Welcome to the Webinar! Please note that we have moved to the ZOOM platform. Please join ZOOM audio (Voice over Internet) if you are able to connect. Otherwise, please see the webinar invitation for dial-in phone lines

INCOSE Webinar Series

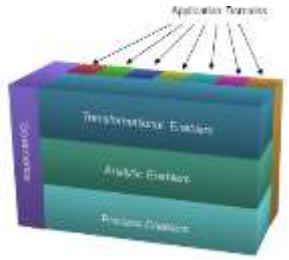
Wednesday 20th October 2021 – Webinar 155

BAE Systems Digital Engineering Journey

Dr Scott Nowlin

With thanks to our Sponsor for 2021

INCOSE is offering Webinars…



- To provide a forum for experts in the field of Systems Engineering to present information on the “State of the Art”
- To explain how INCOSE works, and how to make the most out of INCOSE membership

INCOSE Systems Engineering Professional PDU Credit

For more information about INCOSE certification renewal, including PDU categories and limits: http://www.incose.org/certification/CertProcess/CertRenew

Claim PDUs

You can claim 1 PDU credit towards your INCOSE Systems Engineering Professional (SEP) renewal by attending this entire webinar.

Eligible Sources To Claim PDU

- Live attendance at the webinar: "Attend non-peer-reviewed Professional Technical Society event."
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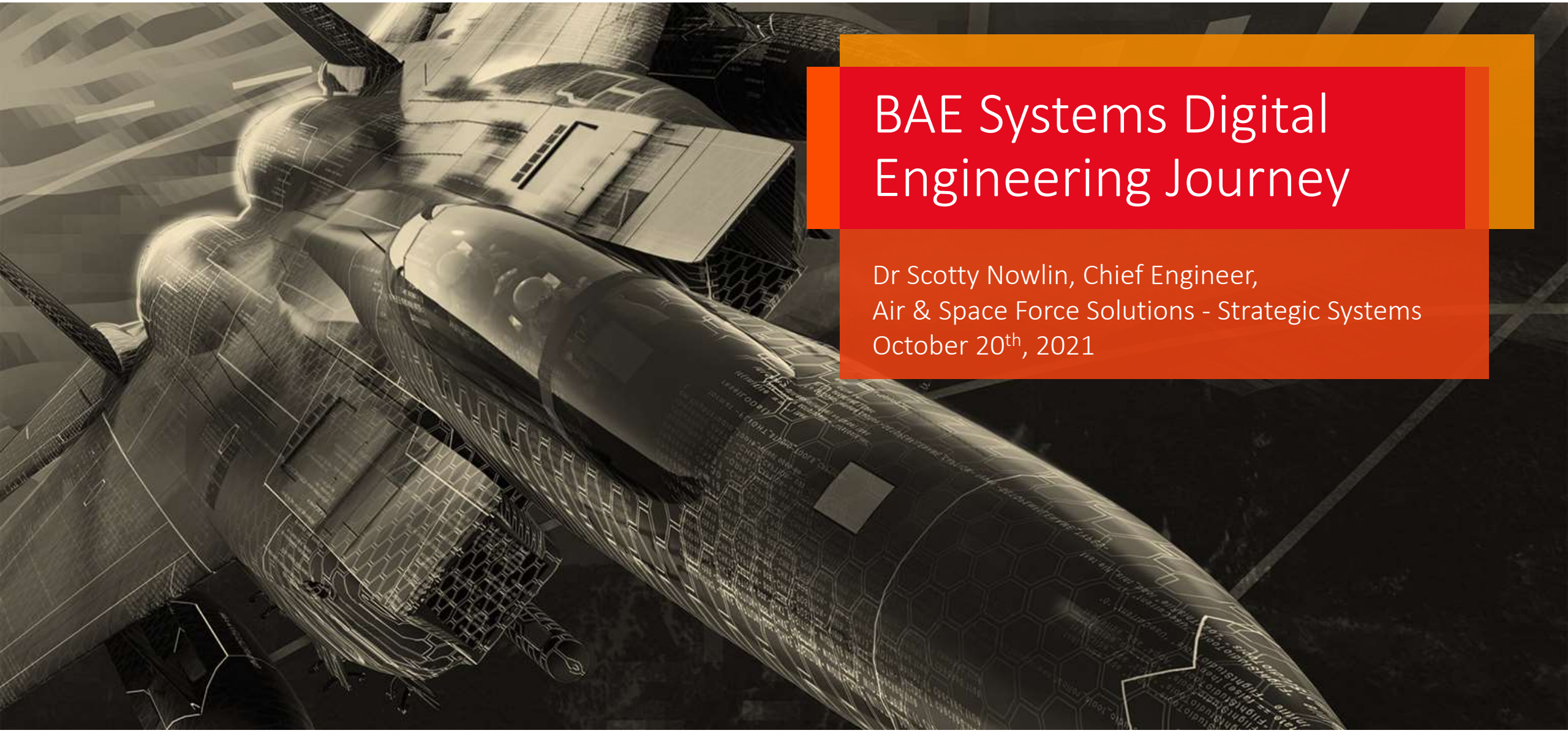
Claim PDUs for Other certifications

INCOSE webinars may also apply to the PDU requirements of other organizations, depending on the subject matter.

Choreography

1. Andy Pickard (your host) will introduce the Webinar and the speaker
2. Dr Scott Nowlin will speak for about 40 to 45 minutes
3. During his talk, participants can write questions using the Zoom Q&A window
4. After Scotty completes his talk, he will spend 10 minutes answering questions that Andy selects from those submitted by the audience
5. Andy Pickard will provide information about upcoming Webinars and then end this session
6. This Webinar is being recorded and will be made available on the INCOSE website to members and employees of CAB organizations



BAE Systems Digital Engineering Journey

Dr Scotty Nowlin, Chief Engineer,
Air & Space Force Solutions - Strategic Systems
October 20th, 2021

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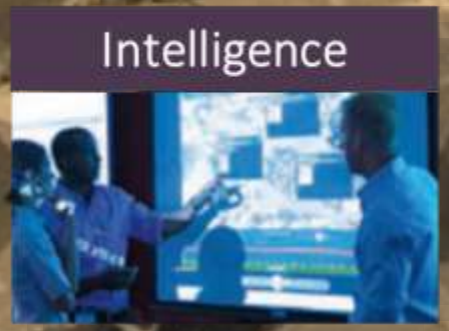
BAE SYSTEMS

BAE Systems, Inc. – a Commanding Breadth of Capabilities

At BAE Systems, we provide some of the world's most advanced electronics, intelligence, security, and IT solutions and support services to protect our customers, in a performance-driven and values-led corporate culture



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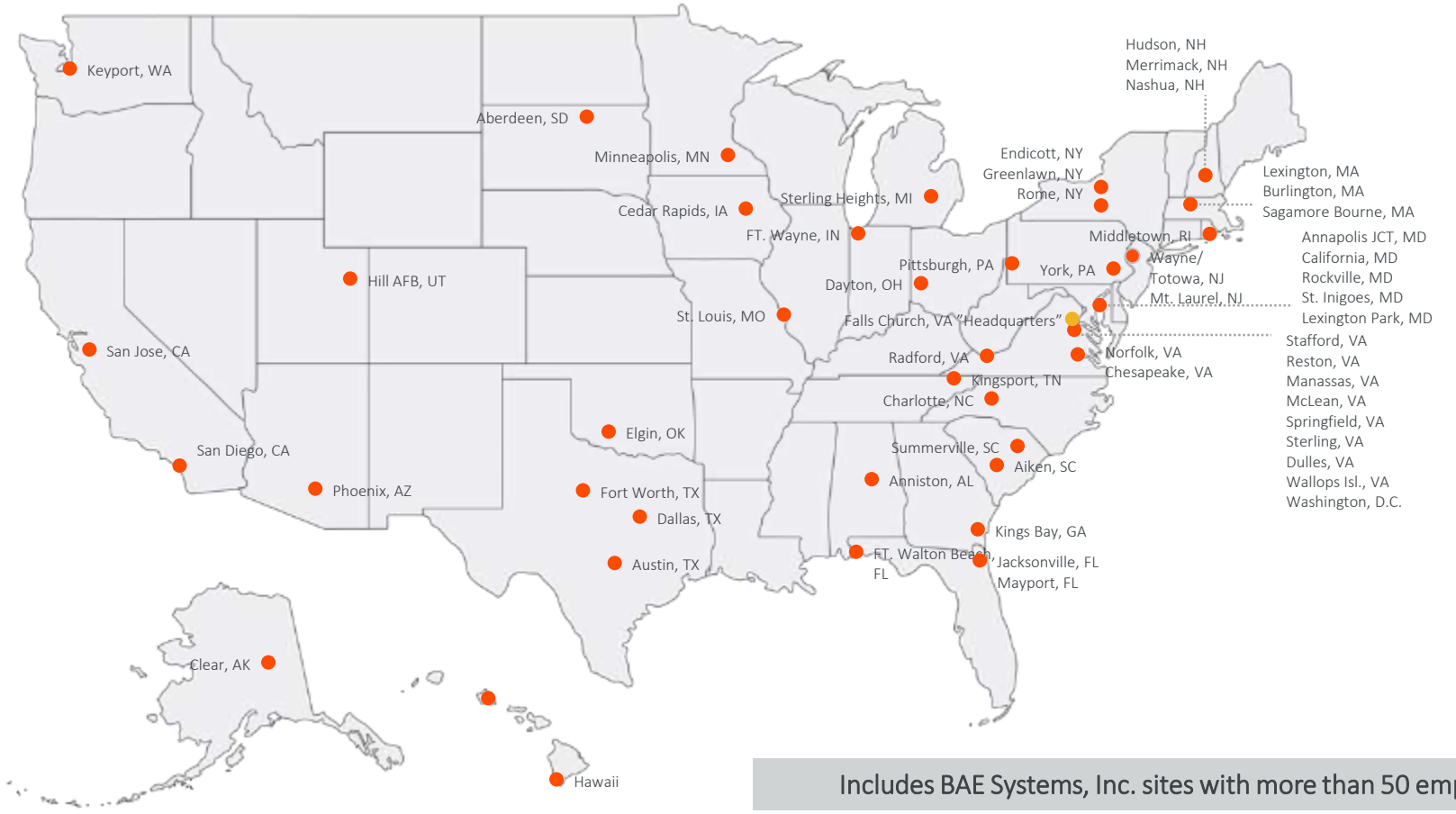
BAE Systems, Inc. U.S. footprint

- Employs approximately 35,000 (32,000 in the U.S.)
- Recorded 2020 sales of approximately $11.9bn
- Operates under a Special Security Agreement
- Holds about 2,000 U.S. and foreign patents across technology domains



Includes BAE Systems, Inc. sites with more than 50 employees

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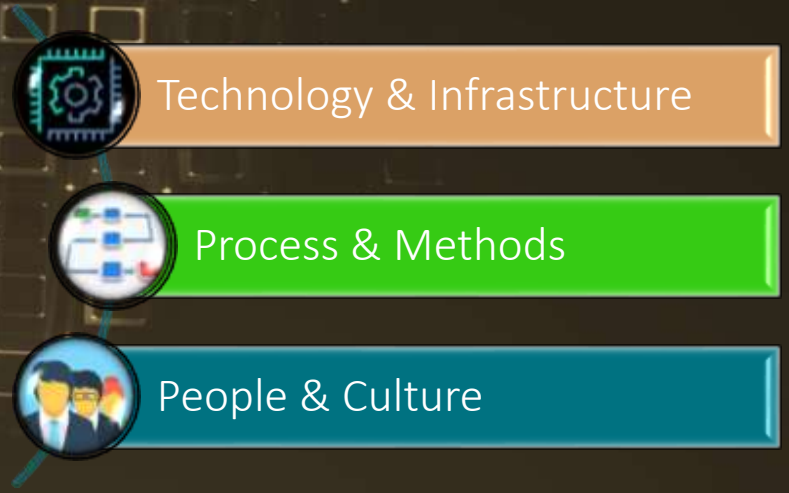
Corporate Digital Engineering Strategy

- MBSE/DE is a key corporate strategy
  - Tailored to / integrated with customer missions and mandates
- Agile development enabled by model-based approach and end-to-end digitalization
  - Digital tools and infrastructure
  - DE methods, processes, and best practices
  - People, culture, training, and development
- Collaboration, engagement, and continuous innovation and improvement



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Enterprise Digital Engineering Vision

Virtual, Collaborative Environment

Digital Threads and Digital Twins

Product-line Ref. Architectures

Enterprise-level Model Libraries

Owning the Technical Baseline

Early Requirement V&V

Systematic Design Reuse

Agile Development and DevSecOps

@ Corporate Systems Engineering Working Group (SEWG)

Connecting Desktop to the Factory Floor and to Force Readiness

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Digital Engineering / MBSE: Best Practice Exemplars

- Reimagining Product Realization
- Digitalizing the Production Process
- Systems Engineering and Integration

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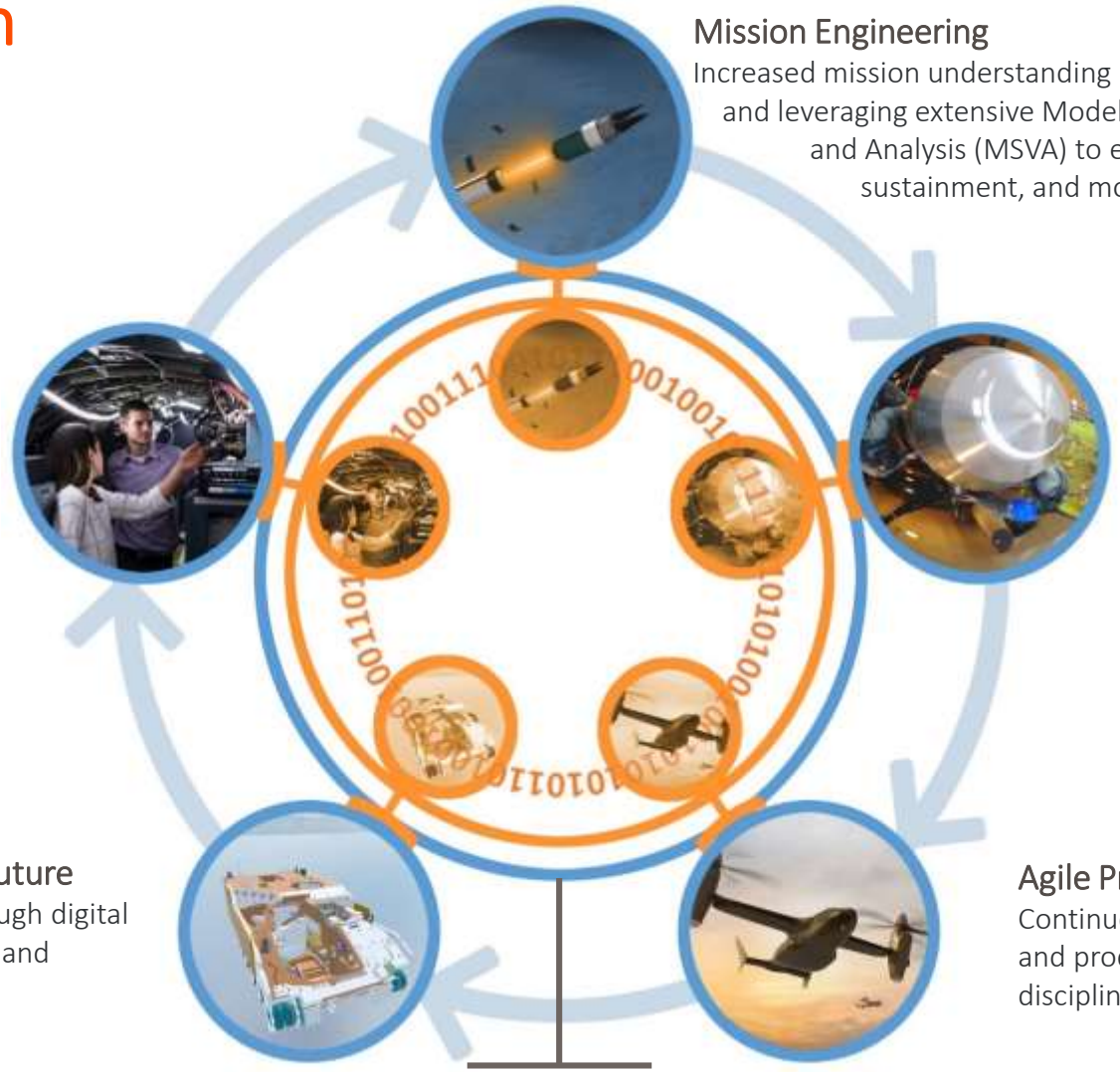
Reimagining Product Realization

Mission Engineering
Increased mission understanding by engaging stakeholders early; and leveraging extensive Modeling, Simulation, Visualization and Analysis (MSVA) to enable acquisition, production, sustainment, and modernization of baselines

Sustainment
Increase mission effectiveness and reliability through data analytics of measured availability and mission performance



Owning the Technical Baseline
Early design decisions, better requirements, rapid change impact assessment, and collapsed cycle time with faster and better capabilities to warfighters

Operations Factory of Future
Quality and cycle time through digital collaboration, connectivity, and automation

Agile Product Development
Continuously progress digital design fidelity and product capabilities using agile, multi-discipline DevSecOps teams

Modern, scalable, agile product development organization

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Digitizing the Production Process For Combat Vehicles

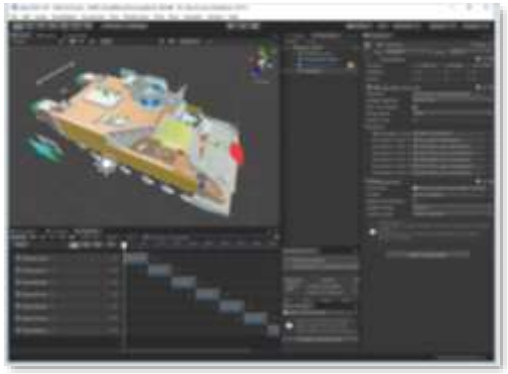
Engineering Data

CAD Models

Manufacturing

Work Instructions
BOM(s)

Simulation Development



- Collaborative Reviews
- Production Process Tested
- Interferences / Installations Reviewed
- Fixtures defined and Assessed
- Human Factors Evaluated

Analysis Outputs

Simulation, Animation, Virtual Reality

Product Changes

- Updated Work Instructions
- Assembly Order
- Updated Models
- Refined Data

Digitized Process Outcomes

- Work instructions simulated and evaluated
- Disruptions to the production line identified
- Prevented critical line stoppages
- Implemented proactive proficiency gains

Our digital environment allows production and design engineers to leverage vehicle experience to optimize the product design and the production process from the **concept** phase

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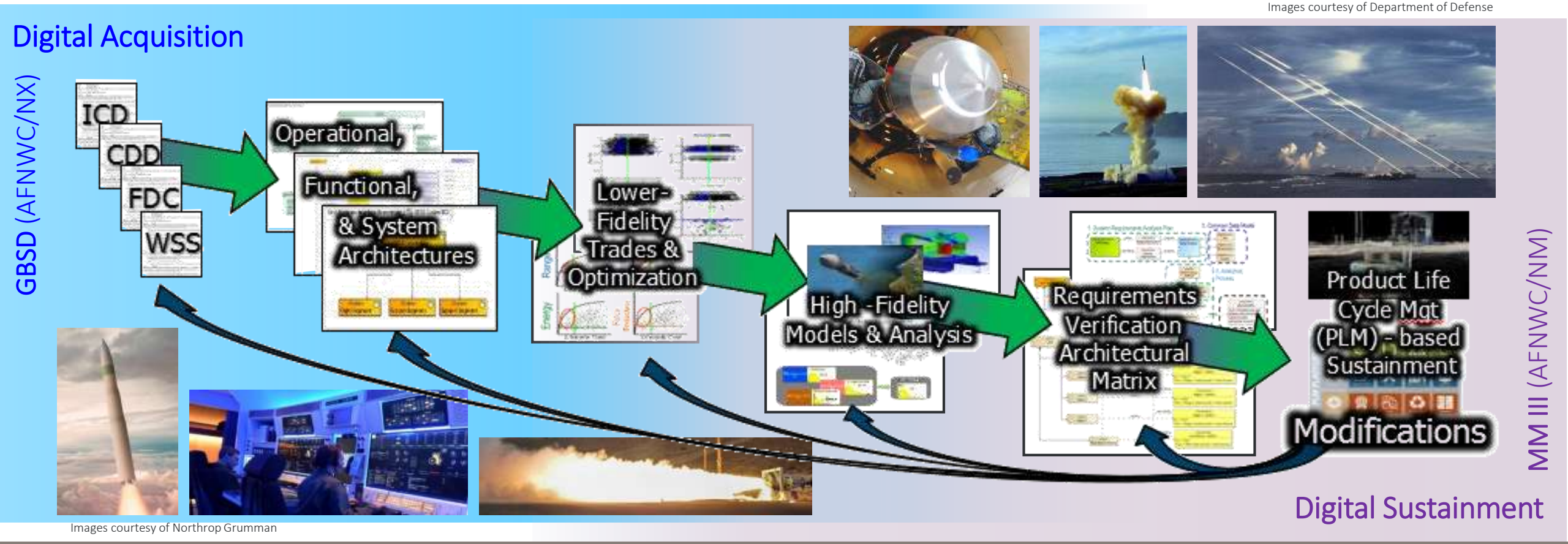
An SE&I Core Enabler – Implementing DE/MBSE across the ICBM Enterprise lifecycle to enable nuclear deterrence

Images courtesy of Department of Defense



Images courtesy of Northrop Grumman

AFNWC/NX is a SAF/AQ *New Digital Acquisition* exemplar, and the 2017 *SAF Acquisition Excellence Continuous Improvement*, 2018 *HAF Nuclear Deterrence Operations Professional Team*, 2019 *OSD Product Support Innovation*, and 2020 *DoD David Packard Excellence in Acquisition* award-winner

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Digital Engineering: Workforce & Culture

- Training and Development
- Communities of Practices

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DE Talent Development: MBSE Catalyst Program

- One-year, intensive training and development program
  - Hands-on training + pilot use case development
  - Selected Engineering “HiPots” to develop DE methods and skills
  - Pathfinder to incubate program deployment

Stage 1: Self-Learning & Prep
- I&SU MBSE Pathway
  - Level 1: Engineer Track
  - Level 2: Modeler Track
- Pilot project planning

Stage 2: Classroom Training & Labs
- System Modeling & Design
  - Language: SysML
  - Tools: MagicDraw, PLM
  - Methods: System architecture, OOSEM

Stage 3: Projects
- Pilot projects
  - Customer-facing pilot use cases
  - Deliverables: demos

Stage 4: Demos
- Internal & external stakeholder (customer) demos
- Technical feedback & recommendations

Deploy and Expand

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Vibrant DE Communities of Practices (CoPs)

- Cross-business Working Groups (WGs) & Communities of Practices (COPs) – connecting practitioners and sharing best practices:
  - Model-Based Systems Engineering
  - Virtual Reality/Augmented Reality
  - Cyber/Information Assurance
  - DevSecOps
  - Artificial Intelligence/Machine Learning
  - Systems Architecture
  - User Interface/User Experience…
- Internal university-style training programs provide employees a broad curriculum of DE training
  - Agile Digital Engineering Principles and Techniques (ADEPT)
  - Model-Based Systems Engineering (MBSE)
  - Modeling, Simulation, Visualization and Analysis (MSVA)
  - Career Planning and Mentoring
  - Many more…

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BAE Systems Is on a Digital Engineering Journey…

- Embrace an end-to-end, lifecycle DE strategy for enterprise transformation
  - Engaging closely with customers to implement the shift across programs
- Reimagine our product realization process (value stream) in an agile, digital enterprise
  - Connecting mission, design, development, factory, and field operations
- Focus on business agility, methods and practice, workforce and culture
  - Delivering our commitment – better, faster, and cheaper

BAE Systems is committed to digital engineering in support of our customers' missions

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Contact Info

www.baesystems.com

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Platforms & Services: Chris Wentland, chris.wentland@baesystems.com

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Upcoming Webinars (tentative schedule)

Who	What	When
TBD	TBD	Wednesday 17th November 2021 at 11am EST
TBD	TBD	Wednesday 15th December 2021 at 11am EST

Invitations will be emailed in advance and informational updates will be placed on www.incose.org
Go to http://www.incose.org/products-and-publications/webinars for more info on the webinar series, including a way to view the last 154 Webinars and soon – this one!

Information on the webinars is now being posted in INCOSE Connect, in the INCOSE Library area, at https://connect.incose.org/Library/Webinars/Pages/INCOSE-Webinars.aspx . Joining instructions will added around two weeks before the webinar is scheduled to take place.

GfSE / INCOSE Webinars

The German Chapter of INCOSE, GfSE, is launching a new series of Global webinars. Invitations will be emailed in advance and informational updates will be placed on www.incose.org. These webinars are open to all INCOSE members.
Go to http://www.incose.org/products-and-publications/webinars for more info

Who	What	When
Prof Jon Holt	Model-based Systems Engineering Demystified the need for MBSE	Tuesday 30th November 2021 at 5pm CET (11am EDT)
TBD	TBD	TBD

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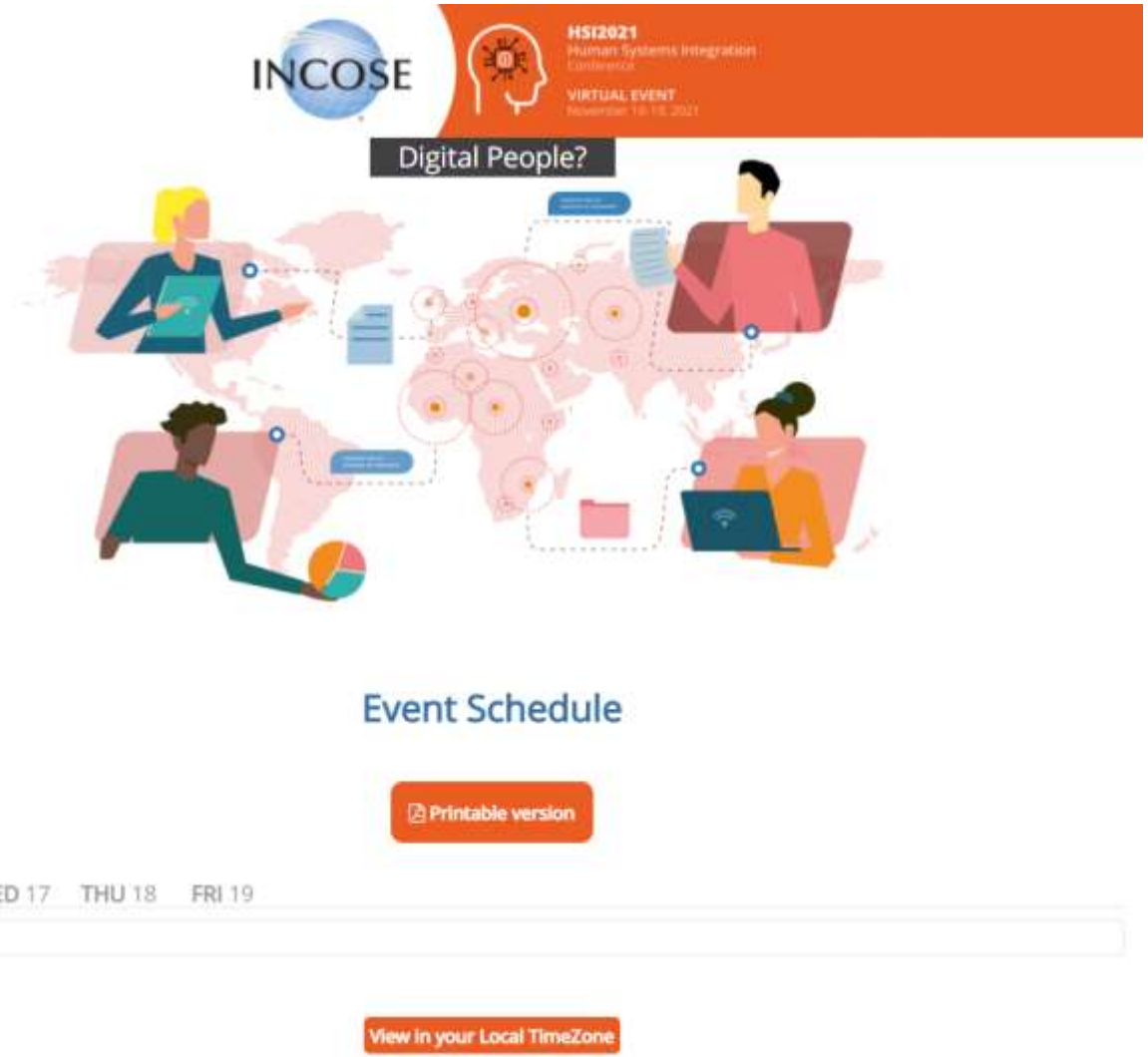
INCOSE Human Systems Integration Conference



16 – 19 November 2021
Virtual Conference
https://www.incose.org/hsi2021/registration
https://www.incose.org/hsi2021/event-schedule

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