SHARPENING THE COMPETITIVE EDGE THROUGH AEROSPACE INNOVATION
MISSILE DEFENSE

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WELCOME TO DEFENSE FORUM

The 2021 AIAA DEFENSE Forum Executive Steering Committee (ESC) and Technical Program Committee (TPC) are excited to welcome you back to in-person events. We have worked hard to put together the high-level technical and in-depth discussions centered around the theme **SHARPENING THE COMPETITIVE EDGE THROUGH AEROSPACE INNOVATION**. We hope the program, the defense industry leaders, topics, and discussions inspire you.

We welcome your feedback! Should you have any questions or comments, please see the AIAA staff at the registration desk, or talk with any of the ESC or TPC members.

Enjoy the forum and make it a great week!

TABLE OF CONTENTS

Organizing Committee.......................................................... 4
Sponsors & Partners .............................................................. 5
Forum Overview...................................................................... 7
General & Security Information ............................................ 8
Plenary Sessions................................................................... 11
2022 Call for Presentations.................................................. 13
Venue Map........................................................................... 19

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ORGANIZING COMMITTEE

EXECUTIVE STEERING COMMITTEE

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(Forum Executive Chair)

David Denhard, Missile Defense Agency

Dean Gehr, Raytheon Missile Systems (Retired)

Darren Hayashi, Raytheon Missiles & Defense

Anjaney Kottapalli, Lockheed Martin
(Forum Technical Program Chair)

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Anthony Mitchell, CAES

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Ali Raz, George Mason University

Edward Swallow, The Aerospace Corporation

Robie Samanta Roy, Electra.aero

Jeffrey Tober, Johns Hopkins University Applied Physics Laboratory

David Van Wie, Johns Hopkins University Applied Physics Laboratory

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Alexander Edsall, Charles Stark Draper Laboratory

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Rick Gamble, QuantiTech Corporation

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Keith Labbe, Systems Planning and Analysis, Inc.

Jarret Lafleur, Sandia National Laboratories

Michael McFarland, Raytheon

James McIntire, MIT Lincoln Laboratory

Mark Neice, Directed Energy Professional Society

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Timothy Wadhams, CUBRC

Gary Wood, Johns Hopkins University Applied Physics Laboratory

Otmar “Nick” Yakaboski, U.S. Air Force Materiel Command
AIAA would like to thank the following sponsors and AIAA Corporate Partners for their support of the 2021 AIAA DEFENSE Forum.

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<table>
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<th>WEDNESDAY 15</th>
<th>THURSDAY 16</th>
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<td>0730 hrs</td>
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<td>0800 hrs</td>
<td>Keynotes</td>
<td>Technological Overmatch: The Critical Role of DoD R&amp;D Panel</td>
<td>Advanced Technology: Industry Prime Contractors Panel</td>
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<td>0830 hrs</td>
<td>Operational Needs &amp; Military Requirements</td>
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<td>Leveraging Innovation to Advance Missile Defense</td>
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<td>Missile Systems Award Presentation</td>
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<td>1000 hrs</td>
<td>AP-01: Advanced Prototypes I</td>
<td>AMI-01: Autonomy and Machine Intelligence</td>
<td>HYTASP-04: Hypersonic Flight and Trajectories</td>
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<td>1030 hrs</td>
<td>DEW-01: Integration of an HEL onto a Combat UAV</td>
<td>SMS-01: Sea-Based Strategic Missiles I: Mission Effectiveness</td>
<td>SMS-04: Strategic Missiles: Launch Systems</td>
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<td>SYS-01: Space Systems</td>
<td>WPSE-04: Weapons Systems Effectiveness: MS&amp;A</td>
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<td>DEW-04: HEL Lethality Measurements</td>
<td>HYTASP-03: Hypersonic Phenomenology</td>
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<td>SMS-02: Sea-Based Strategic Missiles II: Enabling Technology</td>
<td>SUR-01: Survivability</td>
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<td>1530 hrs</td>
<td>Networking Coffee Break</td>
<td>Defense Industry Leadership Series Keynote</td>
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<td>1600 hrs</td>
<td>Systems Engineering for the Digital Battlespace</td>
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<td>Air Force Futures Agile Gaming Demo: Hypersonics 2030</td>
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<td>1630 hrs</td>
<td>Ron Sega, Army Futures Command</td>
<td>Space Asset Protection Panel</td>
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<td>1700 hrs</td>
<td>DoD Digital Engineering Strategy and Implementation Panel</td>
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<td>Wright Brothers Lecture: Hypersonics for National Security: Conventional Prompt Strike</td>
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**AIAA Technical Committee Meetings**

**TUESDAY, 14 SEPTEMBER, 1800 HRS**
Airborne Directed Energy Systems Integration Committee  
*Homewood Suites, Hopkins West Room*

**WEDNESDAY, 15 SEPTEMBER, 1800 HRS**
Missile Systems Technical Committee  
*Homewood Suites, Hopkins East Room*

**WEDNESDAY, 15 SEPTEMBER, 1800 HRS**
Weapons Systems Effectiveness Technical Committee  
*Homewood Suites, Hopkins West Room*

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**Event Health and Safety Policies**
The health and safety of all participants is AIAA’s top priority as we come back together in person for the first time in 19 months. For everyone’s protection, in conjunction with the facility, we have put the following protocols in place.

**Required:**
- Proof of full vaccination or Negative Covid test
- Completion of Daily Health Questionnaire
- Daily temperature check
- Masks while indoors except when actively eating or drinking
- Speakers at the podium may be unmasked while speaking

**Forum Health and Safety Precautions:**
- Social distancing will be observed as possible within the facility
- Please be respectful of each individual’s personal space and comfort level
- Seating in the auditoriums will be every other seat
- Food and beverage will be provided in individual packaging
- Seating in the lunch area will be reduced to 5-6 per table
- Lunch will be available for approximately 90 minutes to allow for a flow through the lines and for seating
- Hand sanitizer stations are placed around the facility
- Masks are available at the AIAA table should you need one
- Disinfecting wipes will be placed in the back of all meeting rooms, and at the registration and AIAA tables in the lobby

Any questions or issues, please let an AIAA staff person know.

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**Employment Opportunities**
AIAA members can post and browse resumes, browse job listings, and access other online employment resources by visiting the AIAA Career Center at [aiaa.org/careers](http://aiaa.org/careers).

**Membership**
AIAA is your vital lifelong link to the collective creativity and brainpower of the aerospace profession and a champion for its achievements. [aiaa.org/membership](http://aiaa.org/membership)

**Nondiscriminatory Practices**
AIAA accepts registrations irrespective of race, creed, sex, color, physical handicap, and national or ethnic origin.

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**Security Badge**
A security conference badge is required for admittance to the forum sessions. Each attendee will be required to produce a driver’s license, military I.D., or company photo I.D. prior to receiving a forum badge. Badges must be worn at all times during the forum.

**Security Restrictions**
Electronic devices or electronic equipment of any kind—including cell phones, radios, personal fitness devices, PDAs, laptops, tablets, cameras, video/audio recording equipment, and two-way pagers and devices—are NOT allowed in the session rooms. One-way pagers must be placed on vibrate during the sessions. Note-taking is not permitted in or around the forum sessions. Books, magazines, fliers, brochures, and other paper products will not be allowed in the session rooms.

Luggage, briefcases, and other large cases will not be allowed in the forum area. Please leave these items in your car or hotel as storage is not available at the Kossiakoff Center. Small handbags, purses, and personal possessions will be inspected upon entry into the conference area.

Security spot checks may be made at any time.
NEW THIS YEAR!

AIAA DEFENSE Forum Proceedings published through DTIC

AIAA DEFENSE Forum presenters have the option to publish their presentation and/or a paper as part of conference proceedings, through the Defense Technical Information Center (DTIC).

DTIC will publish proceedings from the AIAA DEFENSE Forum on a separate AIAA DEFENSE Forum webpage available on www.dtic.mil. More than 750,000 users access information available on the DTIC website.

Presenters may submit their presentation (PowerPoint or PDF) or a manuscript directly to DTIC (not to AIAA)
- Manuscripts should follow the AIAA manuscript template
- See the DTIC submission website for more information: https://discover.dtic.mil/submit-documents/

Materials may be unclassified, ITAR, or classified up to SECRET/NOFORN

Submissions must be related to DoD- or DoE-funded research
- Submitters must have a valid CAC account
- Once materials have been successfully submitted, you will receive an accession number from DTIC
  - Please provide the accession number to AIAA
    - Accession numbers are provided via web pop-up and email notifications, and follow this format: AD####
    - You may email the number to conferences@aiaa.org
    - You may bring it onsite to the AIAA DEFENSE Forum and give it to a staff member at the registration desk

Timeline:
- Presentation or manuscript due to DTIC: 2000 hrs ET, 24 September 2021
- Proceedings available online: 29 October

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ONLINE SHORT COURSE
Hypersonic Propulsion Concepts: Design, Control, Operation, and Testing
12 October – 4 November 2021
(4 Weeks, 8 Lectures, 16 Hours)
Tuesday and Thursday
1300–1500 hrs EDT

This new 16-hour online course, instructed by experts from AIAA’s High Speed Air-Breathing Propulsion Technical Committee, will introduce participants to the most important fundamentals of the technical discipline. Starting with an introduction and theoretical background, the course will quickly move into various practical applications and concepts.

COURSE FEES
$995 USD AIAA Member
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ONLINE SHORT COURSE
Understanding Cybersecurity in the Space Domain
6–8 October 2021
1100–1700 Eastern Time

This course examines the practical issues of developing and sustaining a secure cyber environment through all phases of the space mission lifecycle. The SpaDoCs Framework provides a comprehensive and systematic model for understanding and tackling all critical issues of cybersecurity in the space domain.

COURSE FEES
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All students will receive an AIAA Certificate of Completion at the end of the course.
Cancellation Policy: A refund less a $50.00 cancellation fee will be assessed for all cancellations made in writing prior to 7 days before the start of the event. After that time, no refunds will be provided.

Please contact Jason Cole at jasonc@aiaa.org if you have questions about the course or group discounts (for 5+ participants).
TUESDAY, 14 SEPTEMBER

**0800–0845 hrs**
Operational Needs and Military Requirements
The 2018 National Defense Strategy is clear that a more lethal force and technological innovation are key to generating a decisive and sustained advantage. What do our warfighters need from the aerospace community to become a “more lethal, resilient, and rapidly innovating Joint Force” in an era of multi-domain warfare?

KEYNOTE SPEAKER:
John Matyjas, Scientific Adviser to the Commander, Air Combat Command

**0845–0930 hrs**
Leveraging Innovation to Advance Missile Defense
“The United States must outpace existing and potential rogue state and rogue actor offensive missile capabilities. To do so, the country will continue to sustain, modernize and expand the Missile Defense System and pursue the rapid, yet measured, development of advanced missile defense concepts and technologies for homeland and regional defense.” (Missile Defense Agency Director’s Vision and Intent, p. 3) How can government, industry, and academia work together to advance critical missile defense capabilities?

KEYNOTE SPEAKER:
RDML Tom Druggan, USN, Program Executive, Aegis Ballistic Missile Defense, Missile Defense Agency

**0930–0935 hrs**
2021 AIAA Missile Systems Award Presentation
“For over four decades of technical contributions and outstanding leadership in the advancement of missile systems technologies.”

RECIPIENT:
Ralph H. Klesstadt, Principal Engineering Fellow, and Chief Engineer, Hypersonics Advanced Technologies, Raytheon Missiles & Defense

**1600–1620 hrs**
Systems Engineering for the Digital Battlespace
Before we explore digital engineering and its opportunities, we need to take a step back and consider the human element. What is required to build technology in digital environments, and how do we quickly, safely, and affordably design and produce systems for the warfighter? Dr. Sega will examine the “why” behind digital engineering, and set the stage for the following panel session.

SPEAKER:
Ronald Sega, Chief Technology Officer, U.S. Army Futures Command

**1620–1730 hrs**
DoD Digital Engineering Strategy and Implementation
As we enter into the fourth industrial revolution, this new digital era offers the opportunity to transform warfighting technologies and their development. To do so requires a new approach to systems engineering. More than two years after the Digital Engineering Strategy was released by DoD, hear how the Services are embracing digital tools and techniques, and what the next steps are for implementation.

MODERATOR:
Dan Heller, Vice President, Corporate Engineering, Lockheed Martin

PANELISTS:
Thomas C. Fu, Head, Mission Capable, Persistent and Survivable Naval Platforms Department, Office of Naval Research
Stephanie L. Possehl, Acting Deputy Director for Engineering and Director for Engineering Policy and Systems, Office of the Under Secretary of Defense for Research and Engineering
Rob Wallace, Technical Director, U.S. Army Engineer Research and Development Center (ERDC) Information Technology Laboratory (ITL)

**1730–1830 hrs**
AIAA Wright Brothers Lecture in Aeronautics
“Hypersonics for National Security: Conventional Prompt Strike”

KEYNOTE:
Walter Rutledge, Senior Technical Advisor, CENTRA Technologies
**WEDNESDAY, 15 SEPTEMBER**

0800–0930 hrs

**Technological Overmatch: The Critical Role of DOD R&D**

“Innovation without execution is hallucination.” DoD Research and Development (R&D) is charged with taking fundamental research and applying it to technologies for the warfighter. Hear about current and future projects, upcoming opportunities, and how these organizations enable the research community to transition ideas to technological advantages.

**MODERATOR:**
Laura J. McGill, Deputy Laboratories Director, and Chief Technology Officer, Nuclear Deterrence, Sandia National Laboratories

**PANELISTS:**
Patrick Baker, Director, DEVCOM Army Research Laboratory

Bryan Rosselli, Vice President, Business Transformation & Execution, Raytheon Missiles & Defense

0930–1030 hrs

**Defense Industry Leadership Series: How Digital Technologies are Driving Change in Defense**

In today’s global threat environment, speed to the battlefield is just as important as speed on the battlefield. Digital technologies, and the data threads they create, are helping drive transformative change throughout the defense industry, from how we envision and field solutions to how we interact with customers and warfighters. In his talk, Bryan Rosselli will offer key insights into Raytheon Missiles & Defense’s unique digital transformation journey and how it’s accelerating the pace of innovation and performance, strengthening customer partnerships, and helping industry and government leaders reimagine the DoD’s acquisition process.

**KEYNOTE SPEAKER**

Bryan Rosselli, Vice President, Business Transformation & Execution, Raytheon Missiles & Defense

1030–1130 hrs

**Space Asset Protection**

While the Interim National Security Strategic Guidance released in March calls for ensuring the “safety, stability and security of outer space activities” (p. 17), much work remains to be done to protect our space assets. It’s time to protect our nation’s space-based systems by designating them as critical infrastructure. Without adequate security, cyberattackers can cause them to malfunction, send false information or collide, potentially creating a debris field that could linger for decades. Worse, cyberattackers could simulate an attack on military systems, sparking an international confrontation. (Ed Swallow and Sam Visner, “It’s time to declare space systems as critical infrastructure,” POLITICO, April 2, 2021) How do the various commands, agencies, and organizations involved cooperate; how can the defense community support; and what new policies, products, and solutions are needed to secure space assets?

1130–1230 hrs

**Air Force Futures Agile Gaming Demo: Hypersonics 2030**

The Air Force Futures Agile Wargaming Team will be providing a modified demonstration of a strike game. The demo game will examine how to prosecute various targets using different combinations of platforms and munitions. The demo has been modified to account for a larger group of participants, as agile games typically average 6–9 players for 3-hour sessions. This game and the surrounding conversation are meant to highlight the quick-turn development and execution key for successful agile games through the lens of conceptual hypersonics. Players do not need to have any prior experience in wargaming or hypersonics.

**THURSDAY, 16 SEPTEMBER**

0800–0930 hrs

**Advanced Technology: Industry Prime Contractors Panel**

Maintaining the Department’s technological advantage will require changes to industry culture, investment sources, and protection across the National Security Innovation Base” (National Defense Strategy [Unclassified], p. 3). The sense of urgency is driving a new environmental dynamic in industry, but how can we accelerate through the “valley of death”? Industry leaders respond to DoD modernization priorities and address requirements for fielding technologies at the speed of relevance.

**MODERATOR:**

Todd Nygren, Senior Vice President, Engineering and Technology Group, The Aerospace Corporation

**PANELISTS:**

Timothy Barton, Dynetics Group CTO, Leidos

Naveed Hussain, Chief Technology Officer, Vice President, and General Manager, Boeing Research & Technology

Tom Pieronek, Vice President and Chief Technology Officer, General Manager, Boeing Research & Technology

Naveed Hussain, Chief Technology Officer, Vice President, and General Manager, Boeing Research & Technology

John C. Zolper Sr., Principal Engineering Fellow, Defense Technology Strategy, Raytheon Technologies

1530–1830 hrs

**Air Force Futures Agile Gaming Demo: Hypersonics 2030**

The Air Force Futures Agile Wargaming Team will be providing a modified demonstration of a strike game. The demo game will examine how to prosecute various targets using different combinations of platforms and munitions. The demo has been modified to account for a larger group of participants, as agile games typically average 6–9 players for 3-hour sessions. This game and the surrounding conversation are meant to highlight the quick-turn development and execution key for successful agile games through the lens of conceptual hypersonics. Players do not need to have any prior experience in wargaming or hypersonics.
**Tuesday, 14 September 2021**

**1-PLNRY-1**

**0800 - 0930 hrs**

**Plenary 1: Operational Needs and Military Requirements**

Speaker: John Matyjas, Scientific Adviser to the Commander, Air Combat Command

The 2018 National Defense Strategy is clear that a more lethal force and technological innovation are key to generating a decisive and sustained advantage. What do our warfighters need from the aerospace community in order to become a “more lethal, resilient, and rapidly innovating Joint Force” in an era of multi-domain warfare?

**Plenary 2: Leveraging Innovation to Advance Missile Defense**

Speaker: RDML Tom Druggan, USN, Program Executive, Aegis Ballistic Missile Defense, Missile Defense Agency

“The United States must outpace existing and potential rogue state and rogue actor offensive missile capabilities. To do so, the country will continue to sustain, modernize and expand the Missile Defense System and pursue the rapid, yet measured, development of advanced missile defense concepts and technologies for homeland and regional defense.” (Missile Defense Agency Director’s Vision and Intent, p. 3) How can government, industry and academia work together to advance critical missile defense capabilities?

**2-AWARD-1**

**0930 - 0940 hrs**

**2021 AIAA Missile Systems Award Presentation**

**Ralph H. Klestadt**
Principal Engineering Fellow, Chief Engineer, Hypersonics Advanced Technologies
Raytheon Missiles & Defense

“For over four decades of technical contributions and outstanding leadership in the advancement of missile systems technologies.”

**3-AP-1**

**Advanced Prototypes**

Parsons Auditorium

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<td>1030 hs</td>
<td>Enabling Next-Generation Leading Edge Design with Cold Spray Additive Manufacturing</td>
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<td>J. Neult, G. Ferguson, DEVCOM Army Research Laboratory, Aberdeen Proving Ground, MD</td>
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<td>1100 hs</td>
<td>Application of Model-Based Systems Engineering to Test Program Planning and Analysis</td>
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<td>B. Barnes, Systems Planning and Analysis, Inc., Alexandria, VA</td>
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<td>1130 hs</td>
<td>Effects of Wing Deformation on LauncherOne Store-Separation Predictions</td>
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<td>C. Acuff, NASA Dryden Flight Research Center, Edwards, CA; N. Johnson, New Horizons Aeronautics, LLC, Edwards, CA; K. Powers, Q. Murphy, Virgin Orbit, LLC, Long Beach, CA</td>
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<td>Validation of LauncherOne Drop Test Predictions Using Flight Test Data</td>
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**4-DEW-1**

**1000 – 1230 hrs**

**Integration of an HEL onto a Combat UAV**

Room 5/6

Chaired by: M. NEICE, Directed Energy Professional Society

**5-GNC-1 / 6-SYS-1**

**Guidance, Navigation, Control, and Estimation I / Space Systems**

Room 3/4


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<td>Multilevel Data Integration with Applications in Sensor Networks</td>
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<td>J. Spell, Johns Hopkins University Applied Physics Laboratory, Laurel, MD; L. Wang, Johns Hopkins University, Baltimore, MD</td>
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<td>Comparison of Constraint Learning Methods for Rapid, Autonomous Trajectory Generation</td>
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<td>L. Hood, A. Damany, J. Fan, A. Stempack, A. Strong, Sondra National Laboratories, Albuquerque, NM</td>
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<td>SciBox - a Realtime Autonomous Satellite Constellation Management System</td>
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<td>T. Choe, Johns Hopkins University Applied Physics Laboratory, Laurel, MD</td>
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<td>1140 hrs</td>
<td>AIAA-Defense2021-9023 Ground Testing and Computation of the HIFiRE-5B Configuration to Evaluate Boundary Layer Transition</td>
</tr>
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<tr>
<td>1100 hrs</td>
<td>AIAA-Defense2021-9025 Ground Testing and Computation of the HIFiRE-5B Configuration to Evaluate Boundary Layer Transition</td>
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<tr>
<td>1130 hrs</td>
<td>AIAA-Defense2021-9026 Ground Testing and Computation of the HIFiRE-5B Configuration to Evaluate Boundary Layer Transition</td>
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<tr>
<td>1200 hrs</td>
<td>AIAA-Defense2021-9028 Ground Testing and Computation of the HIFiRE-5B Configuration to Evaluate Boundary Layer Transition</td>
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</table>
### Tuesday, 14 September 2021

**12-WSE-3**

**Weapon Systems Effectiveness: Test and Evaluation II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1300</td>
<td>Accuracy, Efficiency, and Transparency in Environmental Data Analysis</td>
<td>C. Hayes, D. Harvey, S. Taylor, Los Alamos National Laboratory, Los Alamos, NM</td>
</tr>
<tr>
<td>1330</td>
<td>Proton Radiography for Density Movies of Dynamic Exploding Events</td>
<td>K. Prestidge, Los Alamos National Laboratory, Los Alamos, NM</td>
</tr>
<tr>
<td>1400</td>
<td>Suborbital Sounding Rocket and Missile Testing of Space and Defense Technology</td>
<td>E. Libby, R. Weaver, R. Maddox, R. Stanfield, N. Grayson, H. Chenin, Peraton Corporation, Herndon, VA</td>
</tr>
<tr>
<td>1430</td>
<td>The challenges of developing High Energy Laser (HEL) test and evaluation (TE) systems integrated into representative threats for the purpose of assessing lethality.</td>
<td>D. Ward, SemQuest Inc., Colorado Springs, CO</td>
</tr>
</tbody>
</table>

**13-PLNRY-3**

**Plenary 3: Systems Engineering for the Digital Battlespace**

**Plenary 4: DoD Digital Engineering Strategy and Implementation**

Before we explore digital engineering and its opportunities, we need to take a step back and consider the human element. What is required to build technology in digital environments, and how do we quickly, safely and affordably design and produce systems for the warfighter?

Dr. Sega will examine the “why” behind digital engineering, and set the stage for the following panel session.

**Plenary 4: DoD Digital Engineering Strategy and Implementation**

As we enter into the fourth industrial revolution, this new digital era offers the opportunity to transform warfighting technologies and their development. To do so requires a new approach to systems engineering. More than two years after the Digital Engineering Strategy was released by DoD, hear how the Services are embracing digital tools and techniques, and what the next steps are for implementation.

**Moderator:** Dan Heller, Vice President, Corporate Engineering, Lockheed Martin

**Panelists:**

- Stephanie Possehl
  - Deputy Director for Engineering (Acting) and Director for Engineering Policy and Systems
  - Office of the Under Secretary of Defense for Research and Engineering

- Thomas C. Fu
  - Head, Mission Capable, Persistent and Survivable Naval Platforms Department
  - Office of Naval Research

- Rob Wallace, Ph.D., PE
  - Technical Director, US Army Engineer Research and Development Center (ERDC)
  - Information Technology Laboratory (ITL)

### Tuesday, 14 September 2021

**14-AWARD-2**

**AIAA Wright Brothers Lecture in Aeronautics Award: Hypersonics for National Security: Conventional Prompt Strike**

**Lecturer:** Walter Rutledge
- Senior Technical Advisor
- CENTRA Technologies

**Wednesday, 15 September 2021**

**15-PLNRY-5**

**Technological Overmatch: The Critical Role of DoD R&D**

"Innovation without execution is hallucination." DoD Research and Development (R&D) is charged with taking fundamental research and applying it to technologies for the warfighter. Hear about current and future projects, upcoming opportunities, and how these organizations enable the research community to transition ideas to technological advantages.

**Moderator:** Laura McGill, Deputy Laboratories Director, Chief Technology Officer Nuclear Deterrence, Sandia National Laboratories

**Panelists:**

- Patrick Baker
  - Director
  - DEVCOM Army Research Laboratory

- Douglas Blake
  - Acting Executive Director
  - Office of Naval Research

- Timothy Bunning
  - Chief Technology Officer
  - Air Force Research Laboratory
<table>
<thead>
<tr>
<th>Wednesday, 15 September 2021</th>
<th>16-AMI-1</th>
<th>Autonomy and Machine Intelligence</th>
<th>Auditorium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaired by: R. SAMANTA ROY, Lockheed Martin Corporation and B. GRABOWSKI, Raytheon</td>
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<thead>
<tr>
<th>Wednesday, 15 September 2021</th>
<th>17-SMS-1</th>
<th>Sea-Based Strategic Missiles I - Mission Effectiveness</th>
<th>Room 3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaired by: S. VAN DYK, Navy Strategic Systems Programs and A. EDSELL, The Charles Stark Draper Laboratory, Inc. and C. CUPPLES, Lockheed Martin Space Systems</td>
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<tr>
<td>W. Kuhle, Johns Hopkins University Applied Physics Laboratory, Laurel, MD</td>
<td></td>
<td></td>
<td>W. Vasik, S. Howell, Systems Planning and Analysis, Inc., Alexandria, VA</td>
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<thead>
<tr>
<th>Wednesday, 15 September 2021</th>
<th>18-WSE-4</th>
<th>Weapon Systems Effectiveness: MS&amp;A</th>
<th>Parsons Auditorium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaired by: R. ADDIS, Lawrence Livermore National Laboratory and A. CASH, Dynetics, Inc.</td>
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</tr>
<tr>
<td>I. George, P. Wallentine, Missile Defense Agency, Albuquerque, NM</td>
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<td>C. Neal, Air Force Research Laboratory, Eglin, FL</td>
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<tr>
<th>Wednesday, 15 September 2021</th>
<th>19-DEW-4</th>
<th>HEL Lethality Measurements</th>
<th>Auditorium</th>
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<tbody>
<tr>
<td>Chaired by: M. NEICE, Directed Energy Professional society</td>
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</tr>
<tr>
<td>1300 hrs AIAA-Defense2021-9040</td>
<td>Continuous wave laser induced damage threshold of AMTIR-2, 4, 5 and 7 chalcogenide windows at 1.07 microns</td>
<td>1330 hrs AIAA-Defense2021-9041</td>
<td>Summary Results of the Army Space and Missile Defense Command’s High Energy Laser Counter-RAM (Rocket, Artillery, Mortar) Lethality Program</td>
</tr>
<tr>
<td>J. McElhenny, CCDC Army Research Laboratory, Adelphi, MD</td>
<td></td>
<td></td>
<td>E. Romanczuk, AMRDEC, Redstone Arsenal, AL; J. Wills, Modern Technology Solutions, Inc., Huntsville, AL; C. LoMas; U.S. Army Space and Missile Defense Command, Redstone Arsenal, AL; J. West, Radiance Technologies, Huntsville, AL</td>
</tr>
<tr>
<td>1400 hrs AIAA-Defense2021-9042</td>
<td>Comparison of Mortar Vulnerability Estimates to Army Field Tests (Secret)</td>
<td></td>
<td>C. LoMas, U.S. Army Space and Missile Defense Command, Huntsville, AL; C. Malone, Consultant, Pittsburgh, PA; J. West, Radiance Technologies, Huntsville, AL</td>
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<tr>
<th>Wednesday, 15 September 2021</th>
<th>20-HYTASP-2</th>
<th>Hypersonic Propulsion</th>
<th>Parsons Auditorium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaired by: J. MCINTIRE, MIT Lincoln Laboratory and J. RHODAS, Lockheed Martin Aeronautics</td>
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<tr>
<td>M. Reagans, J. Kernives, Air Force Institute of Technology, Wright-Patterson AFB, OH</td>
<td></td>
<td></td>
<td>B. Pomeroy, D. Staaden, W. Hallum, N. Walker, M. Chaverini, Sierra Nevada Corporation, Madison, WI</td>
</tr>
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</table>
### Wednesday, 15 September 2021

#### 21-RUWS-1 Robotic and Unmanned Weapon Systems Room 7/8

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
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#### Wednesday, 15 September 2021

#### 22-SMS-2 Sea-Based Strategic Missiles II - Enabling Technology Room 3/4

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
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</thead>
<tbody>
<tr>
<td>1300 hrs</td>
<td>Rapid Feature Development and Deployment on High Consequence Systems</td>
<td>M. Burno, M. Gerlitz, General Dynamics Corporation, Pitfield, MA</td>
</tr>
<tr>
<td>1330 hrs</td>
<td>Collaboration via OUSD(R&amp;E) Programs to ensure Stable and Affordable Domestic Manufacturing Infrastructure and Skilled Worker Pipelines</td>
<td>M. Ray, B. Snow, K. Perry, Naval Surface Warfare Center Crane, Bloomington, IN</td>
</tr>
<tr>
<td>1400 hrs</td>
<td>Government Radiation Hardened System on a Chip (GRADSOC)</td>
<td>P. Melanson, Charles Stark Draper Laboratory, Inc., Cambridge, MA</td>
</tr>
<tr>
<td>1430 hrs</td>
<td>Strategic Missile Electronics Card &amp; Box development in a Model Based Engineering Environment</td>
<td>D. Kenyon, A. Sireci, Lockheed Martin Corporation, Sunnyvale, CA</td>
</tr>
<tr>
<td>1500 hrs</td>
<td>Seamless management of electronics production data: Initial implementation of IPC-2581</td>
<td>A. Amar, D. Kenyon, Lockheed Martin Corporation, Sunnyvale, CA</td>
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</table>

#### Wednesday, 15 September 2021

#### 23-WSE-1 Morphing Weapons Technology Room 5/6

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1300 hrs</td>
<td>Active Missile Forebody Articulation for Improved Interceptor Performance</td>
<td>B. Dickman, Air Force Research Laboratory, Eglin AFB, FL; J. Ratoff, Ledes, Inc., Shalimar, FL; M. Rask, Cummings Aerospace, Niceville, FL; D. Braddock, T. Mason, Ledes, Inc., Shalimar, FL</td>
</tr>
<tr>
<td>1330 hrs</td>
<td>Optimization and Validation of Load-Bearing Skins for Cylindrical Morphing Missile Bodies</td>
<td>E. Frank, University of Dayton Research Institute, Dayton, OH; W. Chapkin, D. Siefert, J. Boar, Air Force Research Laboratory, Wright-Patterson AFB, OH</td>
</tr>
<tr>
<td>1400 hrs</td>
<td>Design and Optimization of a Morphing Missile Head</td>
<td>R. Beblo, G. Reich, Air Force Research Laboratory, Wright-Patterson AFB, OH; T. Cruz-Gonzalez, M. Tidball, University of Dayton Research Institute, Dayton, OH</td>
</tr>
<tr>
<td>1500 hrs</td>
<td>Control Systems for High Speed Stratospheric Maneuverability</td>
<td>J. Schone, E. Blakes, AIA Engineering, Huntsville, AL; K. Casper, Sandia National Laboratories, Albuquerque, NM; M. Landers, Dynetics, Huntsville, AL</td>
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</tbody>
</table>

#### Wednesday, 15 September 2021

#### 24-PLNRY-6 Defense Industry Leadership Series: How Digital Technologies are Driving Change in Defense Auditorium

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
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</thead>
<tbody>
<tr>
<td>1530 - 1600 hrs</td>
<td>Defense Industry Leadership Series: How Digital Technologies are Driving Change in Defense</td>
<td>Bryan Rosselli, Raytheon Missiles &amp; Defense</td>
</tr>
</tbody>
</table>

**Speaker:** Bryan Rosselli  
**Title:** Vice President, Business Transformation and Execution  
**Company:** Raytheon Missiles & Defense

In today’s global threat environment, speed to the battlefield is just as important as speed on the battlefield. Digital technologies, and the data they create, are helping drive transformative change throughout the defense industry, from how we envision and field solutions to how we interact with customers and warfighters. In his talk, Bryan Rosselli will offer key insights into Raytheon Missiles and Defense’s unique digital transformation journey and how it’s accelerating the pace of innovation and performance, strengthening customer partnerships, and helping industry and government leaders reimagine the DoD’s acquisition process.
Wednesday, 15 September 2021
25-PLNRY-7
1600 - 1730 hrs
Space Asset Protection
Auditorium

While the Interim National Security Strategic Guidance released in March calls for ensuring the “safety, stability and security of outer space activities” (p. 17), much work remains to be done to protect our space assets. “It’s time to protect our nation’s space-based systems by designating them as critical infrastructure. Without adequate security, cyberattackers can cause them to malfunction, send false information or collide, potentially creating a debris field that could linger for decades. Worse, cyberattackers could simulate an attack on military systems, sparking an international — possibly nuclear — confrontation.” (Ed Swallow and Sam Visner, “It’s time to declare space systems as critical infrastructure”, POLITICO, April 2, 2021.) How do the various commands, agencies and organizations involved cooperate; how can the defense community support; and what new policies, products and solutions are needed to secure space assets?

Moderator: Jamie Morin, Executive Director, Center for Space Policy and Strategy; Vice President, Defense Systems Operations, The Aerospace Corporation
Panelists:

Col Brian Bracy, USSF
Chief (Acting), Systems Engineering and Architecture
Office of the Portfolio Architect
Space Systems Command

Roberta Ewart
Chief Scientist
Space Systems Command

Ronald Keen
Senior Energy Advisor, National Risk Management Center
Cybersecurity and Infrastructure Security Agency
Department of Homeland Security

Samuel Visner
Director, National Cybersecurity Federally Funded Research and Development Center, MITRE
Board Member, Space Information Sharing and Analysis Center (ISAC)

Thursday, 16 September 2021
26-PLNRY-8
0800 - 0930 hrs
Advanced Technology: Industry Prime Contractors Panel
Auditorium

“Maintaining the Department’s technological advantage will require changes to industry culture, investment sources, and protection across the National Security Innovation Base.” (National Defense Strategy [Unclassified], p. 3) The sense of urgency is driving a new environmental dynamic in industry, but how can we accelerate through the “valley of death”? Industry leaders respond to DoD modernization priorities and address requirements for fielding technologies at the speed of relevance.

Moderator: Todd Nygren, Senior Vice President, Engineering and Technology Group, The Aerospace Corporation
Panelists:

Tim Barton
Dynetics Group CTO
Leidos

Naveed Hussain
Boeing Chief Technology Officer and VP and General Manager
Boeing Research & Technology

Tom Pieronek
Vice President and Chief Technology Officer
Research, Technology and Engineering
Northrop Grumman Aeronautics Systems

Steve Walker
Chief Technology Officer
Lockheed Martin

John Zolper
Vice President, Research and Innovation
Raytheon Company

Thursday, 16 September 2021
27-HYTASP-4
1000 hrs
Hypersonic Flight and Trajectories
Parsons Auditorium

1030 hrs
AIAA-Defense2021-9061
Training an Artificial Neural Network to Fly Hypersonic Glide Vehicles Using Reinforcement Learning
A. Lysek, J. Curro, C. Zagaris, J. Komives, Air Force Institute of Technology, Wright-Patterson AFB, OH

1100 hrs
AIAA-Defense2021-9062
Systems Study of Communication Networks with Hypersonic Vehicles
M. Martin, M. Miller, J. Rozier, W. Engler, Georgia Institute of Technology, Atlanta, GA

1130 hrs
AIAA-Defense2021-9024
Hypersonic Phenomenology Signature Study
D. Gao, G. Wrench, Lockheed Martin Corporation, Palo Alto, CA

Friday, 17 September 2021
28-SMS-4
1000 hrs
Strategic Missiles - Launch Systems
Auditorium

1030 hrs
AIAA-Defense2021-9063
Investigation and Verification of External Acoustics Approach of a Silo Launched Flight Vehicle Using Computational Fluid Dynamics
M. Lively, F. Sanchez, S. Ramakrishnan, Northrop Grumman Corporation, San Bernardino, CA

1100 hrs
AIAA-Defense2021-9064
Prediction and verification of silo launch tube environments during the hot fly-out of ICBM launch vehicles using CFD
R. Hanham, Northrop Grumman Corporation, San Bernardino, CA; S. Buchanan, Northrop Grumman Corporation, Ogden, UT

1130 hrs
AIAA-Defense2021-9065
Virtual Reality for Computational Fluid Dynamics (CFD)
D. Gaber, Johns Hopkins University Applied Physics Laboratory, Laurel, MD

1200 hrs
AIAA-Defense2021-9067
Minuteman III Integrated Test Bed Enhancements
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Room</th>
<th>Chair(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1130 hrs</td>
<td>AIAA-Defense2021-9071 - Unmanned Aircraft System (UAS) Categorization and Character-Driven Grouping</td>
<td></td>
<td>J. Gundlach, Gundlach Aerospace LLC, Fairfax Station, VA; S. Baird, C. LaMar, U.S. Army SMDC, Huntsville, AL; A. Westenhefer, Radiance Technologies, Huntsville, AL</td>
</tr>
<tr>
<td>1200 hrs</td>
<td>AIAA-Defense2021-9072 - Analysis of an Aircraft Optical Window</td>
<td></td>
<td>J. Tom, S. Long, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
</tr>
<tr>
<td>1300 hrs</td>
<td><strong>Hypersonic Phenomenology</strong></td>
<td>3-3</td>
<td>J. DayWitt, Lockheed Martin Corporation and J. McIntire, MIT Lincoln Laboratory</td>
</tr>
<tr>
<td>1400 hrs</td>
<td>AIAA-Defense2021-9075 - Hypersonic Vehicles</td>
<td></td>
<td>C. Epstein, M. McLaughlin, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, MA</td>
</tr>
<tr>
<td>1430 hrs</td>
<td>AIAA-Defense2021-9076 - Update to EPSS Workshop on Plume/Wake/Hypersonic Signature Prediction Capabilities As National Assets</td>
<td></td>
<td>M. Vaughn, CCDC AvMC, Redstone Arsenal, AL</td>
</tr>
<tr>
<td>1300 hrs</td>
<td><strong>Missile Defense</strong></td>
<td>3-4</td>
<td>R. Gamble, Quantitech Corporation and D. Fox, Lockheed Martin Missiles and Fire Control</td>
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<tr>
<td>1330 hrs</td>
<td>AIAA-Defense2021-9078 - Recent Threat Observations</td>
<td></td>
<td>B. Sheeks, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, MA</td>
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<tr>
<td>1430 hrs</td>
<td>AIAA-Defense2021-9081 - Angle of Attack Based Queueing</td>
<td></td>
<td>B. Miller, Lockheed Martin Corporation, Palo Alto, CA</td>
</tr>
<tr>
<td>1500 hrs</td>
<td><strong>System and Decision Analysis for National Security</strong></td>
<td>7-8</td>
<td>K. Labbe, Systems Planning and Analysis and J. Lafleur, Sandia National Laboratories</td>
</tr>
<tr>
<td>1330 hrs</td>
<td>AIAA-Defense2021-9082 - Portion-Marking Documents through the Use of Artificial Intelligence</td>
<td></td>
<td>K. Townsend, A. Firpi, Johns Hopkins University Applied Physics Laboratory, Laurel, MD</td>
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</table>
### Thursday, 16 September 2021
#### Survivability Auditorium

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter/Institution</th>
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</thead>
<tbody>
<tr>
<td>1300</td>
<td>AIAA-Defense2021-9087</td>
<td>Physics Based Survivability Metrics</td>
</tr>
<tr>
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<td>R. Ewart, USSF/SSC, El Segundo, CA</td>
<td>R. Ewart, USSF/SSC, El Segundo, CA</td>
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<tr>
<td>1330</td>
<td>AIAA-Defense2021-9088</td>
<td>Rapid Structural Vulnerability Toolkit</td>
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<td></td>
<td>S. Rosencrantz, N. Berg, Skyward Ltd., Dayton, OH</td>
<td>S. Rosencrantz, N. Berg, Skyward Ltd., Dayton, OH</td>
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<tr>
<td>1400</td>
<td>AIAA-Defense2021-9089</td>
<td>The Fast Laser ATGM Soft-Kill (FLASK) Countermeasure and the Integration of its Optical Threat Warner with the Modular Active Protection System Framework (MAF)</td>
</tr>
<tr>
<td></td>
<td>C. Wolfe, L. Vanderhoef, Army Research Laboratory, Aberdeen Proving Ground, MD; G. Thomson, Oak Ridge Associated Universities, Belcamp, MD; A. Valenzuela, A. Schweinsberg, Army Research Laboratory, Aberdeen Proving Ground, MD; W. Beyer, CCDC Ground Vehicle Systems Center, Warren, MI; et al.</td>
<td>C. Wolfe, L. Vanderhoef, Army Research Laboratory, Aberdeen Proving Ground, MD; G. Thomson, Oak Ridge Associated Universities, Belcamp, MD; A. Valenzuela, A. Schweinsberg, Army Research Laboratory, Aberdeen Proving Ground, MD; W. Beyer, CCDC Ground Vehicle Systems Center, Warren, MI; et al.</td>
</tr>
<tr>
<td>1430</td>
<td>AIAA-Defense2021-9090</td>
<td>Overview of LLNL’s Hypersonic Flight Modeling Suite (Sora)</td>
</tr>
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<td>D. Driver, Lawrence Livermore National Laboratory, Livermore, CA</td>
<td>D. Driver, Lawrence Livermore National Laboratory, Livermore, CA</td>
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### Thursday, 16 September 2021
#### Weapon Systems Effectiveness: Laser Lethality II Room 5/6

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter/Institution</th>
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<tbody>
<tr>
<td>1300</td>
<td>AIAA-Defense2021-9091</td>
<td>Missile Component Testing under High Speed Airflow at AEDC</td>
</tr>
<tr>
<td></td>
<td>C. von Hohenleiten, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
<td>C. von Hohenleiten, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
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<tr>
<td>1330</td>
<td>AIAA-Defense2021-9092</td>
<td>Thermal Blooming Analysis/Engagement Study</td>
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<tr>
<td></td>
<td>L. Schauweld, Naval Surface Warfare Center Dahlgren, King George, VA</td>
<td>L. Schauweld, Naval Surface Warfare Center Dahlgren, King George, VA</td>
</tr>
<tr>
<td>1400</td>
<td>AIAA-Defense2021-9093</td>
<td>Laser Lethality Field Test Review, JTCG/ME</td>
</tr>
<tr>
<td></td>
<td>C. Carney, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
<td>C. Carney, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
</tr>
<tr>
<td>1430</td>
<td>AIAA-Defense2021-9094</td>
<td>Laser Penetration Testing &amp; Analysis of Metals in High Subsonic and Supersonic Flow</td>
</tr>
<tr>
<td></td>
<td>E. Nugent, B. Myruski, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
<td>E. Nugent, B. Myruski, Naval Surface Warfare Center Dahlgren, Dahlgren, VA</td>
</tr>
<tr>
<td>1500</td>
<td>AIAA-Defense2021-9095</td>
<td>Target Vulnerability Process for Laser Weapons</td>
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<td></td>
<td>C-ASCM Applications</td>
<td>S. Potter, Booz Allen Hamilton, King George, VA</td>
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### Thursday, 16 September 2021
#### Air Force Futures Agile Gaming Demo: Hypersonics 2030 Auditorium

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<tr>
<th>Time</th>
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<th>Presenter/Institution</th>
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<tbody>
<tr>
<td>1530</td>
<td>AIAA-Defense2021-9095</td>
<td>The Air Force Futures Agile Wargaming Team will be providing a modified demonstration of a strike game. The demo game will examine how to prosecute various targets using different combinations of platforms and munitions. The demo has been modified to account for a larger group of participants, as agile games typically average 6-9 players for 3-hour sessions. This game and the surrounding conversation is meant to highlight the quick-turn development and execution key for successful agile games through the lens of conceptual hypersonics. Players do not need to have any prior experience in wargaming or hypersonics.</td>
</tr>
</tbody>
</table>
ADVANCED PROTOTYPES

Ryan Fontaine
MIT Lincoln Laboratory
ryan.fontaine@ll.mit.edu

Innovative engineering solutions are necessary to field advanced systems that provide the DoD with new and improved capabilities in both modern and future mission spaces. Novel approaches to thermal management, structural and aerodynamic design, power and control devices, optics, manufacturing processes, and other related areas can help make conceptual systems a reality. Briefings are solicited for a session highlighting hardware: the engineering, manufacturing, and assembly challenges associated with building and fielding advanced prototypes in areas of interest to the DoD.

› Engineering Trades Required to Produce a Fieldable System
› Hardware Design, Build, and Test Challenges and Successes
› Implementation of Novel Technology and Hardware to Enable New DoD Capabilities
› Innovative Manufacturing and Design Processes
› Low-Size, Weight, and Power (SWaP) Multifunctional Components
› Other Topics in Advanced Prototypes

AIR AND MISSILE DEFENSE

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Air and missile defense requirements continue to broaden as new threats emerge on land, sea, air, and space. Technical briefings are sought on existing, newly deployed, and emerging concepts for missile defense. Effective air and missile defense assimilates a wide range of capabilities across the air and missile defense timeline and system, and, as such, briefings are requested on threat detection and characterization, air and missile defense subsystems such as interceptors or command/control, and integrated air and missile defense systems to defeat multiple threat types. Other innovative topics not included in the subtopic list will also be considered.

› Ballistic Defense Concepts and Systems
› Counter-UAS Concepts and Systems

› Hypersonic Defense Concepts and Systems
› Missile Defense in Other Battlefield Domains
› Space Development Agency Collaboration
› Threat Characterization
› Other Topics in Missile Defense

AUTONOMY, COLLABORATIVE ENGAGEMENT, AND MACHINE INTELLIGENCE

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In 2016 the Defense Science Board conducted a study at the request of the Undersecretary of Defense for AT&L that concluded “that there are both substantial operational benefits and potential perils associated with the use of autonomy” in defense systems. The Board also articulated that the rapid advance of enabling technologies and commercial applications was providing significant opportunities for the DoD. This study concluded that “DoD must accelerate its exploitation of autonomy—both to realize the potential military value and to remain ahead of adversaries who also will exploit its operational benefits.”

In 2019, the DoD released its Artificial Intelligence (AI) Strategy following national AI initiatives highlighted by a Presidential Executive Order. The centerpiece of DoD’s strategy was the creation of the Joint AI Center (JAIC), with focus on the applications and infrastructure of machine learning (ML) to DoD problems. Today we find that the maturation of autonomy and machine intelligence technology has yet to reach critical mass for use in many franchise DoD programs. In this track, we explore the challenges associated with autonomy and machine intelligence, especially focusing on maturation and deployment of technologies and techniques that will help engender trust in systems leveraging stochastic, nondeterministic autonomous capabilities.

› Architectures
› Autonomous Systems and the T&E and Safety Communities – Processes and Procedures for Certification
› Verification and Validation of Autonomous Systems and Effects on DoD 3000.09
› Autonomous Systems on the Multi-Domain Battlefield
Autonomy/Machine Intelligence Solutions to Intractable Hypersonics Challenges
Counter-Autonomy
Edge Perception
“Explainable” AI – Toward Understanding the “Black Box” Nature of Deep Neural Networks
Fragility in Today’s ML Techniques
Future of “Algorithmic Warfare”
Human–Machine Teaming
Large-Scale Data and SW Dev Frameworks for ML
Applications of Commercial Best Practices to DoD
Sparse Data Machine Learning
DoD Challenge Problems that Silicon Valley Isn’t Addressing
Other Topics in Autonomy, Collaborative Engagement, and Machine Intelligence

**CYBER AND COMPUTING SYSTEMS**

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Papers are sought on the theoretical and practical use of software, hardware, computer, and information systems at both a technical and policy level of aerospace and defense applications, focusing on aerospace computing; cybersecurity to include information assurance, program protection, & risk management; parallel, GPU, multicore and high-performance computing; embedded and autonomous systems; and survivable computing in extreme environments.

- Architecture, Operation, Network Management
- Current State of Aerospace and Defense Computing System Programs and Projects
- Cyber Resiliency
- Cybersecurity and DoD Risk Management Framework (RMF)
- High Performance and Embedded Computing for Artificial Intelligence and Machine Learning
- Parallel, GPU, Multicore, and High-Performance Computing
- Quantum Computing
- Open System Architectures
- Reconfigurable Computing
- Survivable Computing in Extreme Environments (such as Space and High Velocity/Acceleration)
- Other Topics in Cyber and Computing Systems

**DIRECTED ENERGY WEAPONS**

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Directed energy (DE) weapons are emerging for defense applications. This session will look at DE capabilities that can be implemented in an airborne environment, for both defensive and offensive operations. Presentations are solicited for laser DEW, RF and microwave DEW, and any other form of airborne DEWs. In addition to the weapon source technology, other technologies as they relate to airborne DE are important such as: primer power, thermal management, beam control, beam propagation, command and control, sensors, and lethality. Of particular interest are DE systems, how DEWs fit within a system of systems concept and how DEWs affect operational scenarios. Briefings are sought on the use of DEWs that address the capabilities listed below.

- Coordination of Conventional Weapons with DEWs
- Counter to Swarming Attacks
- Counter-RAM
- Counter-Sensors/ISR
- Counter-UAVs
- Means to Extend the Range of DEWs
- Minimizing the Environmental Impacts on DEW Effectiveness
- Other Topics in Directed Energy Weapons

**GUIDANCE, NAVIGATION, CONTROL, AND ESTIMATION**

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Current and future defense systems rely more than ever on advanced guidance, navigation, control, and estimation to achieve precision, reliability, and autonomy in challenging adversarial environments. Unmanned platforms, missiles, spacecraft, and even manned vehicles, ground support systems, and data networks are achieving unprecedented levels of performance and robustness by leveraging breakthroughs in components, machine learning, computer vision, cooperative/distributed algorithms, autonomous navigation, optimal guidance, feedback control, sensor fusion, and other technical areas. Presentations describing such advances in algorithms, software, and hardware are solicited, as are presentations on alternative position, navigation, and timing (PNT); novel applications; improvements to existing systems; field test results; and lessons learned.

- Alternative Position, Navigation, and Timing (PNT)
- Optimal Guidance
- Sensor Fusion
- Feedback Control
- Adaptive Autopilots
- Autonomous Navigation
- Other Guidance, Navigation, Control, and Estimation Topics
HIGH-MANEUVERABILITY AND HYPERSONIC SYSTEMS AND TECHNOLOGIES

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Presentations are solicited for a session addressing hypersonic and high-speed flight systems and technologies. This call is intended to include systems that utilize a significant phase of hypersonic flight within the atmosphere including hypersonic ISR vehicles, hypersonic cruise missiles, gun-launched hypervelocity projectiles, and hypersonic boost-glide vehicles. There is interest in concepts using sustained air-breathing propulsion, rocket-boosted vehicles with significant unpowered glide capabilities, and innovative hybrid propulsion systems. There is particular interest in key enabling air vehicle technologies as well as end-to-end system concepts that bring revolutionary military capabilities to the warfighter and the enabling technologies necessary for mission success with high-speed systems.

› Advanced Flight Control and Trajectory Optimization
› Aerothermal Modeling and Phenomenology of Hypersonic Flowfields
› Ground Testing and Flight Testing of Hypersonic Systems
› High Temperature Materials and Affordable Manufacturing
› Hypersonic Flight Vehicle Design and System Concept Studies
› Hypersonic Propulsion
› Innovative Techniques for Defending Against Adversary Hypersonic System Capabilities
› Seeker and Targeting Technologies for High-Speed Strike Weapons
› Subsystem Development for Hypersonic Vehicles
› Other Topics in High-Maneuverability and Hypersonic Systems and Technologies

SECURE COMMUNICATIONS NETWORKING

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Secure communications networking is the backbone of the Department of Defense’s Joint All-Domain Command and Control (JADC2) concept. The committee is seeking briefings on enabling technologies, concepts, and systems, including:

› 5th Generation (5G) Communications Technologies
› Fully Networked Command, Control and Communications (FNC3)
› Mosaic Warfare
› Advanced Battle Management System
› Project Convergence
› Project Overmatch
› Other Topics On Secure Communications Networking

ROBOTIC AND UNMANNED SYSTEMS

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With the maturing and miniaturization of applicable technologies, autonomous and unmanned systems have new capabilities increasing their popularity within the U.S. military. Robotic, unmanned systems offer affordable, capable fighting machines with less risk to their operators. Applications for these systems include C3, ISR, weapons systems platforms, and ground/air safety. Autonomy enables robot capability to execute tedious and hazardous tasks not specifically planned or designed. Autonomous robots can be tasked when factors are unknown, or when the geological environment cannot be anticipated. Policies and technologies are needed to bind unmanned systems’ operational space; tools and testing are needed to characterize performance limits of capability/robot competence.

› Autonomy
› Defense Against Robotic/Unmanned Systems
› Miniaturization
› Payloads
› Remotely Piloted Vehicles, UAVs
› Tactical UAVs and Spacecraft
› Urban Warfare
› Other Topics in Robotic and Unmanned Systems

SPACE ACCESS

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Access to, and freedom of operations in, space is critical to national security. The committee is seeking briefings on the following topics:

› Delivery Systems
› Offensive Capabilities and Boosters
› Space Launch (Short and Long Range)
› Space Traffic Management: Proliferation, Risk, Mitigation, and Policy
› Other Topics in Space Access

SPACE SYSTEMS

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Space systems are in the defense news daily, spanning topics from acquisition to user services to resiliency and survivability. Space systems are the basis for U.S. assured access to space, consisting of launch vehicles, spacecraft, payloads, ground support equipment, launch operations and ranges, and test hardware used in ground testing and operations. Space systems also include operations centers to maintain space vehicles or spacecraft on orbit. With current defense reliance on non-U.S. space systems, and the failures of certified space systems, assured access to space is a growing concern. The size and type of space systems is changing, and the defense community is increasingly
leveraging commercial capabilities. Space systems require rigorous developmental test and evaluation due to the harsh launch, landing, and operational space environment, and must function from the first time to every time called upon. Emphasis is on rapid and effective fielding of space assets and compressed space acquisition cycles. Submissions are solicited that address any of these aspects of state-of-the-art military space systems.

› Launch Vehicles
› Spacecraft
› Payloads
› Ground Support Equipment
› Launch Operations
› Ranges
› Test Hardware
› Other Space Systems Topics

STRAIGHTIC MISSILE SYSTEMS

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Presentations are solicited for sessions for strategic missile systems, focusing on future requirements, development of new technical and operational concepts, modernization and sustainment of existing weapon systems, lowering lifecycle costs, and application of innovative engineering and manufacturing processes. Challenges include lowering future cost of ownership, mitigating technology obsolescence and industrial base evolution, providing flexibility, diversity, responsiveness, accuracy, and survivability for long-term effectiveness, and assuring safety, security, and reliability. Technical presentations are solicited for engineering, science, and technology developments applicable to fire control and launch systems, missiles, and reentry vehicles.

› Advanced Concepts, Including Penetration Aids, Underwater Launch, and Radiation Hardening
› Advanced Technology for Thermal Protection, Propulsion, Avionics, Sensors and Materials/Structures
› Aging Effects, Surveillance, and Age Management
› Air-Launched Ballistic Missiles
› Concepts to Leverage Technologies, Design Approaches, and Infrastructure Across Weapon Systems
› Design and Operational Concepts for Future Strategic Weapon Systems
› Ground-Based Strategic Deterrent (GBSD)
› Ground Test, Flight Test, and Alternative Test Methods

SURVIVABILITY

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The Survivability Technical Committee (SURTC) promotes the research and development of new technologies that define the state of the art in survivability. Survivability is the capability of a system to avoid or withstand a hostile environment (man-made or otherwise). Therefore, the survivability discipline forms part of the systems engineering process and is affected by all other engineering disciplines, such as materials (e.g., armor applications) and structures (e.g., resilient structures). The SURTC is looking to the future as game changers emerge and revolutionize the discipline, and, in addition to the topics listed below, is particularly interested in advanced materials and structures for survivability.

› Additive Manufacturing and Survivability (e.g., Improved/Faster Battle-Damage Repairs)
› Aerospace Survivability and the Cyberspace/Information Domain
› Armor/Anti-Armor
› Autonomy and Survivability (e.g., Survivability of Autonomous Agents, Adaptive Survivability)
› General Survivability
› Space and Space Launch Systems
› Space Junk: Proliferation, Risk, Mitigation and Policy
› Survivability Against Directed Energy Weapons
› Survivability Game Changers: Emerging Technological Solutions that Will Revolutionize Survivability
› System Safety, Protection, and Health Monitoring
› Other Survivability Topics
SYSTEM AND DECISION ANALYSIS FOR NATIONAL SECURITY

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National security decision makers often turn to system-level decision analyses to help them evaluate the differences in cost, risk, and benefit of alternative future options. These analyses usually include some of the following elements: definition of objectives, criteria, and metrics; brainstorming, definition, and enumeration of alternative systems or approaches; modeling and evaluation of alternatives against criteria; and conversion of multi-criteria analyses into overall alternative evaluations and recommendations. This topic area seeks to bring together professionals from throughout the defense industry to share methods, lessons learned, and insights in system-level decision analysis gained during national security work. Possible topics include but are not limited to:

- Conceptual Design and Evaluation
- Data Visualization and Communication
- Economic and Resource Analysis
- Methods and Tools for Decision Analysis
- Performance and Capability Analysis
- Policy Trade Studies
- Risk Analysis
- Other Topics in System and Decision Analysis for National Security

SYSTEM PERFORMANCE MODELING AND SIMULATION

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Measurement, analysis, modeling, and simulation is critical to understanding the capabilities and limitations of our systems across the battlespace. Briefings are solicited for new and innovative analysis techniques, high fidelity and fast-running models, component and system simulations, algorithms, threat/target modeling techniques, technology development, and design maturity. Systems of interest span kinetic, hypersonic, and directed energy weapons across the Army, Navy, Air Force, and Missile Defense Agency.

- Computational M&S Test Predictions
- Debris and Post-Intercept Sensor Scene Modeling and Simulation Predictions and Reconstruction
- Digital/Model-Based Engineering
  - Network Communication Standards
  - Stability and Control Prediction/Guidance and Navigation Control
  - Transition Modeling Prediction
- Distributed Architectures and Modeling Joint Operations
- M&S Assessments on the Cost of Weapon System Test and Evaluation and Ops
- M&S Criteria Development and Predictions
- New and Innovative Modeling Techniques for First Principle Codes (FPCs)
- New M&S Codes, Models and Techniques
- New M&S Employed in the Assessment of Weapon Systems
- Novel Applications
- Payload Integration
- Propulsion Design
- Risk Reduction Through Weapon System M&S
- Secondary Damage Modeling, Effects and Consequences, Including Casualty Modeling
- Warheads/Warhead Effects
- Weapon System Effectiveness M&S of Lethality for Kinetic Energy Weapons
- Other System Performance, Modeling And Simulation Topics

TACTICAL MISSILES

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Presentations are solicited on advances in the research, development, test, and evaluation of Joint, Army, Navy, and Air Force tactical missiles. Papers may address components or systems. Papers are solicited for sessions on tactical surface-to-surface, air-to-air, and air-to-ground missile systems. This topic area is intended to bring together technology developers and customers of all types to share not only new technology developments and results from analysis, simulation, and testing, but also operational lessons learned. Papers may address testing, design, and or analyses of systems, subsystems, components, software, or algorithms.

- Advanced Materials and Manufacturing: Sensors, Embedded Diagnostics, Additive Manufacturing
- Insensitive Munitions for Propulsion and Warheads: Design Approaches, Modeling, and Test Results
- Modeling, and Simulation: Integration, Targeting, Weapon Effectiveness, and Lessons Learned
- Propulsion and GNC: Thrust Vectoring, Pulse Motors, Controllable Solids, Sensors, Algorithms
- Test: Missile Integration, Targeting Capabilities, Weapon Effectiveness, and Lessons Learned
- Other Topics Relating to Tactical Missiles
TEST AND EVALUATION

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Testing and evaluation, from phenomenology to operational, provides confirmation of the effectiveness of our weapon systems and anchors our models and simulations. There have been many recent efforts to modernize testing infrastructures and develop low cost, high value techniques. This technical area invites participants in those efforts to highlight their achievements, results and plans by providing presentations highlighting recent test events and development efforts. Of particular interest are papers discussing new test venues, equipment, techniques, novel instrumentation, and data collection methods for flight, ground, arena, gun, wind tunnel, and anechoic chamber tests. Additionally, data management, utilization, and performance criteria development and lessons learned are also of interest.

› Assessments on the Cost of Weapon System Test and Evaluation
› Comparison of Flight, Ground, and Computational Results
› Debris and Post-Intercept Sensor Scene Results and Comparisons
› Demonstrated Weapon System Effectiveness and Lethality for Kinetic Energy Weapons
› Evaluation of Results, Criteria Development, and Assessment
› Flight, Ground, and Computational Test Execution and Results
› New Diagnostics Employed in the Assessment of Weapon Systems
› New Venues and Testing Techniques
› Risk Reduction Through Weapon System Test and Evaluation
› Wind Tunnel, Anechoic Chamber, Directed Energy Ranges, and Other Test Types
› Other Test and Evaluation Topics

WEAPON SYSTEM OPERATIONAL PERFORMANCE

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Assessing operational performance of weapon systems ensures mission success for the warfighter and cost effectiveness for the DoD. This topic area focuses on force level, mission level, and weapon system performance assessment.

› Combat Modeling, Force Level, and Mission Level Assessment
› Cost and Effectiveness Assessment
› Cost of Weapon System Employment and Ops
› Data Acquisition and Assessment
› Direct and Indirect Fire Weapon System Performance
› Measured Post-Intercept and/or Impact Debris
› New Employment or Assessment of Weapon Systems
› Probability of Hit and Kill
› Other Topics in Weapon System Operational Performance
CALL FOR TECHNICAL BRIEFINGS

ABSTRACT SUBMISSION BEGINS
17 September 2021

ABSTRACT DEADLINE
19 October 2021, 2000 hrs ET, USA

SUBMIT YOUR ABSTRACT
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