating Systems Engineering Into Aerospace and Student-Led Initiatives at SDSU - Chase Rodriguez, Jalen Noel, Joseph Ballesteros, and Courtney Cummingham, SDSU team
11-12 noon	Resilience in Today's and Tomorrow's Systems - Kenneth Cureton, USC	A Systems Framework for Using AI to Audit Compliance with Healthcare Regulations - Andre J. Bahou, GWU	Systems Engineering and the Advent of Science-directed Lawmaking – David Schrunk, MD, SELAW WG
12 – 1pm	**Lunch, Sponsors**		
1 – 2 pm	Requirements: A Comprehensive Overview (**2-hour tutorial**) - Dr. Rick Hefner, Caltech	Utilizing Systems Engineering Principles to Understand Systemic AI Biases - Andy von Stauffenberg, Colorado State University	Developing MOSA Systems using SysML v2 Textual Notation - Charles Brechtel and Steve Massey, Prewitt Ridge team
2 – 3 pm		AI-Assisted Use Case Generation; A Case Study - Fernando Granados, SAIC	How the INCOSE Model-Based Capability Matrix Has Steered Model-Based Systems Engineering Transformation at NASA - Dr. Steve Cornford, Greg Pierce, Terry Hill, and Patricia Nicoli, NASA team
3 – 4pm	Application of Resilience and System Trust in Systems Engineering Practices - Kaela Dang and Dr. Kenneth Preston, Boeing Corp team	Leveraging AI for Enhanced Systems Engineering - Dr. Rick Hefner, Caltech	Overcoming Key Challenges in MBSE Adoption - Andy von Stauffenberg, Colorado State University
4 – 5 pm	**Student Poster Session (lobby)**		
5:30 – 6:30 pm	**Informal Happy Hour at Eureka! Restaurant**		
6:30 – 8 pm	**Informal Dinner at Eureka! Restaurant**		

(subject to change)

AI MBSE

Sunday

Time	Room A	Room B	Room C
8-9am	**Breakfast / Sponsors (lobby)**		
9-10am	**Keynote 2: "Pros and Cons of Implementing MBSE at a Start-Up" – Mr. Mike Wallace, Virgin Galactic**		
10:10 -11am	Effective Integration of Diverse Academic Competencies in the Development of Student-Led Complex STEM Projects - Marco Rosa, UTEP	INCOSE Foundation: Fueling Systems Engineering Worldwide - Dorothy Benveniste, INCOSE Foundation	Extending Descriptive System Models for Requirement Verification - Sam Goodwin, Alec Rambo, and Dr. Alex Ford, NGC team
11 – 12 noon	Three Keys for a Framework Supporting: A Systems Approach to Modern Management - Dr. Julia Taylor, Taylor Success Systems	Integrating Software and Systems Engineering: A Transdisciplinary Approach to Breaking Down Traditional Silos - Doug Rosenberg (Parallel Agile) and Dr. Azad Madni (USC)	Applying Systems Engineering Tools for Process Design - Dr. Rick Hefner, Caltech
12 – 1pm	**Lunch, Sponsors**		
1 – 2 pm	Mastering Your Systems Engineering Competencies (**2-hour tutorial**) - Dr. Rick Hefner, Caltech	System-Theoretic System Safety Approach to an Autonomous Space Mission - Robert Crombie (Aerospace Corporation) and Drake Mailes (A-P-T Research, Inc.)	Interpersonal Skills for Leading System Engineering - David Shostak, Caltech
2 – 3 pm		Managing the Technical Baseline or: How I Learned to Start Worrying and Sweat the BOM - Charley Patton, NGC	Risk Denial on High-Risk Programs - Scott Jackson, Burnham Systems
3 – 4pm		AI for SE in Lawmaking – Successes and Shortcomings of Using AI to Generate Cost and Risk Models - Greg Bulla, Mitch Seime, and David Schrunk, SELAW WG team	
4 pm	**End of conference**		

(subject to change)

AI

Presentation Abstracts

(keynote) Why Mars, Why Now? – James Melton, PhD

Why is it so important for humans to go to Mars? How can we work together effectively to accomplish this? What makes us think this can and will happen? These questions have plagued humanity since we first looked up into the night sky.

As distant as Mars may seem, there are reasons why exploration and eventual settlement are important for our own survival. In addition, the spinoff technology that will immediately benefit us will be phenomenal. This program will reveal facts that make Mars so intriguing that you will wonder why we haven't seriously embraced this idea sooner.

Highlights of this intriguing view into the short-term future:

- What opportunities await us in the new Martian world?
- Are we destined to become a multi-planet species?
- Insights on who will ideally settle the Red Planet.
- What role can you play in our new future world?
- Why we can no longer remain earthbound.

(keynote) Pros and Cons of Implementing MBSE at a Start-Up – Mr. Mike Wallace, Virgin Galactic

Should all Start-up Tech companies employ Model-Based Systems Engineering (MBSE) for their products? Model-Based Systems Engineering has become a ubiquitous buzz word in the tech industry. As most of us know, the term was coined in 1993 (A Wayne Wymore), but some of the practices of this concept dates back even earlier. Since then, MBSE has become a common systems engineering practice and has been employed across many technological fields. There are many benefits a company can receive from using MBSE but is it a panacea for tech companies to use as a cure-all for systems engineering gaps that are plagued by document-centric systems engineering processes, particularly for start-up companies. Most start-up companies tend to feel the need to use MBSE due to the successes that larger companies have benefited from. The understanding of knowing when to apply and when not to apply MBSE is crucial to the success of a Start-up company. The company needs to understand the cost of implementing MBSE, the current knowledge and skills of their systems engineers, the complexity of the tools needed for MBSE, the complexity of the product being developed and cultural resistance to changes amongst their employees. The results used to determine this are a mixture of personal experience as well as data provided from the tech industry. Despite the limited scope of research data provided on this topic, there is enough supporting material to conclude that the application of MBSE at a Start-up company should be thoroughly investigated prior to employing it based on the pros and cons that will be addressed.

Three Keys for a Framework Supporting: A Systems Approach to Modern Management – Dr. Julia Taylor, Taylor Success Systems

Modern Management today requires much more than mastering the fundamental functions such as technical development, marketing, accounting, finance, and production. What is crucial is being able to take a Big Picture view and at the same time being able to implement operationally. Managers need a framework that is emergent and can be reviewed and changed iteratively over time.

A survey in 2024 by Price Waterhouse Coopers (PwC) showed that 45% of global CEOs believe that their organization will no longer be economically viable in 10 years if they stay on the same course that they are on. This means that a framework for modern management is definitely needed-- a framework that can be updated and that will support agility.

There are three keys that this study will focus on: 1) Systems Thinking, 2) Leadership & Teamwork, and 3) Analytical Techniques (includes Big Data & Systems Analytics) which form the foundation for a systems approach to modern management. These keys must be considered within a context that is defined for the purpose of making sense out of a situation and being able to take proper action. This study presents a novel method for doing this, along with examples supporting key concepts. In addition, resources are provided which can help you to design, tailor and implement your own Systems Approach framework which includes each of the three keys.

Systems Considerations in Designing a Stratospheric Early Warning Airship – Mr. Randall DeGering, A2 Systems Engineering

Since 1957, NORAD depends upon an array of ground-based radars to detect Russian bombers approaching across the Arctic region. Radar signals transmitted from ground-based radar towers are blocked by the curvature of the Earth, creating a "radar shadow." One solution to this problem would be using an airship carrying a radar to high altitudes (e.g., 70,000 feet). This would offer greatly extended surveillance coverage and act as a “tripwire” for the early detection of hostile forces. Research has yet to uncover any similar proposals. Designing such an early warning airship can be viewed as a classic “system of systems” with each subsystem having numerous requirements, conflicting designs, and requiring successful component integration. Research also explores how new digital engineering methodologies could be used to effectively capture program requirements, design activities, and validation efforts to further this proposed early warning airship concept.

AI-Assisted Use Case Generation; A Case Study – Mr. Fernando Granados, SAIC

As the systems engineering community grapples with the integration of emerging technologies, artificial intelligence (AI) stands out for its promise to breakdown complexity. While systems engineers are keen to harness AI for deliberate and strategic advantage, the lack of an SE-AI formalized implementation approach has often yielded unpredictable and inconsistent results. This study confronts the issue head-on for the respective implementation of Use Cases, presenting a novel methodology for integrating the use of an AI-based chatbots with the rigors of traditional use case development practices.

Effective Integration of Diverse Academic Competencies in the Development of Student-Led Complex STEM Projects – Mr. Marco Rosa, UTEP

The advent of interdisciplinary projects in STEM education has brought forth a paradigm shift in how research and development are approached. This convergence is a catalyst for innovation and efficiency, and fosters a holistic approach to problem-solving, which is crucial for the development of comprehensive solutions. The effective integration of diverse philosophical competencies into STEM projects is not only beneficial but necessary in today's multifaceted project environments.

Integrating diverse competencies, from both STEM and Liberal Arts, into interdisciplinary student-led projects also has a direct effect on training costs. The Harvard Data Science Review reports that effective interdisciplinary training can reduce the need for additional training by 15-25%, representing significant financial savings for organizations and contributing to a more agile workforce.

By embracing this interdisciplinary collaboration approach, and implementing best practices, organizations can achieve cost savings, better use of limited resources, enhance innovation, and prepare a workforce that is equipped to effectively tackle the complex challenges of the future.

Integrating Software and Systems Engineering: A Transdisciplinary Approach to Breaking Down Traditional Silos – Mr. Doug Rosenberg, Parallel Agile, and Mr. Azad Madni, USC

Disconnects between Systems Engineering and Software Engineering invariably compromise the reliability of complex systems. Agile methodologies, widely used in software development, often ignore traditional systems engineering modeling languages such as SysML, leading to significant gaps in requirements modeling and software behavior analysis. Compounding this problem is the fact that systems models are typically decomposed from a functional perspective, failing to align with modern object-oriented programming methods, creating further dissonance between the two disciplines.

Currently in the news, Boeing's Starliner spacecraft problems vividly illustrate the System/Software disconnect. The spacecraft has

faced significant delays and technical challenges, particularly due to software issues, including a thruster control software error and a mission timer error, which nearly led to mission failure. These issues underscore the perils of poorly integrated systems and software engineering. A major disconnect between systems and software engineering shows up in the form of disconnects between hardware and software. The difficulties encountered in integrating software with hardware systems have become a focal point, illustrating the urgent need for more cohesive engineering practices.

Speaking at a May 25 public meeting of the Aerospace Safety Advisory Panel, Patricia Sanders, chair of the committee, expressed skepticism that NASA and Boeing would be able to resolve known issues with Starliner in time for its scheduled launch, stating, "We are no longer building hardware in which we install a modicum of enabling software. We are actually building software systems, which we wrap up in enabling hardware, yet we have not matured to where we are uniformly applying rigorous systems engineering principles to the design of that software."

AIM Process, described in Rosenberg's book AI Assisted MBSE with SysML, is an integrated systems/software approach that specifically addresses the disconnect between systems and software by encouraging systems engineers to leverage AI as an enabler for better understanding software. Madni, in his papers, describes this use of AI as an example of Augmented Intelligence. By utilizing AI-driven tools, systems engineers can generate use case narratives that consider failure modes, rapidly create executable wireframes, and generate embedded microcontroller code, database schemas, user interface code, and a wide range of test cases. This AI-driven approach enables deeper insights into software behavior, allowing for more accurate and comprehensive requirements definition. Deep dive prompting into software requirements ensures that potential gaps are identified early, enabling a more complete understanding of the system as a whole.

Transdisciplinary Systems Engineering (TSE), as defined and explored in Dr. Madni's book, is about transcending traditional disciplinary boundaries to exploit convergence and technological advancements. TSE fosters collaboration between diverse fields such as computer science, social sciences, and systems design, revealing new patterns and pathways for intuitive and effective system design.
AIM Process exemplifies this transdisciplinary engineering methodology by replacing silos between software and systems engineering with an integrated approach within a collaborative engineering environment. By exploiting this integrated approach, organizations can mitigate the risks of software-related failures, thereby significantly enhancing the reliability and success of complex systems.

Managing the Technical Baseline: How I Learned to Start Worrying and Sweat the BOM – Mr. Charley Patton, NGC

As one of the technical management processes identified in the INCOSE Systems Engineering Handbook, the Configuration Management Process probably doesn't get as much attention as the technical processes that form the core of the typical systems engineer's daily system development activities. Yet, configuration management is one of those processes that has a bipolar relationship with success: when done right, CM disappears into the background and many other system development endeavors just seem to go smoothly; when done wrong (or not at all), many development activities (especially integration), customer conversations, and progress tracking just seem to go haywire.

Chief among the myriad configurations that can be managed is the technical baseline, which comprises all technical artifacts consumed or generated across all system development activities, making the systems engineering activity the logical choice as managers of the baseline. Therefore, SE practitioners need to understand the benefits, potential pitfalls, and basic techniques associated with identifying controlled artifacts, and managing not only the technical artifacts, but also the people who depend on those artifacts.

This presentation describes the need for technical baseline management, typical content of technical baselines, conditions that affect the ability to conduct viable configuration management practices, causes of configuration misalignments, examples of good and improvable configuration management practices, and suggestions for how to convince stakeholders to properly engage in the configuration management process.

Interpersonal Skills for Leading System Engineering – Mr. David Shostak, Caltech

Human Integration for System Engineering (SE) considers many factors and challenges. This presentation will explain in fine detail and completely lay out all the factors needed for the Human Integration of a System Engineering team.

The System Engineer and the People

The lead System Engineer needs to understand how to plan for the people the SE needs on the project and what tools will be required to acquire the best people for the SE team. The SE needs to know how to find the necessary people. The SE needs to organize a baseline technical core team and structure. What will each person on the SE team's technical responsibility be? What project resource management tools are needed?
How will the SE team be organized and developed? What methods and tools will be used to develop the team? What if virtual teams are involved? How will the virtual team be organized and communicated, too?

System Engineering Fundamentals and Skills

There are System engineering fundamentals the lead SE will need to know and use. What characteristics and roles of a System Engineer will need to be followed? What are the functions of a lead System Engineer in running a team of people? What challenges does a lead System Engineer face? There are many things to consider and think about.
What will make the System Engineer succeed? What leadership style is needed? What kind of leadership styles are there? What conflicts do they have to deal with? What are the successful motivation factors?
In Summary, Leading the Charge and Contributions
Regarding this abstract and presentation, I will present and demonstrate the skills a lead System Engineer needs to consider when leading the charge of a team and what the contribution would be to the project to make it a success. I will explain in fine detail what they are.

Take Aways:
1. How to plan and what to consider in a System Engineering Human Integration team
2. What are the lead System Engineering Responsibilities
3. How to conduct Team Organization
4. What are the System Engineering fundamentals and skills needed for Human Integration?

Application of Resilience and System Trust in Systems Engineering Practices – Ms. Kaela Dang, Boeing Corp, and Dr. Kenneth Preston, Boeing Corp

The recognition and understanding of resilience and system trust in systems engineering are key factors when it comes to building teamwork, accountability, trust, communication, and professionalism among team members. It is important to understand that system engineering is the type of engineering that focuses on many technical elements within many disciplines. These elements can consist of design engineering, process engineering, electrical and electronic concepts, mechanical engineering, software engineering and even cybernetics. Resilience and system trust are critical to the success of the overall growth and operation of any systems engineering organization with respect to their service of excellence and enhance overall competitiveness.

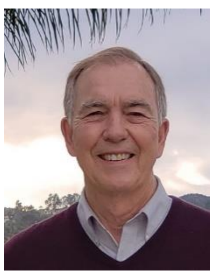
Resilience is seen whenever adversity is present. This is true in systems engineering when addressing reliability, redundancy, obsolescence, and collaborating with suppliers. There are many challenges that engineers deal with that must be acknowledged, understood, and resolved by the conclusion of any type of design. These resolutions result in increased team effectiveness and performance in the eye of the customer chain. It also builds on the confidence, competence and contribution levels of the engineers and engineering support through open communication and continuous learning. It is behavior patterns can effectively dissect, evaluate, analyze, and respond to large amounts of analyses, evaluations, modeling, and assumptions made in procuring a design by engineering.

When talking of resilience, system trust is a major factor. Integrity, character, trust-giving, and ability are four areas that define the meaning of system trust within systems engineering. It is the trust factors within engineers that binds them and their teams together. The trust factor allows engineers and support functions to work and resolve difficult tasks via shared confidence resulting in a strong rapport and with others, building and maintaining stronger teams. System trust also builds expectation levels and defines roles of team members and allows for respect and appreciation from within. This paper will describe system engineering methods and techniques within selected engineering functions and examine their performance working through resilience and system trust in the products analyzed, evaluated, and used by end users.

Risk Denial on High-Risk Programs – Mr. Scott Jackson, Burnham Systems Consulting

Risk denial is a common phenomenon in industry today. It can be found in all domains, in particular high-speed aircraft, space systems, and tall buildings. Risk denial is the refusal to accept the fact that these systems have any risk at all, Symptoms of risk denial include the absence of risk in project documentation and the claim by program managers that “We are good engineers; we don’t have risk.” The root cause of risk denial is the much-believed myth that zero-risk is possible. Following are common sources of risk that are often ignored by project management: (1) system complexity, (2) Unpredictable environment, (3) external factors, e.g. FOD, etc. (4) human factors: payload overload, complacency, optimism, Lack of structural design measures (e.g., margin). The straightforward way to account for these sources is to include them in system simulations, to the best of the ability of project engineers. The most obvious evidence of high-risk systems is the number of well-publicized failures in the past. These include, at a minimum, (1) the two Space Shuttle disasters, Challenger and Columbia. (2) the two 737Max disasters, and (3) the Concorde disaster. It is well to identify a small number of current projects that are worthy of evaluation of risk denial. They include, first, the Boom supersonic aircraft program. Secondly, there are two New York skyscrapers worthy of note: the Steinway building and the Central Park tower both greater than 2000 feet tall. It is important to note that there is no claim that these aircraft or buildings will fail, only that there is the potential for failure based on the common sources of risk denial discussed above.

AI for SE in Lawmaking – Successes and shortcomings of using AI to generate cost and risk models – Mr. Greg Bulla, Mr. Mitch Seime, and Mr. David Schrunk, SELAW



The emergence of ChatGPT and other large language models (LLMs) has already offered systems engineers a range of exciting possibilities, such as generating software code, technical writing, process definitions, and more. In this presentation, the INCOSE Systems Engineering and Lawmaking (SELAW) Working Group (WG) will demonstrate how ChatGPT can effectively contribute to initial efforts in risk and cost modeling to support the creation of new laws.

Cost modeling is a crucial component of the lawmaking process. When developing a new law, one of the primary considerations should be its overall affordability. This involves not only the costs associated with researching, drafting, and implementing the law but also the ongoing expenses required for enforcement and defending it against legal challenges. Laws that cannot be enforced effectively may result in selective enforcement, eroding public trust in the legal system. In addition to cost, governments must assess the potential unintended consequences of new legislation. Well-intentioned laws may inadvertently lead to economic, social, or political repercussions. Therefore, proposed laws should be rigorously modeled for risks and adjusted as necessary before being enacted.

As part of this presentation, the SELAW WG will address potential concerns with using LLMs in systems engineering, including the accuracy of results, lack of transparency in the calculation process, consistency (determinism), and potential bias. It will also discuss how ChatGPT might be effectively integrated into an SE workflow.

The SELAW Working Group was established in April 2022 with the mission of applying fundamental systems engineering principles to the process of lawmaking. Although many municipalities in the United States and abroad produce sound legislation, the process often lacks consistency, leading to redundant efforts, unintended consequences, budgetary strain, and reduced effectiveness. The SELAW WG believes that laws should be crafted with the same rigor as engineering projects —incorporating research, transparency, clear objectives (requirements), stakeholder engagement, modeling, verification, validation, traceability, and more. The goal of SELAW is to develop a robust, standardized lawmaking process that can be adopted by legislative bodies everywhere.

Developing MOSA Systems using SysML v2 Textual Notation – Mr. Charles Brechtel and Mr. Steve Massey, Prewitt Ridge team

This presentation will explore developing and implementing an example MOSA compatible systems model in SysML v2 textual notation. The concept of a Modular Open Systems Approach (MOSA) is gaining growing influence across DoD acquisition efforts, and has even been enacted into law since the National Defense Authorization Act of 2017. As defined by the Office of the Undersecretary of Defense, in the development of DoD systems, “MOSA is an acquisition and design strategy, consisting of technical architectures, that adopts open standards and supports a modular, loosely coupled, and highly cohesive system structure.” Using MOSA, acquisitions officials and systems developers can design interoperable, modular and reusable systems that can easily plug-and-play with other MOSA compatible systems. For example, a MOSA approach can be used to develop a new EVTOL payload interface, and the MOSA definition can aid in rapid and reusable development of a multitude of EVTOL payloads. In tandem with the growing importance of MOSA, SysML v2 development has continued to mature, with a full release expected in the very near future. SysML v2 is an important evolution of the popular Systems Modeling Language, and includes some important new features – including the textual notation format. SysML v2 textual notation provides a unique and novel approach that enables the modeling of systems “as code”. With this textual notation format, system models can transition beyond the need for traditional node-and-edge graphical modeling tools. Instead, using textual notation, SysML v2 models can be both rapidly and simply developed in a modeling tool as simple as a common text editor. This presentation will evaluate how this new modeling technique – specifically SysML v2 textual notation – can be used to develop a MOSA compatible model, and evaluate the effectiveness of this new approach to modeling MOSA compatible systems.

To evaluate the usefulness of SysML v2 textual notation as a modeling language for MOSA, this presentation will explore developing a model that emphasizes modular and open interfaces for a primary system and how these primary interfaces can be utilized by a third party (like a contractor or integrator) to aid in the development of subsystems that can be integrated into this modular and open primary interface. The model will leverage the rich semantics and flexible notation of SysML v2 to develop a precise definition of MOSA compatible interfaces of this theoretical primary system. Moreover, this notation will be leveraged to provide means for interactions and interchange of information to take place across this interface, and will seek to use some of the novel capabilities provided by SysML v2 to demonstrate their utility in development of a MOSA system. Once this primary MOSA system interface is complete, the presentation will explore how SysML v2 can then be used to model subsystem components that will integrate into the primary system interface. Our goal will be to rapidly and effectively develop multiple subsystems that are compatible with this interface, demonstrating the value of the MOSA approach to system development when paired with the novel capabilities in SysML v2. Finally, the presentation will conclude with a summary of the usability of SysML v2 as a MOSA compatible modeling language and an evaluation of how it can aid in the future acquisition and development of MOSA systems.

How the INCOSE Model-Based Capability Matrix Has Steered Model-Based Systems Engineering Transformation at NASA – Mr. Steve Cornford, Mr. Greg Pierce (NASA/JSC), Mr. Terry Hill and Ms. Patricia Nicoli

The National Aeronautics and Space Administration (NASA) is embarking on new, complex, and diverse missions to accomplish its scientific and exploration objectives, and it views digital transformation as a key enabler for those missions. The NASA Model-Based Systems Engineering (MBSE) Leadership Team (MLT) is leading the charge in the digital transformation of the systems engineering domain at NASA, and it is using the INCOSE Model-Based Capability Matrix (MBCM) as a roadmap. This paper discusses the modifications and tailoring of the INCOSE MBCM(Hale & Hoheb, 2020)for use at NASA, the process the team has taken on multiple rounds of assessment, findings to date, and work products that have been generated as a result of the assessment. The paper will also discuss findings and potential changes that should be made to the original product.

INCOSE Foundation: Fueling Systems Engineering Worldwide – Ms. Dorothy Benveniste, INCOSE Foundation

The INCOSE Foundation's "Fueling Systems Engineering Worldwide" presentation highlights the Foundation's crucial role within the INCOSE organization, emphasizing its impact on driving innovation, education, and research in systems engineering. The call to action focuses on raising awareness within INCOSE to inspire greater engagement and support for the Foundation's mission.

(2-hour tutorial) Mastering Your Systems Engineering Competencies – Dr. Rick Hefner, Caltech

To excel in systems engineering, professionals must possess a diverse set of competencies. This tutorial provides a thorough and practical guide for professionals looking to develop the competencies outlined in the INCOSE Systems Engineering Competency Framework. It offers a structured approach that encompasses both theoretical knowledge and practical application, catering to individuals at various stages of their careers, from novice practitioners to seasoned experts.

The framework identifies a wide range of competencies, organized in the following categories:

- Core Competencies: Systems Thinking; Lifecycles; Capability Engineering; General Engineering; Critical Thinking; Systems Modelling and Analysis
- Professional Competencies: Communications; Ethics and Professionalism; Technical Leadership; Negotiation; Team Dynamics; Facilitation; Emotional Intelligence; Coaching and Mentoring
- Technical Competencies: Requirements Definition; System Architecting; Design for…; Integration; Interfaces; Verification; Validation; Transition; Operation and Support;
- Management Competencies: Planning; Monitoring and Control; Decision Management; Concurrent Engineering; Business & Enterprise Integration; Acquisition and Supply; Information Management; Configuration Management; Risk and Opportunity Management
- Integrating Competencies: Project Management; Finance; Logistics; Quality

Participants will assess their own skills against the framework and identify areas for improvement, for both the current roles and career goals. Then practical guidance will be provided on how to acquire new skills and improve existing ones. By the end of the tutorial, participants will be equipped with the knowledge, tools, and mindset necessary to enhance their systems engineering capabilities. Whether embarking on a new career path or seeking to advance in their current role, participants will emerge from the tutorial empowered to tackle the most challenging systems engineering problems with confidence and competence.

Leveraging AI for Enhanced Systems Engineering – Dr. Rick Hefner, Caltech

The integration of Artificial Intelligence (AI) into Systems Engineering processes has emerged as a pivotal paradigm shift. Through real-world case studies and discussions, this presentation will provide systems engineers with the knowledge, tools, and insights necessary to harness the transformative power of AI for enhanced Systems Engineering.

Attendees will learn how incorporating AI components into products can enhance functionality, efficiency, and user experience. Examples include:

1. Personalized Recommendations: E-commerce platforms like Amazon and streaming services like Netflix use AI algorithms to analyze user behavior and preferences.
2. Enhanced Customer Service: Many companies integrate AI-powered chatbots and virtual assistants into their products to provide round-the-clock customer support. These AI components utilize natural language processing (NLP) and machine learning to understand and respond to customer

inquiries, resolve issues, and provide relevant information promptly and efficiently.
3. Predictive Maintenance: In industries such as manufacturing, aviation, and energy, companies deploy AI-based predictive maintenance systems to monitor equipment health in real-time. By analyzing sensor data, historical maintenance records, and environmental factors, these systems predict potential equipment failures before they occur, enabling proactive maintenance and minimizing downtime.
4. Improved Healthcare Solutions: Healthcare companies are integrating AI components into medical devices, diagnostic tools, and healthcare systems to improve patient care and outcomes. AI algorithms are used for medical image analysis, disease diagnosis, personalized treatment recommendations, and drug discovery, accelerating the development of innovative healthcare solutions.
5. Autonomous Vehicles: Automotive manufacturers are incorporating AI components such as computer vision, sensor fusion, and deep learning into autonomous vehicles. These AI systems enable vehicles to perceive their surroundings, navigate complex environments, and make real-time decisions to ensure safe and efficient autonomous driving.
6. Financial Services: In the financial industry, companies utilize AI components for fraud detection, risk assessment, and algorithmic trading by analyzing transaction patterns and user behavior to identify suspicious activities in real-time. Machine learning algorithms predict market trends and optimize investment strategies for better returns.
7. Content Creation and Curation: Media and entertainment companies employ AI components to automate content creation, curation, and personalization.

AI methodologies, techniques, and tools can also be used to improve Systems Engineering practices:
1. AI-Enabled Requirements Engineering: AI-powered techniques such as natural language processing (NLP) and machine learning (ML) facilitate the elicitation, analysis, and validation of system requirements, ensuring alignment with stakeholder needs and objectives.
2. Intelligent Design Synthesis: AI algorithms, including genetic algorithms, neural networks, and evolutionary computation, expedite the iterative process of system design synthesis, enabling rapid exploration of design spaces and identification of optimal solutions.
3. Predictive Analytics for System Performance: AI-driven predictive analytics and simulation modeling is being used to forecasting system performance, reliability, and resilience under diverse operating conditions and unforeseen scenarios.
4. Autonomous System Verification and Validation: AI is being used in automating verification and validation processes, encompassing techniques such as model checking, automated testing, and anomaly detection, to enhance system safety, security, and compliance.
5. Cognitive Decision Support Systems: AI-powered decision support systems leverage data-driven insights, expert knowledge, and probabilistic reasoning to assist systems engineers in making informed decisions throughout the system lifecycle, mitigating risks and optimizing resource allocation.

By leveraging AI algorithms and technologies, companies can deliver personalized experiences, improve operational efficiency, and drive innovation in their products and services.

(2-hour tutorial) **Requirements: A Comprehensive Overview** – Dr. Rick Hefner, Caltech

The development of requirements is critical to systems development, yet often remains enigmatic in its complexity. This tutorial offers a comprehensive exploration of industry best practices in requirements development, including elicitation, analysis, validation, specification, allocation, and verification.

Beginning with the foundational phase of elicitation, the tutorial delves into strategies for effectively capturing and understanding stakeholder needs and desires. It provides methodologies for conducting context definition and mission analysis, ensuring that requirements are not only comprehensive but also aligned with organizational objectives and constraints. The tutorial presents techniques for validating and verifying the accuracy, consistency, and completeness of requirements, mitigating the risks associated with misunderstanding or oversight.

Specification emerges as a critical juncture, where the abstract notions of requirements are distilled into precise, unambiguous statements. Here, the tutorial equips participants with the tools and frameworks necessary to articulate requirements in a manner that is both understandable and actionable by development teams. The process of allocation involves the strategic distribution of requirements among system components, fostering cohesion and efficiency in the development process.

Verification ensures that the delivered system faithfully adheres to specified requirements. The tutorial illuminates robust verification methodologies, empowering attendees to rigorously assess system performance and compliance. Moreover, an introduction to model-based techniques offers a paradigm shift in requirements development, leveraging visual representations to enhance clarity, traceability, and communication.

Participants will emerge from the tutorial armed with a comprehensive toolkit for navigating the complexities of requirements development. They will also learn about critical INCOSE guides on requirements development. Whether grappling with evolving stakeholder needs, negotiating conflicting requirements, or managing changing project dynamics, attendees will possess the requisite skills and knowledge to navigate the requirements landscape with confidence and efficacy.

Applying Systems Engineering Tools for Process Design – Dr. Rick Hefner, Caltech

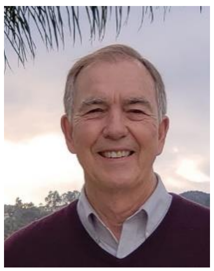
This presentation explores the application of systems engineering tools in business process design, drawing a direct analogy to their use in product development. By comparing the two domains, it highlights shared artifacts and methodologies, demonstrating how systems engineering principles can effectively be applied to business processes. Adopting a systems approach enables organizations to gain a comprehensive understanding of their operations, allowing for the identification of inefficiencies, bottlenecks, and opportunities for improvement.

The systems engineering (SE) methodology provides a flexible and robust framework for structuring, analyzing, and optimizing both physical products and operational workflows. Core systems engineering artifacts, such as stakeholder needs, functional requirements, operational and behavioral diagrams, and system architectures, play a pivotal role in both domains. These elements can be leveraged through various established tools and methodologies to enhance business processes.

In addition, integrating systems engineering with Lean Six Sigma methodologies—particularly DMAIC (Define, Measure, Analyze, Improve, Control) and DMADV (Define, Measure, Analyze, Design, Verify)—opens up further opportunities for process improvement. These frameworks, already well-established in the field of process optimization, complement systems engineering by providing a structured approach to addressing inefficiencies and driving continuous improvement.

Through practical examples, this presentation illustrates how blending systems thinking with Lean Six Sigma principles enriches the process design paradigm. The result is a powerful toolkit for optimizing both product development and business processes, making systems engineering a valuable approach for organizational success.

Systems Engineering and the Advent of Science-directed Lawmaking – Mr. David Schrunk, MD, SELAW WG



This presentation discusses progress in the application of systems engineering principles and methodologies to the lawmaking process of government. In a democracy, the purpose of government is to secure the rights and liberty of the people; that is, to solve or mitigate the societal problems that degrade or threaten to degrade rights and liberty. However, democracies, as a generalization, have been less than successful in their attempts to solve serious problems such as war, crime, poverty, and pollution. Investigations of the traditional method of lawmaking, which has been used by governments for millennia, have disclosed that it is not a problem-solving process. It is, instead, an opinion-based system whose purpose is to create laws rather than to solve problems and it lacks the structured, knowledge-based consistency and discipline that characterizes engineering practices. It is therefore incapable of creating an effective rule of law that solves societal problems. To improve the ability of democracies to satisfy their public service obligations, government agencies in Europe, Japan, and Mongolia, for example, have made notable strides in the development of standards and feedback measures for lawmaking processes. Based on that foundation, investigations are being conducted by the INCOSE Systems Engineering and Lawmaking Working Group (SELAW) to expand systems engineering principles and methodologies to encompass laws and lawmaking. SELAW is studying engineering quality standards and practices as they apply to lawmaking, such as problem definition, modeling and simulation of sanctions, cost/risk analyses, verification, and validation of outcomes. A near-term goal of SELAW is to prepare a summary of its studies for an INCOSE handbook on science-directed lawmaking. The ultimate objective of these efforts is to establish a science and systems engineering-directed lawmaking process that enables democratic governments to satisfy their public service obligations through an effective, cost-efficient, and responsible rule of law. Every science is a success as measured by ever-expanding bodies of scientific knowledge and ever-improving problem-solving technologies. The expanded systems engineering discipline of laws and lawmaking is predicted to be equally successful.

Integrating Systems Engineering Into Aerospace and Student-Led Initiatives at San Diego State University – Mr. Chase Rodriguez, Mr. Jalen Noel, Mr. Joseph Ballesteros, and Ms. Courtney Cunningham, SDSU team

At San Diego State University, systems engineering has become a core framework for both academic instruction and student-led initiatives, allowing students to effectively address complex, interdisciplinary challenges. As president of the Aztec Council on Systems Engineering, SDSU's student chapter affiliated with INCOSE, I was tasked with shadowing the Design, Build, Fly (DBF) team to observe how systems engineering principles are applied in a real-world project setting. This experience has provided valuable insights into how SE methodologies can be used to optimize the design and performance of complex systems, such as an aircraft.

Teams participating in the DBF competition must create, assemble, and pilot an electric-powered, remote-controlled aircraft. A comprehensive systems approach is necessary for success in this competition, in addition to technical talents. Utilizing SE techniques like functional decomposition and risk management, the DBF team successfully integrates avionics, payload management, and propulsion among other subsystems. The Systems lead of the DBF team is responsible for overseeing the ground mission, ensuring that all the subsystems are properly integrated and functioning.

Apart from observing the DBF team, ACOSE has played a significant role in advocating for systems engineering across the university. We provide seminars, workshops, and partnerships with professionals in the field to improve students' comprehension of SE in practical settings. These programs help students acquire skills that are essential in the aerospace industry and other complex sectors by highlighting the need of life cycle thinking, interdisciplinary collaboration, and iterative design.

This presentation will showcase how SDSU is embedding systems engineering into its educational framework and student projects, empowering students to bridge the gap between theory and practice. Through hands-on experiences like DBF and strong connections with industry, SDSU is preparing the next generation of engineers to excel in today's rapidly evolving engineering landscape.

Resilience in Today's and Tomorrow's Systems – Mr. Kenneth Cureton, USC

Successful systems for today's world and into the future must be affordable, adaptable to ever-changing needs, and resilient to a wide range of adverse conditions-- including both environmental and man-made adversities, whether expected or not. And of course, critical quality attributes such as safety, security, and reliability must also be maintained at ever-increasing levels throughout the life cycle of today's and tomorrow's engineered systems.

This presentation leverages the products and findings of the INCOSE Resilient Systems Working Group to examine the necessary characteristics of system resilience for such systems (including assessment of things that potentially frustrate resilience), with a special emphasis on methods of gauging affordable resilience as well as presentation of potential resilience modeling techniques for Model-Based Systems Engineering (MBSE), Digital Engineering (DE), and Digital Twins. The presentation also examines the potential adaptability via artificial intelligence (AI) in increasingly complex systems.

On understanding of this presentation, the audience will be able to grasp and apply key concepts in resilience engineering and understand where to access INCOSE resources and recommended references for potentially accomplishing resilience engineering in their current and future projects.

Ken Cureton is Chairman of the INCOSE Resilient Systems Working Group (RSWG) as well as a regular contributor to the INCOSE Complex Systems Working Group (CSWG), and gratefully acknowledges the efforts of these groups.

Engineering Disasters Unveiled: A Systems Engineers Perspective – Mr. Mitch Seime, NAVWAR

This presentation was previously given at the January 2024 San Diego Chapter meeting. This presentation examines engineering disasters from a systems engineering perspective. Instead of attributing failures to individual components or human errors, we explore these calamities as systemic breakdowns. The session will examine notable engineering disasters such as the Kursk, the Titanic, and the Ocean Ranger loss, analyzing them at the systems level to uncover the intricate connections and dependencies that led to their catastrophic outcomes.

The presentation will highlight the crucial role of human factors in engineering failures, investigating the impact of cognitive biases, communication breakdowns, and organizational culture on decision-making within complex systems. Through case studies, the speaker will emphasize the importance of a systems thinking approach in risk assessment and mitigation, providing insights into strategies for identifying and addressing potential failure points in complex engineering systems.

Additionally, the session will showcase successful post-disaster improvements, demonstrating the transformative power of incorporating lessons learned into engineering practices. The presentation will conclude with a call to action for fostering a resilient engineering culture that embraces continuous improvement, adaptability, and the integration of systems thinking in all aspects of engineering. Attendees will gain a deeper understanding of the critical role systems engineers play in preventing disasters and be inspired to advocate for a holistic approach in their own engineering endeavors.

Utilizing Systems Engineering Principles to Understand Systemic AI Biases – Mr. Andy von Stauffenberg, Colorado State University

This presentation explores the application of Systems Engineering principles, particularly Systems Dynamics Modeling, to analyze, understand, and mitigate systemic biases in Artificial Intelligence (AI) systems. As AI becomes increasingly integrated into critical decision-making processes across various sectors, the issue of bias in these systems has emerged as a significant concern. Systems Engineering, with its holistic approach and tools like Systems Dynamics Modeling, offers a uniquely powerful framework to comprehend and address the complex, interconnected factors that contribute to AI bias.

The presentation will begin by introducing the concept of systemic bias in AI and its potential impacts on individuals and society. We will then delve into how Systems Engineering principles, including requirements analysis, system architecture, and lifecycle management, can be applied to AI bias mitigation. Through the use of causal loop diagrams and stock-flow models from Systems Dynamics, we will demonstrate how various sources of bias - including data bias, algorithmic bias, and human bias - interact and reinforce each other within AI systems.

Case studies will illustrate how Systems Engineering approaches can reveal unexpected feedback loops and long-term consequences of bias in AI applications. We will discuss strategies for reducing systemic bias in AI systems, emphasizing how Systems Engineering's focus on the entire system lifecycle enables more comprehensive and effective bias mitigation. The presentation will highlight the unique advantages of Systems Engineering in addressing AI bias, including its ability to manage complexity, facilitate interdisciplinary collaboration, and ensure traceability of requirements and design decisions.

We will also explore the challenges and limitations of this approach, as well as potential strategies for leveraging Systems Engineering insights to develop more fair and equitable AI systems. The presentation will conclude with a discussion on the role of Systems Engineers in guiding AI development and the importance of integrating Systems Engineering principles throughout the AI lifecycle. By combining the power of Systems Engineering with domain knowledge and ethical considerations, we can work towards creating AI systems that are more robust, transparent, and aligned with societal values.

Overcoming Key Challenges in MBSE Adoption – Mr. Andy von Stauffenberg, Colorado State University

Model Based Systems Engineering (MBSE) promises enhanced efficiency and improved system design, yet its widespread adoption faces significant obstacles. This presentation delves into three primary challenges hindering MBSE implementation and proposes actionable solutions to overcome them.

First, we address the substantial costs associated with MBSE adoption, encompassing both tooling expenses and personnel training. Many organizations struggle to justify these initial investments despite long-term benefits. We explore strategies for phased implementation, leveraging existing resources, and developing comprehensive business cases to mitigate financial barriers.

Second, we examine the cultural and organizational resistance to MBSE adoption. This includes the reluctance to mandate MBSE usage in new projects and the misconception that MBSE fundamentally alters traditional systems engineering practices. We present approaches for fostering a model-based culture, aligning MBSE with organizational goals, and demonstrating its value as an evolution of existing processes rather than a revolution.

Third, we confront the challenge of management support and stakeholder engagement. The lack of executive buy-in and limited understanding of MBSE's full potential beyond diagramming can significantly impede adoption. We discuss methods for cultivating executive sponsors, showcasing MBSE's comprehensive benefits, and developing tailored communication strategies for diverse stakeholder groups.

Throughout the presentation, we draw on industry case studies and research to provide practical insights. Attendees will gain a deeper understanding of these critical MBSE adoption hurdles and leave with strategies to navigate them successfully. By addressing these challenges head-on, organizations can pave the way for successful MBSE implementation and reap its substantial benefits in managing complex systems development.

System-Theoretic System Safety Approach to an Autonomous Space Mission – Mr. Robert Crombie, Aerospace Corporation, and Mr. Drake Mailes, A-P-T Research, Inc.

This presentation presents the results of a comparison study conducted between two system safety hazard analysis methodologies, traditional MIL-STD-882E and System Theoretic Process Analysis (STPA). The comparison was conducted on a generic autonomous refueling satellite system. This study recommends that in situations where resources are constrained that STPA be utilized by both the program office and satellite builder as a key element to their system safety program.

The System Theortic Process Analysis (STPA) will be described with its application for system safety hazard analysis to a generic autonomous Rendezvous Proximity Operations Servicing (RPOS) mission. The intent is to determine the value STPA provides in comparison to -882E, and to evaluate how STPA could be used to inform system safety program development.

The key mission events reviewed are autonomous maneuvering, docking, refueling, and decoupling. The satellite would be commanded from a ground station to begin refueling with client satellites once both are in proximity to each other. The mission begins an autonomous operation that includes close in maneuvering, docking, refueling, and decoupling.

The STPA analysis had four primary steps: identifying losses and hazards, the modelling of the control structures of the satellite, identifying unsafe control actions, and identifying loss scenarios. The STPA review identified 44 hazards. These hazards were developed from modelling system and sub-system behaviour through a series of control loops. From these models, the control actions and feedback were determined and examined for potential hazardous control actions. Causal factors for each of the hazardous control actions were determined. The STPA analysis took about half the time of the 882E analysis.

The two analysis methods were compared to determine which hazards wholly, partially, or do not overlap. The overlapping hazards, both wholly and partially, relate predominately to errant signals or commands that result in an inability to maintain positive control of the RPOD resulting in a collision. A second area of overlap concerns equipment damage due to failures within the fuel system. Hazards with no overlap between the two analysis methods were dominated by individual component failures identified in the -882E review. The STPA review identified hazards caused from interactions between the ground and the RPOS satellite as well as the RPOS and the client satellites.

One of STPA's strengths is finding interactive hazards because the analysis shows where and how outside elements interact with the system, as well as what functions need to occur during nominal operations. The method can also provide insight to software safety analysis by assisting in the identification of safety critical functions and their associated components.

This study recommends that the program owner conduct their own high level STPA analysis before issuing a statement of work to the system builder. This can be done using only program requirements and system architecture. From this, the program owner will develop a well-informed idea of the scope of any potential system safety program. If the program decides to conduct a system safety program using -882E, this pre-contract work can help determine which tasks would be most effective. Thereby, likely reducing the need for duplicative or unnecessary work. Also, by providing this work to the satellite builder they would be able to get a jump start on the work as well as see the level of work expected, perhaps avoiding unnecessary back and forth exchange.

As governments and private parties seek to move faster in the development and deployment of autonomous satellites, system safety must adapt. Taking advantage new analysis methods, such as STPA, is critical to providing efficient and thorough system safety analysis. Program offices would be wise to do some of their own pre-contract STPA analysis work. This will allow for system safety programs to be properly scoped and avoid stakeholders from asking for expensive tasks that would not improve the performance of the safety effort.

A Systems Framework for Using AI to Audit Compliance with Healthcare Regulations – Mr. Andre J. Bahou, George Washington University

Health care data is a high value target both for hackers and for companies that seek to monetize your valuable private health records. Currently Healthcare organizations rely on many software vendors to comply with healthcare regulations. Those vendor relationships are often governed by contractual obligations known as Business Associate Agreements (BAA) between the healthcare provider and the vendor.

As cloud computing and remote servers become the lowest cost option for storing patient data, organizations are increasingly relying on cloud vendors to store that patient data on remote servers in the cloud. Healthcare organizations have the obligations to comply with Health Insurance Portability and Accountability Act (HIPAA) but often lack the ability to know whether their vendors are complying—thereby creating uncertain risk. This presentation will provide a framework to use Artificial Intelligence (Natural Language Processing and Large Language Models) to independently test compliance with healthcare regulations. The novel framework will provide healthcare organizations with the ability to assess their risk, confirm whether vendors are in compliance, and reduce risks by making informed decisions. Some key takeaways include: (1) how to evaluate vendors for compliance with Health Insurance Portability and Accountability Act, (2) verify and audit business associate compliance, and (3) understand governance regarding vendor's compliance and maintenance patient data.

Extending Descriptive System Models for Requirement Verification – Mr. Sam Goodwin, Mr. Alec Rambo and Mr. Alexander Ford, NGC team

System programs require an often-contradictory combination of minimizing costs and deployment timelines as well as complex and time-intensive design and test phases. In an environment where engineering specialties may not be localized geographically to larger program design teams, the establishment of an authoritative source of truth (ASoT) for models used in design and test of products becomes a necessity. Descriptive system models (DSMs) provide a solution as well as capabilities to be extended to integrate with digital simulations and analysis software. Effective extension of DSM into these digital systems allows for the creation of a localized digital twin all based on the DSM serving as a program's ASoT. The exploration of this DSM extension into a larger digital environment sets a basis for the capability to verify program requirements and implement design changes earlier is the program's lifecycle and is timelier and more cost effective. Particularly with program customers or management updating design characteristics, a workflow is in place in the dynamic DSM tied to parameterized models to quickly perform investigations into these changes, determine how it impacts performance measures and requirement satisfaction, and the need to research, purchase, integrate and test physical components completely removed.

With a parameterized simulation, Ansys ModelCenter allows for easy one-to-one mapping of a DSM's set of value properties attached to a system to a simulation's parameters, as well as outputs of that simulation being mapped into the DSM. Within the DSM, value properties linked to analysis outputs utilize satisfy relationships to link with requirements, and when an analysis is updated with new parameters, the results can quickly and automatically flow directly into requirement verification. Some examples of the DSM extension thread that have been used to verify requirements include Dassault SolidWorks for stress analysis of a structure verifying yield strength requirements, Ansys Systems Toolkit to both establish viewability figures and verify antenna field of view requirements, and Ansys HFSS to verify antenna performance requirements such as peak gain, directivity and radiated power.

Presenters

Mr. James Melton, PhD

Author of numerous books, his latest being *Red Planet Leadership*, Jim began his teaching career in the cockpit of an airplane. As a professional speaker, journalist and former college instructor and airline pilot, he has shared his ideas with many of the top Fortune 500 companies and with thousands of people worldwide transforming complex issues into simple common-sense terms. He holds a PhD in Management Science. Public television produced an eight-part series on his work titled, Reaching New Heights of Excellence. He is a contributing columnist for the National Space Society's official magazine, Ad Astra. Jim speaks on innovation, leadership and the future. He is the Chief Ambassador for The Mars Society and speaks at the International Mars Society Conventions. He has been invited to present his work extensively in the U.S. as well as internationally in Canada, Mexico, France, Italy, England, China and Dubai, U.A.E. Jim travels from Palm Springs, California.

Mr. Mike Wallace

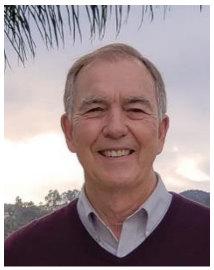
Mr. Wallace is a Director at Virgin Galactic. He is an experienced Systems Engineering Executive leader skilled in Systems and Product Development, Requirements Elicitation, Development, Management, Verification and systems engineering organizational development. An engineering professional with excellent organizational and People leadership skills, Mike has a passion to grow engineering talent. He holds an Engineer's degree focused in Industrial and System Engineering from University of Southern California (USC), a Master's degree in engineering management (MSEE Electives), and a Bachelor's degree in electrical engineering from Cal State University of Northridge.

Dr. Julia Taylor

Dr. Julia Taylor is a Management Consultant at Taylor Success Systems, where she applies Systems Thinking to solve business challenges. She holds a Doctorate in Corporate Strategy (under the guidance of Igor Ansoff), an MBA from Santa Clara University, a B.S. in Chemistry from Memphis State University, and an Electronics degree from Heald Institute of Technology in San Francisco. Currently, Dr. Taylor serves as the President of the San Diego Chapter of INCOSE and has been a board member since 2018. While serving on the San Diego board, the chapter has consistently received the INCOSE Platinum Award, the highest honor for chapters. She has also served on the Planning Committee for the Western States Regional Conference (WSRC) and presently co-chairs the LA-SD Joint Conference Committee, representing San Diego. Additionally, Dr. Taylor is the Chapter Representative for SD INCOSE at the San Diego County Engineering Council (SDCEC) and has served in this role since 2018. She previously held the position of Director of Outreach for the INCOSE International Board. Active in Toastmasters, Dr. Taylor holds the Distinguished Toastmaster (DTM) title and has achieved Presentation Pathways recognition. She is also the author of several technical papers and three business books.

Mr. Greg Bulla

Greg Bulla has worked in software engineering and systems engineering domains for over 20 years. He currently supports the Naval Information Warfare Systems Command (NAVWAR) Headquarters division in conducting technical systems engineering reviews of large DOD programs. Greg's professional software experience includes the planning, design and development of time-critical targeting software, intelligent software agents, and tactical radios, and has directly contributed to the following programs: U.S. Navy's Littoral Combat Ship (LCS), Global Command and Control System (GCCS), Distributed Common Ground System-Navy (DCGS-N), and a U.S. unmanned ship program. His education includes a BS in Aerospace Engineering and an MS in Computer Science, and he holds active INCOSE CSEP certification. He is a Past President of the INCOSE San Diego chapter and the Chair of the INCOSE Systems Engineering and Lawmaking (SELAW) WG.



Mr. David Schrunk, MD

David G. Schrunk is an aerospace engineer and medical doctor with specialization in nuclear medicine and diagnostic radiology. He is the author of multiple refereed papers and presentations on topics of law, medicine, and space exploration, and is the founder of the Science of Laws Institute, a non-profit institution dedicated to the establishment of the science of laws. In 2005 he authored the book, "THE END OF CHAOS: Quality Laws and the Ascendancy of Democracy," which describes the rationale for developing the science of laws. In 2022 he co-founded the INCOSE Systems Engineering and Lawmaking Working Group (SELAW), which is focused on the development of the science of laws and science-directed lawmaking. His affiliations include ILOA (International Lunar Observatory Association), AAAS, AIAA, NSS, and INCOSE.

Dr. Rick Hefner

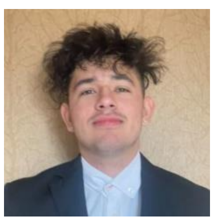
Dr. Rick Hefner serves as the Executive Director for Caltech Technology and Management Education, where he provides professional education programs for technology-driven organizations and individuals. He has over 40 years of experience in systems engineering and has worked with over 30 companies in the aerospace, communications, electronics, and health sciences industries. Dr. Hefner is credited with over 200 presentations and publications, and is a past President of the INCOSE Los Angeles chapter.

Mr. Randall DeGering

Randall DeGering has extensive experience as a USAF officer specializing in air defense and military headquarters staff planning. He accumulated 2,700 flight hours as a rated E-3 AWACS Air Battle Management officer and served on the international NATO staff in Belgium, as well as Deputy Division Chief at HQ USAFE. He was selected to command a NORAD radar control squadron in Alaska and, after retiring, continued to serve as a USAF civilian on the headquarters staffs of USNORTHCOM and NORAD. He has a deep understanding of operations center procedures, Combatant Command (CCMD) and Major Command (MAJCOM) staff operations, branch leadership, and general officer support. As a military contractor, he gained expertise in systems engineering and risk management processes supporting military satellite acquisition. He also has a strong background in military policy, aerospace doctrine, and military operations planning.

Mr. Charley Patton, CSEP

Charley Patton, CSEP, is a systems engineering lead for Northrop Grumman, which he joined in 2004. He has a B.S. in Electrical Engineering and Computer Science from the University of Colorado, Boulder, an M.S. in Business Administration from SDSU, and several certificates, including a Systems Engineering certificate from UCSD and a Model-Based Systems Engineering certificate from Caltech. Mr. Patton transitioned from software engineering to systems engineering the old-fashioned way – one day, his boss volunteered him to go derive the system requirements. From this first excursion into systems engineering, he learned increasingly disciplined methods for identifying and documenting requirements and architectures; planned and executed system test and deployment activities; was a functional manager for 3 years; and even managed a hardware development and production team for a year. Today he splits his time performing systems engineering lead functions, executing technical systems engineering tasks, and trying to get his dachshund to understand the difference between ConOps and OpsCon.



Mr. Joseph Ballesteros

Joseph Ballesteros is a senior at San Diego State University majoring in Aerospace Engineering. Originally from Los Angeles, CA, he relocated to San Diego after graduating from high school. At SDSU, Joseph became actively involved in clubs such as ACOSE and SHPE, where he made connections with fellow students and professionals. He also worked for the university through the Associated Students of San Diego State University. Joseph plans to graduate in the spring of 2025 and is excited to continue his career in the engineering field.

Dr. Kennith Preston

Dr. Kenneth L. Preston is an Engineering Multi-Skill Leader (Project Engineer/Technical Lead Engineer/Control Account Manager) in Systems Engineering and Integration for the C-17 Globemaster III program. He holds a B.A. and M.S. in Physics, an MBA, and a DBA from Columbia Southern University. Dr. Preston has over 37 years of experience in the Space and Defense industry and has received numerous awards for his contributions. A former faculty member at Hampton University, where he taught Mathematics, Dr. Preston has also pursued postgraduate studies at several institutions, including California State University and Caltech. He holds a California Community College Lifetime Teaching Credential in Physics. Dr. Preston is an author, an Associate Member of Manchester Who's Who for Executives and Professionals, and serves on the Industry Advisory Board for Engineering and Technology at California State University, Los Angeles. He also teaches Predictive Analytics, Systems Engineering, and Aerospace Project Management at Caltech's Center for Technology and Management Education (CTME). In addition to his professional accomplishments, Dr. Preston is a martial artist in Korean Soo Bahk Do and actively engages with community programs, speaking to students about STEM careers. He has authored several technical papers, and is an officer at Faith-Based Toastmasters.

Mr. Ken Cureton

Ken Cureton retired from Boeing (formerly Rockwell) after 29 years and continued his career with 16 more years of successful technical leadership in both commercial and government sectors. His expertise includes enterprise systems architecting, system-of-systems modeling, complex networked systems, cloud computing, resilience engineering, and avionics design for manned and unmanned space systems. He has held many key roles, including Chair of the INCOSE Resilient Systems Working Group (RSWG), Committee Member of the AIAA Space Settlement Technical Committee (SSTC), Co-chair of the IEEE SMC MBSE Working Group, Technical Council Chair Emeritus of the NCO Industry Consortium (NCOIC), Boeing Designated Expert (BDE) for Interoperability, and Technical Lead Engineer (TLE) at Boeing Systems Engineering & Integration. Ken holds a BS in Physics from California State University, Los Angeles, and an MS in Systems Architecting & Engineering from the University of Southern California.

Mr. Fernando Granados, CSEP

Fernando serves as a Senior Principle Digital Engineer within the Digital Systems Engineering group of Science Applications International Corporation's (SAIC's) Engineering Innovation Factory (EIF). Within the EIF, he develops and applies Digital Engineering (DE) strategies and capabilities, with an emphasis on Model Based Systems Engineering (MBSE) across a variety of domain missions. Mr. Granados has spent the majority of his career employing Systems Engineering principals on strategic and tactical mission systems for air, space and sea platforms. He received his Masters of Science degree from UCLA in Systems Engineering, a Bachelor of Science degree from Cal Poly Pomona in Aerospace Engineering and is an INCOSE Certified Systems Engineering Professional (CSEP).

Mr. Chase Rodriguez

Chase Rodriguez is currently a Senior at San Diego State University, majoring in Aerospace Engineering. Originally from Chicago, IL, he moved to San Diego after high school and began his studies at San Diego Mesa and Miramar College, where he earned three associate degrees before transferring to SDSU. Throughout his college career, Chase has gained valuable experience through multiple internships. His first was the California Space Grant Internship at NASA JPL through San Diego Miramar College. After joining SDSU, he became involved with the Aztec Council on Systems Engineering (ACOSE), which led to an opportunity to work as a Manufacturing Engineering Intern for Shield AI in Dallas, TX. Most recently, he worked as a Manufacturing and Systems Test Engineering Intern at AeroVironment in Simi Valley, CA. Chase is eager to continue his journey in the engineering field and looks forward to the opportunities that lie ahead after graduation.

Mr. Jalen Noel

Jalen Noel, originally from Harbor City, California, is a first-generation college student currently studying Aerospace Engineering at San Diego State University. He is also a member of the Weber Honors College and serves as Vice President and Treasurer of the Aztec Council of Systems Engineering (ACOSE). Jalen gained valuable experience as a Product Engineering Intern at Veridiam Inc., where he learned various engineering processes and worked with Metallurgy, SolidWorks, and X-Ray Fluorescence. In his free time, he enjoys spending time with friends and family, building Legos, and playing basketball. Jalen is excited and eager to make meaningful contributions to the engineering field while continuing to expand his knowledge and skills.

Ms. Courtney Cunningham

Courtney Cunningham is a 4th year Aerospace Engineering student at San Diego State University, where she is pursuing her Bachelor's degree. Throughout her academic career, she has developed expertise in engineering programs such as MATLAB and SolidWorks, applying these skills to a variety of coursework and hands-on projects. Her passion for the industry extends beyond the classroom, as she is actively involved in professional organizations including the Society of Women Engineers and the local student division of INCOSE, known as ACOSE. Currently, Courtney is collaborating with a team of peers on a senior capstone project focused on designing an innovative aircraft. The project aims to come up with new ideas and tackle common challenges in aircraft design. She is eager to apply her skills to make valuable contributions to the industry and to continue developing as an engineer.

Mr. Andy von Stauffenberg

As the Mission Systems Chief Engineer and Chief Architect at General Atomics Aeronautical Systems, Andy von Stauffenberg leads a team of engineers in developing advanced solutions for remote sensing, datalinks, networks, AI, and ground systems for unmanned aerial vehicles (UAVs). With over 20 years of experience in hardware, software, and systems design within the defense industry, Andy has successfully managed and executed numerous complex projects. Specializing as a multi-disciplinary systems architect, Andy has a strong background in systems engineering, excelling in designing comprehensive enterprise architectures that account for dataflows, physical components, functions, cybersecurity, and operational impacts. Andy anticipates the entire lifecycle of systems, ensuring they meet both current and future needs. Andy holds multiple certifications and patents and is proficient in several programming languages. Currently pursuing a PhD in Systems Engineering from Colorado State University, Andy is researching sociotechnical AI systems, focusing on a Multi-Modal Federated AI System with Multi-Sensory Feedback for enhanced decision-making. This research integrates diverse data sources, ensures data privacy, and has applications in healthcare, smart cities, and security. Committed to advancing the fields of unmanned systems and AI, Andy continuously strives to innovate and develop solutions that address today's and tomorrow's complex challenges.

Mr. Mitch Seime

Mr. Mitch Seime is a Systems Engineer and the Head of the Mission Assurance Department at Naval Information Warfare System Command (NAVWAR). A retired submarine electronics technician, Mitch served as the assistant program manager for the Common Submarine Radio Room and Submarine Operating Authority from 2008 to 2016, where he enhanced communications and network capabilities. During this period, he earned his Lean Six Sigma Black Belt and led projects that implemented numerous improvements and reduced costs. In 2016, Mitch joined the NAVWAR Office of the Chief Engineer to establish the Chief Engineer for Navy Nuclear Command, Control, and Communications (NC3). As Lead Systems Engineer, he defined the engineering and certification processes for strategic systems and fostered active collaborations with other stakeholders in strategic deterrence. In 2022, he was reassigned to assess and transform NAVWAR's Technical Authority to expedite the development, certification, and deployment of National Security and Defense Business Systems for the U.S. Navy. Mitch has been a member of INCOSE since 2013, serving in various roles, including secretary, director for the first and second years, and VP for Technical Development. He holds a BS in Workforce Education with a focus on Technology Management and an MS in Systems Engineering Management from the Naval Postgraduate School.

Mr. A.J. Bahou

A.J. Bahou is the Chair of Bradley's Artificial Intelligence (AI) Practice and an intellectual property attorney specializing in the intersection of healthcare law and technology. As both a transactional attorney and trial lawyer, he has significant experience with computer technologies, including AI, virtual reality, medical devices, software, hardware, and internet security systems within the healthcare industry. A.J. has represented both plaintiffs and defendants in various U.S. jurisdictions, including the U.S. Federal Circuit and the U.S. Supreme Court. A core focus of A.J.'s practice includes healthcare transactions, M&A diligence, healthcare technology, and regulatory matters related to data privacy and security. A.J. earned his B.S.C.E. from Tennessee Tech University, a Master's in Electrical and Computer Engineering, summa cum laude, from The Johns Hopkins University, and a Juris Doctorate, magna cum laude, from the University of New Hampshire. He is currently pursuing a PhD in Systems Engineering at The George Washington University. A.J. serves on the Boards of Directors of LaunchTN and the Tennessee Intellectual Property Association. He also chairs the Artificial Intelligence Task Force for the Tennessee Bar Association. His past leadership roles include chairing the Intellectual Property Executive Council of the Tennessee Bar Association, the Intellectual Property Law Section of the Nashville Bar Association, and serving as a board member of the Middle Tennessee chapter of the Information Systems Security Association.

Mr. David Shostak

David Shostak is a versatile and dynamic leader, a successful Program Manager leading high-technology programs. His experience in technical fields, versatility, and knowledge inspire confidence in his ability to handle diverse, challenging projects. With leadership skills in one package, David is the model for getting the most out of and motivating people. David's contributions to GPS vehicle navigation are pioneering and game-changing. His dedication was recognized when the product earned a spot on Oprah Winfrey's Favorite Things List, solidifying his credibility and success.

Mr. Robert Crombie, ESEP

Robert B. Crombie has been involved with research and development of aircraft and space systems for over 40 years. During 24 years of active duty with the Air Force, he performed roles ranging from flight test engineer, manned spaceflight engineer, systems engineering lead, and deputy program manager. Since then, he has continued to work in the integration of national space and ground systems for several firms. Currently Rob is a senior project leader for the Aerospace Corporation in El Segundo, CA where he advises various programs on integration and test issues. He has a B.S. in engineering sciences from the Air Force Academy, and a M.S. in aeronautics from the California Institute of Technology. He is recognized by INCOSE as an Expert Systems Engineering Professional (ESEP).

Mr. Drake Mailes

Drake Mailes is a Principal System Safety Engineer for APT (A-P-T Research, Inc.). Prior to this, he worked for the United States Air Force from 2015 to 2022, where they held the roles of Site Senior Functional for System Safety and Lead System Safety Engineer - Ground Based Strategic Deterrent. Drake obtained a BS in Chemical Engineering from Brigham Young University in 2013, and an MS in Civil and Environmental Engineering from Brigham Young University in 2014. Drake then obtained a 40hr HAZWOPER certification from Utah Trust Insurance in March 2015, an OSHA 10hr General Industry certification from the State of Utah in November 2014, and a Certified Safety Professional certification from the Board of Certified Safety Professionals in July 2020. Drake is currently enrolled in a Master of Legal Studies program at the University of Utah, which he began in 2022.

Mr. Scott Jackson

Scott Jackson is a Principal Engineer at Burnham Systems Consulting, where he helps commercial aircraft companies worldwide adapt and implement systems engineering processes across their organizations. His consulting focuses on the unique challenges of applying systems engineering to commercial aircraft design and production, drawing from his extensive experience in the field. Scott's career includes systems engineering and leadership roles at Boeing, McDonnell Douglas, and Douglas Aircraft. He also teaches graduate-level systems engineering courses at the University of Southern California. Scott is the author of several books, including Systems Engineering for Commercial Aircraft and Systems Engineering for Commercial Aircraft: A Domain-Specific Adaptation. He also authored Architecting Resilient Systems, which is used in graduate courses at the University of Southern California.

Ms. Dorothy Benveniste

With 25 years of Systems Engineering experience in Flight Controls, Payloads, Airframe and Structures subsystems, Dorothy Benveniste led technical programs as a Project Engineer at Boeing Commercial Airplanes for in-service commercial fleets of 747 and 767 aircraft that navigate the globe. She holds a Bachelor of Science degree in Computer Science from Cal State University Los Angeles and an MBA from Pepperdine University, Malibu, CA. Dorothy has served at the chapter and board of director levels of INCOSE, most recently as the Managing Director of the INCOSE Foundation. What if we could engineer the future—and change the world? With your support, the Foundation will advance systems thinking to address complex global challenges, enable STEM outreach programs in local schools, and deliver solutions that make a difference—especially in underserved regions. For a better world through a systems approach that is accessible to all.

Mr. Charles (Zeke) Brechtel

Charles (Zeke) Brechtel has held a variety of roles throughout his career. In 2020, he became the Co-founder and CTO of Prewitt Ridge. Prior to that, he worked at SpaceX from 2015 to 2020, where he served as a Mission Integration Engineer, Hyperloop Pilot, and Integration & Test Engineer. From 2013 to 2015, Charles was a Graduate Research Assistant at the University of Colorado Boulder. He earned a BA in Physics from Ohio Wesleyan University in 2013, followed by an MS in Aerospace, Aeronautical, and Astronautical/Space Engineering from the University of Colorado Boulder in 2015. During his graduate studies, he also obtained a certification in Astrodynamics and Satellite Navigation in May 2015.

Mr. Steve Massey

Steve Massey is the Co-founder and CEO of Prewitt Ridge, a company focused on developing software that supports a DevOps for Hardware approach for complex engineering, with a particular emphasis on the human aspect of engineering, such as Requirements Management. Before founding Prewitt Ridge, Steve contributed to the successful launch of over two dozen spacecraft during his time at SpaceX. He was the Mission Manager for Falcon 9 flight 20, ORBCOMM-2, the first booster to successfully return to land. Additionally, he led the development of Slingshot Aerospace's Edge platform, which integrates sensor fusion across visible light, IR, and RF sensors to deliver actionable insights to warfighters on remote platforms. Steve is passionate about digital engineering and applying software iteration principles to hardware development, enabling teams to deploy innovative systems faster than their competitors and adversaries.

Ms. Kaela Dang

Kaela Dang holds a bachelor's degree in electrical engineering and has experience working at Southern California Edison, where she managed the electrical grid. She currently works at Boeing, focusing on sustainment and parts management for the C-17 Globemaster III. In this role, Kaela serves as a support focal for various United States Air Force programs. Her academic background includes a focus on circuit design, power systems analysis, load flow studies, microelectronics, and digital logic design. She has extensive programming experience as well as proficiency in the Microsoft software stack. In her free time, Kaela enjoys learning new languages and expanding her knowledge in psychology, marketing, and project management.

Dr. Steven Cornford

Steven Cornford, PhD, is currently a senior engineer at Caltech's Jet Propulsion Laboratory (JPL). In his 25 years of experience covering the entire mission life cycle, he spent the last decade pioneering MBSE ontologies, developing prototypes, and working as a PI with DARPA to assess complex trade spaces in spacecraft constellation performance through SysML models. Dr. Cornford has a gifted ability to convey the promise of MBSE and its connection to the big picture. He has authored over 100 papers and been awarded the NASA Exceptional Service Medal. He has a double major in mathematics and physics from UC Berkeley, an MS in mathematical physics and a PhD in experimental atomic physics from Texas A&M University.

Mr. Gregory Pierce

Gregory Pierce is a career Systems Engineer with over 20 years of experience at NASA's Johnson Space Center (JSC), where he has worked on a range of exciting projects, including space shuttle tile repair, space suits, and jetpacks. He currently leads the digital transformation of engineering, with a focus on systems engineering, within the Engineering Directorate at JSC.

Mr. Terry Hill

Terry Hill is an experienced Aerospace Engineer with a strong background in the aviation and aerospace industry. He is skilled in system safety, team building, system requirements, requirements management, and configuration management. Terry holds a Master of Science degree in Aerospace Guidance, Navigation, and Control Theory from The University of Texas at Austin and is recognized for his expertise in engineering and leadership. He is currently NASA's Digital Engineering Program Manager at the Office of the Chief Engineer.

Mr. Alec Rambo

Alec Rambo is a Multidiscipline Engineer with 5 years of professional experience in complex system architecture, cyber-physical systems, network design and analysis, phased array radar sensors, and semiconductor manufacturing. He is dedicated to applying his foundational knowledge to cutting-edge applications in the pursuit of innovation. Alec is committed to continuous learning and growth, ensuring he stays at the forefront of his field.

Mr. Doug Rosenberg

Doug Rosenberg is the founder and CEO of Parallel Agile, Inc., and has been a leading figure in software and systems engineering as well as object-oriented design for over 30 years. His latest book, AI Assisted MBSE (AIM), is his ninth publication. From 1984 to 2014, Doug founded and led ICONIX Software Engineering. In the 1990s, he played a pivotal role in integrating the modeling approaches of Booch, Rumbaugh, and Jacobson, years before the development of UML. This methodology became known as the ICONIX Process. For the past decade, Doug has focused on bridging the gap between systems engineering and software engineering, recognizing that almost every modern system includes software, yet many systems engineering approaches overlook it. AIM represents a significant advancement toward achieving that integration.

Dr. Azad Madni

Dr. Azad Madni, a member of the National Academy of Engineering, is the founder and CEO of Intelligent Systems Technology, Inc. He serves as a University Professor of Astronautics, Aerospace and Mechanical Engineering at USC, where he holds the Northrop Grumman Foundation Fred O'Green Chair and directs the Systems Architecting and Engineering Program, as well as the Distributed Autonomy and Intelligent Systems (DAIS) Laboratory. He also has joint and courtesy appointments in Civil and Environmental Engineering, Education, and Medicine. In 2023, Dr. Madni received the NAE Bernard M. Gordon Prize for Innovation in Engineering and Technology Education and the IEEE Simon Ramo Medal for his exceptional contributions to systems engineering and systems science. His research focuses on probabilistic model-based and machine learning approaches to complex systems, with specific interests in resilient systems and distributed autonomy. He has worked with numerous sponsors, including NSF, DoD, DARPA, NASA, Boeing, Raytheon, and Lockheed Martin. Dr. Madni is a Fellow of AAAS, AIAA, INCOSE, IEEE (Life), and IETE (Life). Among his many accolades are the AIAA/ASEE Leland Atwood Award, INCOSE Founders Award, and the 2011 INCOSE Pioneer Award. He also leads Intelligent Systems Technology, Inc., an award-winning company he founded 25 years ago, specializing in modeling and simulation technologies for education, training, and performance support.

Mr. Marco Rosa

Marco is currently conducting research for his MS in Systems Engineering and seeks to immediately continue pursuing a PhD in Environmental Science & Engineering, demonstrating a profound commitment to advancing an interdisciplinary approach to systems engineering applications, and project management education, with a focus on converging STEM and liberal arts scopes into effective and resilient interdisciplinary teams. This academic pursuit is complemented by a solid foundation in systems engineering, business administration, and security administration, marked by a Magna Cum Laude distinction in his Bachelor's program. With a robust background in engineering and leadership, particularly within the demanding environment of the U.S. Navy, Marco has demonstrated exceptional skills in project management, team leadership, and technical expertise. As a Naval Engineering Officer, he was responsible for the intricate electrical and mechanical operations management of a Nuclear Aircraft Carrier, showcasing an ability to handle complex systems with precision and care. This role required not only technical acumen but also the capacity to train and lead a large team of engineers, ensuring the safety and efficiency of over 6,000 employees. His extensive list of certifications, notably from the Department of Defense, showcases a versatile skill set and a deep understanding of strategic management, communications, teamwork, and operations.

Mr. Sam Goodwin

Sam joined Northrop Grumman working in systems engineering in 2023. He has supported large-scale contracts' MBSE efforts during their design phases as well as R&D efforts to advance MBSE capabilities and model-sourced systems engineering documentation. Prior to Northop Grumman, Sam earned a master's degree in aerospace engineering from University of Colorado – Boulder where he studied astrodynamics and satellite navigation, during which he enjoyed the opportunity to support design and testing of CubeSat programs. Before attending graduate school, Sam earned bachelor's degrees in applied mathematics and finance from the University of New Mexico. He then worked three years in the investment management industry doing portfolio data analytics and business development before pursuing his interests in aerospace. Outside of work, he enjoys playing soccer, road biking, snowboarding, and finding new restaurants to try.

Dr. Alex Ford

Dr. Alexander L. Ford is a Technical Fellow at Northrop Grumman in the Payload and Ground Systems Division. He received the B.S. degree in Engineering Physics from the University of Illinois in 2010, and the M.S. and Ph.D. degrees in Physics from the University of Kansas in 2012 and 2017, respectively. He earned his M.B.A. from the University of Illinois in 2021. He began his career at Northrop Grumman in 2018 as Principal Engineer in RF Microwave Design, advancing to Hardware Engineering Manager in 2019 and Systems Engineering Manager in 2021. His research interests include plasma physics, systems-of-systems integration, and RF antenna design. Dr. Ford currently holds multiple IP awards from Northrop Grumman and serves as an Adjunct Industrial Research Associate at the University of Kansas.