Test & Evaluation in a Multi-Domain Operational Environment

July 13–15, 2021

Radisson Hotel El Paso Airport

Welcome to the Workshop!

Greetings to the delegates of the ITEA Multi-Domain Operations (MDO) Workshop hosted by the ITEA White Sands Chapter. I am Charlie Garcia and I have the honor and privilege to serve as the Program Chair for this year's event. Our theme this year, **T&E in a Multi-Domain Operational Environment**, recognizes the importance of the Services working together in a system of systems architect, to assure readiness in today's challenging environment. This workshop will discuss selected tenets of related support initiatives and address how to apply these tenets to test planning, test support and will include test capability modernization current and future needs. It is our intent that consideration such as cyber, C4I, distributed testing, modeling and simulations, autonomous systems, hypersonic systems, directed energy, spectrum, advanced instrumentation systems, and certainly "Big Data" will lead to a thorough and relevant discourse at this workshop and aid those in attendance, to prepare for the future. In addition, this year's edition recognizes the importance of the triumvirate, i.e. government, private industry and academia, by not only showcasing representatives from government and private industry but include a special university showcase, demonstrating their contribution to the challenge. We trust you will find these few days informative, enjoyable and a positive experience. On behalf of ITEA, the White Sands chapter and our planning committee, welcome.

Charles Garcia, GreyBeard Group ~ *Program Chair*

Hosted by the ITEA White Sands Chapter

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MESSAGE FROM THE PRESIDENT

I am very happy to be able to welcome everyone in person to the T & E in a Multi-Domain Operational Environment workshop. I would especially like to thank all the attendees, volunteers, speakers, panelists, tutorial instructors, exhibitors and sponsors for their great efforts to make this event a success. I would also like to thank senior leaders in government and industry around the T&E community but especially here at White Sands for recognizing the value of ITEA and in ensuring our entire workforce remains at the cutting edge of T&E best practices. After nearly a year and a half of COVID shutdowns and virtual events, we are extremely excited to at last have an opportunity to engage, interact, and collaborate with our colleagues across every government, industry, and academic organizations in person. The relationships we develop and maintain during these events is a key benefit to the T&E community. I encourage you to get involved at all levels of ITEA – from chapters to our ITEA Board of Directors – we need your participation. I hope you enjoy the workshop!

Pete Crump
President, ITEA

CONTENTS

4 Pre-Workshop Tutorials
7 Wednesday Agenda
9 Technical Sessions 1-4
10 CTEP
11 Thursday Agenda
12 Technical Sessions 5-9
13 Meet our Exhibitors
16 Corporate Members
17 Biographies
22 ITEA Life Members
23 Upcoming Events

MISCELLANEOUS INFORMATION

Registration: Located in the Atrium – 1st floor

Meeting Space: Located on the 1st and 2nd floors

Exhibit Hall: Located in the Atrium – 1st floor

Speaker Ready Room: Veranda Room – 1st floor

IT/AV Support Room: Savoy Boardroom – 2nd floor

Ad Hoc Meeting Space: Tuscan Boardroom – 3rd floor

Breaks and Receptions: All breaks and the Networking Reception will be held in the exhibit hall.

Lunch: Lunch will be served in the Atrium – 1st floor

SECURITY CHECK-IN

Some presentations at the Workshop will be Limited Distribution C and D, which restricts participation in those sessions to U.S. citizens who are employees of the U.S. Federal Government or its contractors (C), or employees of the Department of Defense or its contractors (D). Please be prepared to provide proper identification prior to entering a limited C or D session.

AD HOC MEETING SPACE

While at the Workshop, if the need arises for a private meeting room with colleagues or customers, visit the Registration Desk to reserve space in the Tuscan Boardroom. The room is located on the third floor and has seating for up to ten.

Nobody can do everything, but everyone can do something.

You stepped up when asked, you gave us your energy and creativity, your talents and your valuable time; it really does take a village. We know you are the reason this event is successful. Know that we appreciate you.

— The International Test and Evaluation Association

ITEA MDO PLANNING AND EXECUTION COMMITTEE

Charles Garcia
Program Chair
GreyBeard Group

Richard Martinez
Technical Chair
GreyBeard Group

This wouldn't be possible without the dedication and hard work of the individuals below.

It's a pleasure to work with a team who knows how to make a friendly and inspiring work environment and at the same time demonstrate time and time again a level of dedication, enthusiasm and insight that was truly inspiring. To my team, we are measured by not how much we undertake but what we finally accomplish. This is truly above and beyond.

A thanks to our committee and a special acknowledgement to ELK Management Group, who kept us on track and provided the needed planning tools.

- Steve Aragon, White Sands Chapter President & Associate Technical Chair
- Chuy Benitez, Photographer/Workshop Support, GreyBeard Group
- David Fierro, Registration Support, GreyBeard Group
- Mike Gonzales, Workshop Support, 3 Towers Consulting
- Patti Holguin-Lucero, Workshop Support, GreyBeard Group
- Mando Juarez, IT/AV Co-Chair, GreyBeard Group
- Danny Medina, Workshop Support, GreyBeard Group
- Carlos Maez, IT/AV Chair, SRS
- Anahi Mancha, Security
- Gloria Martinez, Registration Support
- Angela Romesburg, Registration Support
- David Soules, Tutorial Chair, TRAX International

The ITEA planning and execution committee's endeavor is in memory of Dr. David Soules, who served as our Tutorial Chair.

His dedication to science, physics, and engineering in support of the DoD was matched by his commitment and championing for the preservation of our wilderness and environment. He will be sorely missed.

ITEA Offers Continuing Professional Education (CPE)

Pre–Workshop Tutorials provide 4 contact hours of instruction (4 CPEs) for each half–day, 8 contact hours of instruction (8 CPEs) for each full–day, or 20 contact hours of instruction (20 CPEs) for attending the full Workshop, that are directly applicable to your professional development program, including the Certified Test and Evaluation Professional Credential (CTEP).

Stop by the Registration Desk to learn more about elevating the T&E profession with a globally recognized credential.

Pre-Workshop Tutorials ~ Tuesday, July 13th 8:00am – 12:00pm

Pre-Workshop Tutorials require a separate fee from the Workshop.

Introduction to Cybersecurity Test and Evaluation — Salon A

Pete Christensen, Consultant

This tutorial will familiarize attendees with Cybersecurity and Test and Evaluation as it applies to US Federal Government Programs and the U.S DoD. Note that the ideas and concepts presented also apply in principal to any acquisition program. Topics that will be addressed include Cyberspace as an operational domain, Cybersecurity threats, malware, DHS and DoD systems acquisition and associated Cyber T&E policy and process including "Cloud" Programs, requirements analysis, evaluation frameworks, cyber tabletop exercises, cooperative vulnerability assessments, adversarial assessments, cyber ranges and lessons learned.

Predicting & Validating Prototype Performance — Salon C

Mark Kiemele, PhD, Air Academy Associates

Design of Experiments (DOE) is a method that can and should be used not only in the design and development of systems, but also in the modeling and validation of prototype systems such as JADC2 systems. Building useful prediction models and then validating them can ease the burden of making procurement decisions. This tutorial will examine two prototypes that are built to satisfy a common set of requirements. DOE will be used to model the performance of each prototype. Then validation testing will be used to confirm the models and assess the performance capability of each prototype, i.e., how well the prototypes meet the requirements. This facilitates a comparison of the capabilities of the two systems, thereby enhancing the decision as to which system to pursue. There are no prerequisites for this tutorial, as the analysis will be demonstrated via computer. Intended audience: This tutorial is for anyone interested in learning how to model performance and evaluate the capability of multiple prototypes, which should include managers, scientists and engineers and those having to make procurement decisions, would benefit from this course. There are no specific education requirements required, though some knowledge of algebra and basic statistics would help.

Video Compression — Salon B

Gary Thom, Delta Information Systems

With the growing complexity of flight test programs and the improved efficiency of compression algorithms, video is an ever increasing component of flight test data collection. This tutorial will provide a basic understanding of video interfaces. This will include a discussion of the signals, formats, resolutions and frame rates. Building on those basics the tutorial will then present a high level description of how video compression works and the trade-offs that can be made when selecting and implementing video compression components. An overview of various video compression algorithms will be provided, highlighting the differences between the algorithms. We will examine the effects of video compression on video quality and investigate some of the causes and resolutions of quality problems. Finally, there will be a brief overview of audio compression.

Pre-Workshop Tutorials ~ Tuesday, July 13th 1:00pm – 5:00pm

JMETC/TENA Capabilities for JADC2 & Distributed Testing — Salon A

Gene Hudgins, JMETC/TENA Team, Test Resource Management Center

The Test and Training Enabling Architecture (TENA) was developed as a DoD CTEIP project to enable interoperability among ranges, facilities, and simulations in a timely and cost-efficient manner, as well as to foster reuse of range assets and future software systems. TENA provides for real-time software system interoperability, as well as interfaces to existing range assets, C4ISR systems, and simulations. TENA, selected for use in JMETC events, is well-designed for its role in prototyping demonstrations and distributed testing.

Established in 2006 under the TRMC, JMETC provides readily-available connectivity to the Services' distributed test capabilities and simulations. JMETC also provides connectivity for testing resources in the Defense industry and incorporation of distributed testing and leveraging of JMETC-provided capabilities by programs and users has repeatedly proven to reduce risk, cost, and schedule. JMETC is a distributed LVC testing capability developed to support the acquisition community during program development, developmental testing, operational testing, and interoperability certification, and to demonstrate Net-Ready Key Performance Parameters (KPP) requirements in a customer-specific Joint Mission Environment.

JMETC is the T&E enterprise network solution for secret testing, and uses a hybrid network architecture – the JMETC Secret Network (JSN), based on the SDREN. The JMETC MILS Network (JMN) is the T&E enterprise network solution for all classifications and cyber testing. JMETC provides readily available connectivity to the Services' distributed test capabilities and simulations, as well as industry test resources. JMETC is also aligned with JNTC integration solutions to foster test, training, and experimental collaboration.

TRMC Enterprise Big Data Analytics (BDA) and Knowledge Management (BDKM) has the capacity to improve acquisition efficiency, keep up with the rapid pace of acquisition technological advancement, ensure that effective weapon systems are delivered to warfighters at the speed of relevance, and enable T&E analysts across the acquisition lifecycle to make better and faster decisions using data that was previously inaccessible, or unusable. BDA is the application of advanced tools and techniques to help quickly process, visualize, understand, and report on data. JMETC has demonstrated that applying enterprise-distributed BDA tools and techniques to T&E leads to faster and more informed decision-making that reduces overall program cost and risk.

TRMC has been working with Joint Staff and Air Force JADC2 Cross-Functional Teams (CFTs) regarding JADC2 and Multi-Domain Operations (MDO), to inform them on TENA/JMETC and other TRMC capabilities that could be leveraged to support the emerging Joint Staff Joint Domain Environment (JDE). Additionally, TRMC has been engaged with Army Futures Command (AFC) throughout the year in a number of areas including assessing TENA/JMETC support coupled with Big Data Analytics (BDA), expanding OSD TRMC collaboration and cooperation to other mission areas including, but not limited to, Cyber, BDA, Knowledge Management (KM), Machine Learning (ML), and Artificial Intelligence (AI).

This tutorial will inform the audience as to the current impact of TENA, JMETC, and BDA on the T&E community; as well as their expected future benefits to the range community and the warfighter.

Real World Telemetry over IP — Salon B

Gary Thom, Delta Information Systems

As telemetry ranges are making the move to network centric architectures, it is worth considering the lessons learned over the previous 10 years of designing, installing, troubleshooting and optimizing telemetry data distribution over IP networks. This tutorial will begin with the motivation for moving to Telemetry over IP (TMoIP). It will then provide a basic networking foundation for understanding TMoIP and TMoIP formats. With this basis, we will be able to discuss network design considerations and tradeoffs for a successful TMoIP deployment. Finally, we will present some of the real-world problems and issues that may arise in a TMoIP system and the troubleshooting techniques that can be used to resolve them.

LUNCH & LEARN SERIES

ITEA Virtual Lunch and Learn Series is an unclassified session open to ITEA members for **FREE**. Each presentation is 45 minutes long including Q&As.

Want to Present?

Submit abstract submission form to lunchandlearn@itea.org. Form can be found at www.itea.org under the Education tab.

Presentations should:

- Contribute technically sound knowledge in a particular area of Test & Evaluation
- Be non-commercial or marketing in scope

VIRTUAL CONFERENCE

38th International Test and Evaluation Symposium

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Evolution of T&E in an Age of Rapid Technological Change

September 13-17 | 2021

With a virtual platform, we can gather coast to coast and internationally. This year our focus is on ensuring test and Evaluation (T&E) delivers the most cost-effective assurance to the warfighter that new systems coming into the force are suitable, survivable and effective. We are planning more than 25 technical sessions to cover the many ways that improvements of T&E can be used to enable acquisition or improve capability development. Please plan on attending, and more importantly, participating in this year's Annual Symposium.

September 13th | Pre-Symposium Tutorials

September 14-17th | Plenary Speakers / Technical Sessions / Exhibits

Registration is Now Open!!

Why Attend the Virtual Annual Symposium?

Watch Live – Watch presentations, keynotes and panel discussions from top industry thought-leaders all day, every day!

Discuss – Comment and question in real time. Spark conversations with your fellow attendees.

Question – Get in-depth answers in real time in our live Q&A sessions in each presentation and panel!

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Networking – Connect with your fellow attendees and potential customers! You will be able to message, schedule meetings and video chat.

Virtual Exhibition – Search through exhibitors from your own desk and find the latest services and technology solutions for your company.

To view instructions on how to register and access the virtual site, visit:

www.itea.org/event/38th-te-symposium

Hosted by the ITEA Valley of the Sun Chapter

Agenda

TUESDAY, JULY 13

6:30 am – 5:30 pm Registration Desk Open [Atrium]

8:00 am – 5:00 pm **Pre-Workshop Tutorials [Salon A/B/C]**

Introduction to Cybersecurity T&E
Pete Christensen, Consultant

JMETC/TENA Capabilities for JADC2 and Distributed Testing
Gene Hudgins, JMETC/TENA Team, Test Resource Management Center

Predicting and Validating Prototype Performance
Mark Kiemele, PhD, Air Academy Associates

Real World Telemetry Over IP
Gary Thom, Delta Information Systems

Video Compression
Gary Thom, Delta Information Systems

8:00 am – 5:30 pm Exhibitor set-up [Atrium]

WEDNESDAY, JULY 14

6:30 am – 9:00 am Exhibitors continue to set-up [Atrium]

6:30 am – 6:00 pm Registration Desk Open [Atrium]

Speaker Ready Room Available [Veranda]

7:30 am – 8:00 am OPENING CEREMONY
[Salon A/B]

Presentation of Colors & National Anthem
Welcome and Opening Remarks
Pete Crump, ITEA President
Steve Aragon, White Sands Chapter President
Charles Garcia, Program Chair

8:00 am – 8:15 am WSMR Command Group Welcome
Brigadier General Eric Little, Commanding General, White Sands Missile Range (WSMR)

8:15 am – 9:00 am Keynote Speakers:
Sandra Hobson, PhD, (SES), Acting Principal Deputy, Office of the Director, Operational Test & Evaluation, OSD
Christopher Collins, (SES), Director, Developmental Test and Evaluation, and Assessments, Office of the Undersecretary of Defense (R&E)

9:00 am – 9:45 am Keynote Speaker
George Rumford, (SES) Director (acting) and Principal Deputy, Test Resource Management Center (TRMC)

9:00 am – 6:00 pm **Exhibit Hall Open**

9:45 am – 10:15 am **Break in the Exhibit Hall**

10:15 am – 11:00 am Keynote Speaker
Craig Miller, President, Viasat Government Systems

11:00 am – 12:30 pm **Panel:** Multi-Domain Enterprise Test Infrastructure: Current Efforts and Future Considerations
Ryan Norman, Chief Data Officer (CDO), Test Resource Management Center and Deputy, JMETC
Kenny Sanchez, C4T Executing Agent, Test Resource Management Center
Geoff Wilson, T&E/S&T Program Manager and Hypersonics Test Lead, Test Resource Management Center

12:30 pm – 1:30 pm	**Lunch in the Exhibit Hall**
1:30 pm – 2:30 pm	Featured Speakers **Christopher Klug**, Director, Air Force Multi-Domain Test Force **Lieutenant Colonel Michael "Hijack" Fritts**, Director of Operations, 411th Flight Test Squadron and F-22 Combined Test Force, Emerald Flag Founder, Test Pilot
2:30 pm – 3:00 pm	Featured Speaker **Paul Mann**, (SES) Department of the Navy Chief Engineer, Office of the Deputy Assistant Secretary of the Navy (RDT&E)
3:00 pm – 3:30 pm	Featured Speaker **Carroll "Rick" Quade,** (SES), Test & Evaluation Executive, Department of Navy and Director for Innovation, Technology Requirements and T&E (N94)
3:30 pm – 4:00 pm	**Break in the Exhibit Hall**
4:00 pm – 6:00 pm	TECHNICAL SESSIONS 1–4
6:00 pm – 8:00 pm	Networking Reception [Atrium]

Photo-Sonics

Photo-Sonics prepares to begin the testing of their new MITS Fly-Out Optical Tracking system at White Sands Missile Range this summer.

This new tracking system represents the next generation of optical tracking systems scheduled to be distributed to the U.S. weapons ranges in the near future.

This new optical tracking system includes Automatic Self-Surveying, Automatic Stellar and Target board Calibration, Test and Training Enabling Architecture (TENA), Metric Zoom Lenses, Metric Metadata Recording, Digital Multi-Gate Auto-Tracker and a Multi-Station Processing and Control System used to generate real-time TSPI data and provides a 2D and 3D visualization tool set, displays the tracks in real-time, provides quick-look displays to aid in mission planning, and for data reduction presentation.

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WEDNESDAY, JULY 14 • TECHNICAL SESSIONS 1–4

All Sessions will begin at 4:00 pm with time for questions at the end.

SESSION 1

Continuous Process Improvement (CPI) — LOCATION: VALENCIA

Chair: Mark Kiemele, PhD, Air Academy Associates

4:00 pm	Critical Thinking in Continuous Process Improvement	**Mark Kiemele, PhD, Air Academy Associates**
4:30 pm	Lean Six Sigma	**Mark Kiemele, PhD, Air Academy Associates**
5:00 pm	Design for Six Sigma	**Mark Kiemele, PhD, Air Academy Associates**
5:30 pm	Leveraging the CIPP Model to Achieve CPI in T&E and other DoD Applications	**Joe Stufflebeam, PhD, TRAX International**

SESSION 2

DARPA — LOCATION: SALON B

Chair: Colonel (USA, Ret) Barbara Trent, COVA Strategies

4:00 pm	Real-time Analytics Fusion for Continuous LRPF Offensive/Defensive Threat Assessment and Response	**Gert Berthold & Kevin "Cuz" Cousin, PhD, Cova Strategies, LLC.**
4:30 pm	Dual-Purpose ISR Analytics Exploitation for Offensive/Defensive Multi-Domain Operations	**Gert Berthold & Kevin "Cuz" Cousin, PhD, Cova Strategies, LLC.**
5:00 pm	Applying Composable Inline Analytics for Intelligence Fusion	**Gert Berthold & Kevin "Cuz" Cousin, PhD, Cova Strategies, LLC.**
5:30 pm	Analytics Fusion Across Distributed Zones of Security	**Gert Berthold & Kevin "Cuz" Cousin, PhD, Cova Strategies, LLC.**

SESSION 3

Software Intensive in Support of JADC2 — LOCATION: RENAISSANCE

Chair: Jaime Lujan, Trideum

4:00 pm	C4ISR and Software Intensive Systems T&E Challenges	**Kenneth Sanchez, Kathy Smith, & Kent Pickett, NAVAIR**
4:30 pm	Automation of Legacy Test Systems	**Dennis Shen & Dontel Newton, Georgia Tech Research Institute**
5:00 pm	Synthetic Data Generation to Enable T&E S&T for Big Data Analytics	**Kenneth Sanchez, Kathy Smith, & Kent Pickett, NAVAIR**
5:30 pm	New Methods/Products for Comprehensive Analysis of T&E Events; Big Data Analysis for T&E	**Kenneth Sanchez, Kathy Smith, William Wolfe & Kent Pickett, NAVAIR**

SESSION 4

Enabling Technologies — LOCATION: SALON A

Chair Armando Juarez, GreyBeard Group

4:00 pm	The Next Generation DoD Imaging Architecture * Limited D	**Joe Stufflebeam, PhD, TRAX International**
4:30 pm	Remote Classified Operations * Limited D	**Grant Senn, Southwest Range Services (SRS)**
5:00 pm	Universal Beamforming Technology for Telemetry Applications	**Dorse DuBois, Mannatek; Anand Kelkar, CDSI; Juan Guadiana, Mannatek**
5:30 pm	Coupled Sensor Array System (CSAS)	**Jose Mendez, Southwest Range Services (SRS)**

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PRACTITIONER

Practitioner certification will be awarded to candidates with a Baccalaureate Degree and 3 years of relevant T&E work experience (or equivalent) and successfully pass the Practitioner exam.

CALL TO ACTION

- In search of T&E Subject Matter Experts to assist us in updating the CTEP exams.
- Early Career T&E Candidates to assist ITEA as we "pilot" our new Foundational CTEP exam.

BENEFITS

- Become the first Certified Early Career Professional
- Exam fee waived

If you are a T&E Professional with more than five years of work experience or a currently certified CTEP or an Early Career T&E Professional and are interested in helping us revise our program, please contact ITEA Chair, Pete Christensen, pchris322@gmail.com

THURSDAY, JULY 15

7:00 am – 5:00 pm Registration Desk Open [Atrium]

7:00 am – 5:00 pm Speaker Ready Room Available [Veranda]

9:00 am – 4:00pm Exhibit Hall Open [Atrium]

8:00 am – 8:15 am **Welcome and Today's Events** [Salon A/B]

Charles Garcia, Program Chair

8:15 am – 9:00 am Featured Speaker
Randy Garrett, PhD, (SES), Program Manager for Geospatial Cloud Analytics (GCA) and Multi-Domain Analytics (MDA), DARPA Strategic Technology Office (STO)

9:00 am – 9:45 am Featured Speaker
Colonel Nick Hague, Director of Test and Evaluation, Space Force

9:45 am – 10:15 am **Break in the Exhibit Hall**

10:15 am – 10:50 am * Featured Speaker
Gary Anaya, Chief, U.S. Army Fires Center of Excellence /AFC- FCC Capabilities Development & Integration Cell (CDI-Cell)

* Limited D Presentation

10:50 am – 11:30 am Keynote Speaker
Brigadier General Stephanie R. Ahern, Director of Concepts, Futures and Concepts Center (FCC), Army Futures Command (AFC)

11:30 am – 12:00 pm Featured Speaker
Colonel Adam Butler, Deputy Commander, Joint Modernization Command (JMC), Futures and Concepts Center (FCC), Army Futures Command (AFC)

12:00 pm – 1:00 pm **Lunch in the Exhibit Hall**

1:00 pm – 2:00 pm Panel: University Showcase – Supporting JADC2
Laura Boucheron, PhD, Associate Professor, Klipsch School of Electrical and Computer Engineering, NMSU
Shani Rivera, Research Assistant University of Texas at El Paso
Marcella Shelby, PhD, Strategic Initiatives Officer, PSL, New Mexico State University

2:15 pm – 3:00 pm Featured Speaker
Jerry Tyree, Deputy Commander and Technical Director, White Sands Test Center, Army Test and Evaluation Command, White Sands Missile Range

3:00 pm – 3:30 pm **Break in the Exhibit Hall**

3:30 pm – 5:30 pm **TECHNICAL SESSIONS 5–9**

5:30 pm Workshop Concludes

PROCEEDINGS

The proceedings will be uploaded to the ITEA website approximately one week after the workshop concludes. Please visit www.itea.org and click "Events."

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THURSDAY, JULY 15 • TECHNICAL SESSIONS 5–9

All Sessions will begin at 3:30 pm with time for questions at the end.

SESSION 5

Tools for Distributed Testing — LOCATION: SALON B
Chair: Joe Bullington, Jacobs

3:30 pm Employing a CLONE to Enhance JADC2 Testing
CAPT Jeff Hoyle (USN, Retired), Rajive Bagrodia, PhD, Jeff Weaver, PhD & Lloyd Wihl, Scalable Networks Technologies

4:00 pm Development and Testing of Navy Torpedoes in a Full Fidelity Simulated Undersea Environment
Carlos Godoy, Kenneth Sanchez, Kent Pickett, Kathy Smith, NAVAIR

4:30 pm Continuous, Scaled and Agile Security Analysis of Web Application Code
Steve Seiden, Acquired Data Solutions

SESSION 6

University Showcase - Supporting JADC2 — LOCATION: VALENCIA
Chair: Richard O. Martinez, GreyBeard Group

3:30 pm Deep Learning for Verification of Electronic Warfare Techniques
Caleb Story & Jerrik Waugh, Physical Science Laboratory, New Mexico State University

4:00 pm Hot Fire Test in a Reaction Control Engine and Throttleable Engine
Jazmin Arellano, University of Texas at El Paso

4:30 pm Function Level ROP Gadget Survival Using Compiler-Based Software Diversification
David Reyes, University of Texas at El Paso

5:00 pm The Data Acquisition System for a 1 MW Combustor
Md Mohieminul I. Khan, University of Texas at El Paso

SESSION 7

Directed Energy — LOCATION: SALON A
Chair: Mark Henderson, BlueHalo

3:30 pm Directed Energy Weapon Test & Evaluation in a Relevant Multi-Domain Operational Environment * Limited D
Nathaniel C. Charles, Francis Check & Stephen Lenart, TRAX International; Filberto Macias, White Sands Center; Gustavo L. Sierra, ATEC; Steve Squires, HELSTF

4:00 pm Design & Development of a Beam Profiling System for Range Testing of 150 kW Class Laser Systems * Limited C
James Luke, PhD, BlueHalo

4:30 pm Mobile Laser Integrated Diagnostic Suite (LIDS) Program Update * Limited C
Milan Buncick, PhD, BlueHalo

5:00 pm HPM Sensor on Instrumented sUAS Update
Mark Henderson, BlueHalo

SESSION 8

Intellectual Property Considerations for Technology Developed with Government Funding — LOCATION: RENAISSANCE
Chair: Kevin Soules, Loza & Loza, LLP

3:30 pm Patents
Kevin Soules, Loza & Loza, LLP

4:00 pm Copyrights
Kevin Soules, Loza & Loza, LLP

4:30 pm The Bayh-Dole Act
Cameron Smith, Texas Tech

5:00 pm Monetization Strategies for Federally Funded Innovations
William "Hutton" Jones, Texas Tech

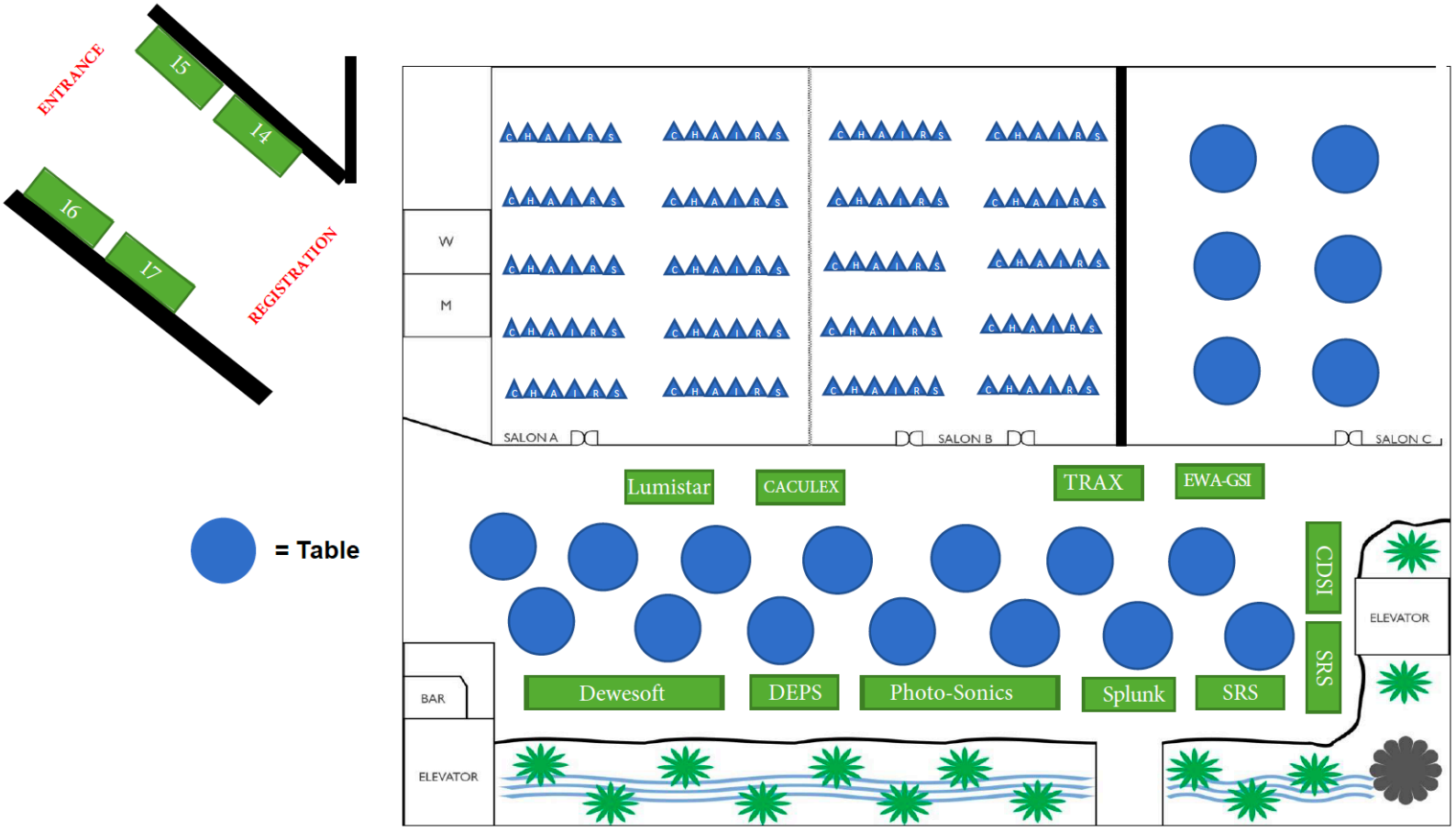
SESSION 9

Technology in Support of Operational Planning — LOCATION: SALON C
Chair: Michael T. McCarthy, Army Futures Command

3:30 pm Infrastructure as Code
Will Lester, Nextech Solutions

4:00 pm Accelerate Through Your PACE Plan
Vivian Richards, Splunk, Inc.

Exhibitor Floor Plan



WEDNESDAY, JULY 14

Hours: 9:00 am - 6:00 pm

Networking Reception at 6:00 pm

THURSDAY, JULY 15

Hours: 9:00 am – 4:00pm

Meet our Exhibitors

CALCULEX

For over 35 years, CALCULEX has designed, produced, and supported state-of-the-art electronics and software systems for operational and test flights on fixed and rotary wing air vehicles. These mission-critical real-time systems acquire, multiplex, process, record, route, and output high-speed data and video. Please visit CALCULEX to discuss your mission requirements.

Tony D. Hatten, Executive Vice President, Sales & Marketing

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Creative Digital Systems Integration, Inc.

CDSI, Inc. is an AS9100D certified small business and is located in Simi Valley, CA. Since its founding in 2006 CDSI has been specializing in affordable adaptive digital beamforming solutions for ground-based and airborne applications. CDSI leverages state-of-the-art devices exclusively from US-based sources. Please visit our booth for more information.

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Directed Energy Professional Society (DEPS)

DEPS was founded in 1999 to foster the research, development, and operational transition of Directed Energy (DE) technologies for national defense and civil applications through professional communication, education and outreach. We intend to be the premier professional organization for the advocation and exchange of information between academia, industry, service laboratories, and the warfighters, while continuing to develop and support the next generation of scientists and engineers in Directed Energy. The Directed Energy Professional Society is incorporated as a 501(c)(3) non-profit corporation in New Mexico, organized and operated exclusively for charitable, scientific, and educational purposes.

Cynnamon Spain, Events Director

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Biographies Plenary Session Speakers and Panel Members

Brigadier General Stephanie Ahern has served as the Director of Concepts, Futures and Concepts Center, Army Futures Command, in Austin, TX, since August 2020. As an Army Engineer she served in Germany, Bosnia-Herzegovina, Albania, Kosovo, Afghanistan, and Iraq. As an Army Strategist, she taught at the U.S. Military Academy, spending summers in Iraq and State Department; was a Council on Foreign Relations fellow at Treasury; served in HQDA G-3/5/7, Arlington National Cemetery, OSD-Policy, National Security Council, and for Secretary of the Army; and was an MSFS and SSP adjunct professor at Georgetown University. She has a B.S. in Engineering Management from the U.S. Military Academy, a Master of Strategic Studies from the U.S. Army War College, and a Master and Ph.D. in Political Science from the University of Notre Dame.

Gary Anaya has served as the Chief of the FCoE Capabilities Development and Integration – Cell (CDI-C), Fort Bliss since 2007. Prior to that he was the Deputy Director of the US Army Air Defense School Air & Missile Defense Battle Lab. Mr. Anaya works under the direction of the Army Futures Command - Futures & Concepts Center (AFC/FCC) Fires-CDID, supporting Fires initiatives at Fort Bliss, TX where he leads a small team of Department of Army Civilian Engineers and 25 contractors. The CDI-C team supports multiple Fires Testing, Experimentation & Exercise initiatives by generating unique integrated Live-Virtual-Constructive (LVC) environments that replicate both current and future Army and Joint systems. The CDI-C plays a critical role in support of the training and certification of the Task Force that deploys in support of Operation Noble Eagle (ONE) which is the Air Defense mission for the National Capital Region (NCR). His team also replicated portions of the Theater Fires Command and Multi-Domain Task Force during Joint All Domain Command & Control (JADC2) Sensor-to-Shooter and Joint Fires kill chain events.

Dr. Laura Boucheron received the BSEE with a minor in Mathematics in 2001 and MSEE in 2003 from New Mexico State University and the PhD in EE in 2008 from The University of California Santa Barbara. She is currently an Associate Professor in the Klipsch School of Electrical & Computer Engineering at New Mexico State University. Her research interests are in image processing and machine learning, with particular interest in interdisciplinary applications.

Colonel Adam Butler is a native of San Antonio, Texas. He enlisted in the Army in 1983 in the Infantry before attaining his commission as a Second Lieutenant in the Finance Corps in 1993. Adam served as the Chief of Disbursing and Chief of Pay & Exam in 10th Finance Support Unit and 208th Finance Bn., Vicenza, Italy.

He commanded HHD & C/176th Finance Bn, Korea and A/15th Finance Bn, Fort Hood, Texas. After command, he served as the S-3, 230th Finance Bn (FWD), Bosnia Herzegovina where he was selected for the Training with Industry (TWI) program at the Armed Forces Bank, Fort Leavenworth, Kansas. Upon completion of TWI, he served as the Banking Officer for the United States Army Europe, and 7th Army. He next served at Ft. Campbell, Kentucky as Operations Officer and Commander, 101st Finance Support Unit, 101st Soldier Support Battalion.

Following graduation from Command and General Staff College, Adam served as the Chief, Centrally Managed Programs, United States Special Operations Command, MacDill, AFB, Florida. Thereafter, he commanded the 2nd Brigade, 1st Armored Division Special Troops Bn. and served as the 1st Armored Division G8, Fort Bliss, Texas. He served at the Pentagon as the Deputy Director, Resource Integration, Deputy Chief of Staff of the Army, G2. He also served as the Director, J8, United States Forces-Afghanistan. Upon re-deployment, he served as the Garrison Commander at Fort Lee, Virginia.

Christopher C. Collins is the Director, Developmental Test and Evaluation, and Assessments (D,DTE&A) within the Office of the Undersecretary of Defense (Research and Engineering). DTE&A provides support to DoD acquisition programs in the use of innovative and efficient DT&E strategies to ensure production readiness and fielded systems meet Warfighter/User needs; improve the Defense Acquisition T&E workforce "practice of the profession;" and advance T&E policy and guidance. DTE&A also conducts Independent Technical Review Assessments (ITRA) and Milestone Assessments for major acquisition programs.

Mr. Collins was appointed to the Senior Executive Service in April 2020. Prior to his appointment, he was the COMNAVSEASYSCOM Deputy for Test and Evaluation. He has also served within various engineering and test leadership positions in the Aegis Ballistic Missile Defense Program within the Missile Defense Agency, and also completed a one-year experiential assignment with the U.S. Air Force on the Headquarters Staff.

Lieutenant Colonel Michael "Hijack" Fritts is currently assigned to the 412th Test Wing at Edwards AFB, CA where he is an Experimental Test Pilot and the Director of Operations of the 411th Flight Test Squadron and F-22 Combined Test Force (CTF) where he is responsible for planning, executing, and reporting on all developmental and operational test (DT/OT) programs supporting F-22 future modernization and a $25B Air Force F-22 fleet. Lt Col Fritts is a uniquely qualified 4th & 5th Generation Experimental/Developmental/Operational Test/Fighter Pilot with experience in early science and technology (S&T), acquisitions, program management, developmental test, operational test, and combat operations. He has also conducted unique research in human systems engineering where he designed and flew a test management project that exposed the need for enhancements in real-time human systems monitoring via biofeedback and leveraging big data in high performance aircraft. He also has worldwide experience across North America, Middle

East, and Asia worldwide experience across North America, Middle East, and Asia in tactical, operational, and strategic military operations. During his previous assignment at Eglin AFB, FL he was a Command Evaluator/Instructor Pilot and Chief of Fighter Test Operations and Training for HQ Air Force Materiel Command. During this time, he was selected as a USAF Fellow at the Defense Advanced Research Projects Agency (DARPA), where he worked first-hand with program managers to rapidly develop innovative and often high-risk research ideas. His work leveraged a developmental, test, and evaluation (DT&E) background and acquisitions experience to advance numerous classified programs in key areas of all-domain command and control, advanced RF/IR sensors, weapons, hypersonics, machine learning, and cyber.

Lastly, in building on the work he started at DARPA, Lt Col Fritts founded and directed Emerald Flag, a revolutionary and consistent multi-domain testing environment at Eglin AFB leveraging the full spectrum of capabilities/domains (weapons, water, webs, widgets and warfighters) and joint organizations (S&T, Acquisitions, DT, OT, Operations) native to the Gulf Coast responsible for rapid and urgent testing of current/new programs as well as experimental technologies essential to Joint All-Domain Command and Control (JADC2).

Dr. Randy Garrett is currently a Program Manager at DARPA in the Strategic Technology Office. Dr. Garrett has created programs in big data analytics and cybersecurity. He was named DARPA Program Manager of the Year, was awarded an Outstanding Civilian Service Medal from the Secretary of Defense, and assisted with earning DARPA a Joint Military Unit Award. Prior to DARPA, Dr. Garrett was a senior technical architect at the National Security Agency and was the Senior Science Advisor for Army Intelligence. Dr. Garrett was presented an Outstanding Civilian Service Medal from the Army and was a Federal 100 award winner. Dr. Garrett has held senior management positions at SAIC, General Dynamics, and Rockwell. He has a Ph.D. in Computer Engineering and undergraduate degrees in physics and mathematics.

Colonel Nick Hague is currently the United States Space Force Director for Test and Evaluation. Prior to this assignment, he was assigned to NASA Johnson Space Center Astronaut Office in Houston, Texas performing human spaceflight training, operations and support.

Colonel Hague is a Kansas native and graduated from the United States Air Force Academy in 1998 with a Bachelor of Science degree in Astronautical Engineering. He earned a Master of Science degree in Aeronautical and Astronautical Engineering from the Massachusetts Institute of Technology in 2000. A United States Test Pilot School graduate in 2003, Hague was selected in 2009 for the Air Force Fellows program in Washington, D.C., and was a staff member in the United States Senate. Following his fellowship, he served in the Pentagon as a congressional appropriations liaison for United States Central Command. In 2012, Hague was assigned to the Joint Improvised Explosive Device Defeat Organization, Crystal City, Virginia, as the Deputy Division Chief for research and development.

Selected as an astronaut by NASA in 2013, Hague completed astronaut candidate training in July 2015. He is a veteran of 2 spaceflight missions. His first, Soyuz MS-10, experienced a catastrophic inflight rocket failure and was successfully recovered]. His second, Soyuz MS-12, docked to the International Space Station where he served as Flight Engineer for Expeditions 59 and 60, completing 3 spacewalks and logging 203 days in space.

Dr. Sandra Hobson was appointed to the Senior Executive Service in 2014 as the Deputy Director for Live Fire Test and Evaluation in the Office of the Director, Operational Test and Evaluation, within the Office of the Secretary of Defense. She oversees survivability and lethality testing and evaluation of major Department of Defense systems and munition programs, in accordance with Title 10 U.S. Code, Section 2366.

Prior to this appointment, Dr. Hobson supported the Director, Operational Test and Evaluation, in two other capacities: first as a Research Staff Member at the Institute for Defense Analyses and then as an Aircraft Systems and Weapons Staff Specialist in the Office of the Director, Operational Test and Evaluation. During these tenures, she provided guidance and direction on the live fire test and evaluation of major Department of Defense aircraft and weapons acquisition programs to include the F-35 Joint Strike Fighter, the Air Force KC-46A aerial tanker, and the Navy P-8A multi-mission maritime aircraft.

Dr. Hobson earned her Bachelor of Science degree in Aerospace Engineering from the United States Naval Academy and her Doctor of Philosophy degree in Aerospace Engineering from A. James Clark School of Engineering at University of Maryland. Dr. Hobson is a recipient of the National Fellowship for Exceptional Researcher awarded by UNESCO (the United Nations Educational, Scientific and Cultural Organization), and two Secretary of Defense Medals for Meritorious Civilian Service.

Chris Klug is the first Multi-Domain Test Force Director. He is chartered with standing up a test organization that is inclusive of the warfighting domains, services, and allied nations. After graduating from the University of Michigan with an Aerospace Engineering degree he began his career as a flight test engineer with Boeing on the F/A-18E/F Super Hornet in St. Louis, MO, Patuxent River, MD, and China Lake, CA. In 2002 he started at Edwards AFB, CA as an engineer testing the integration of avionics and weapons on the F-16. In 2007 he was selected as the JSF Air-to-Air Store Certification Lead where his areas of responsibility included weapon separation and integration with the F-35 for the United States Air Force, Navy, Marines, and foreign partners. After earning a Master's degree from Georgia Tech in 2010 he was an avionics flight chief, then the Global Vigilance Combined Test Force Chief Engineer testing Remotely Piloted Aircraft such as the RQ-4B Global Hawk. Prior to his current assignment he served as the senior civilian and Technical Advisor to the 412 Operations Group Commander in all manning and organizational matters, strategic planning, and in administering mission related policies.

Brigadier General Eric D. Little assumed command of White Sands Missile Range 20 May 2021. He received his commission in 1993 through ROTC at the University of Colorado at Colorado Springs. Commissioned as an aviation officer, he completed the Initial Entry Rotary Wing and Aviation Officer Basic Courses in June 1994 and was assigned to 1st Battalion, 501st Aviation Regiment at Camp Coiner and Seoul Air Base, Republic of Korea, where he served as battalion assistant S-4 and a UH-1 platoon leader.

Upon completion of the UH-60 Qualification Course at Fort Rucker, Alabama, in 1995, he was assigned to 4th Battalion, 101st Airborne

Division (Air Assault) as a UH-60 platoon leader, POL platoon leader, and assistant S-3. In 1998, he attended the Aviation Officer Advanced Course at Fort Rucker followed by assignment to 3-58th Aviation Regiment (ATS) in Wiesbaden, Germany, with duties as assistant S-3 and battalion S-1. BG Little then assumed command of C Company, 5-158th Aviation Regiment in Giebelstadt, Germany, in 2000. Upon completion of command, he was assigned to Fort Carson, Colorado, as the deputy G-3 Air for the 7th Infantry Division. In 2002, he assumed command of Stetson Troop, 3d Armored Cavalry Regiment, deploying the troop to Operation Iraqi Freedom in 2003. Returning from Iraq, BG Little was assigned to Fort Carson as the G-3 Air for the 7th Infantry Division. In 2005, he transitioned to USASMDC/ARSTRAT with a primary duty to stand up the Joint Functional Component Command for Integrated Missile Defense at Schriever Air Force Base, Colorado, and later served as the J37 for that command. In 2006, he moved to Quantico, Virginia, as a student at the Marine Corps Command and Staff College. Upon completion, BG Little was accepted as a Functional Area 40, space operations officer. He completed the Space Operations Officer Qualification course in late 2007 and returned to Colorado Springs with an assignment to Peterson Air Force Base, Colorado, serving in the 1st Space Battalion as an Army Space Support Team leader and later as commander, 1st Space Company. He then served as executive officer to the deputy commanding general, USASMDC/ARSTRAT. In 2010, BG Little deployed to Al Udeid Air Base, Qatar, as the deputy director of Space Forces, U.S. Central Command. In 2011, he returned to Peterson AFB for a six-month assignment to the G33, USASMDC/ARSTRAT. He then attended the Joint Forces Staff College enroute to Kirtland Air Force Base, New Mexico, with duty at the Joint Navigation Warfare Center, U.S. Strategic Command. In 2014, he attended the Army War College at Carlisle Barracks, Pennsylvania, with subsequent assignment to U.S. Army Pacific as the director, Strategic Programs Division where he was responsible for Space, Cyber Electromagnetic Activities, and Special Technical Operations. In July 2018 he assumed command of the 1st Space Brigade at Fort Carson, Colorado. He became USASDMC's deputy commander for operations in July 2020.

Paul D. Mann was appointed to the Senior Executive Service (SES) in 2010 and is the Department of the Navy (DON) Chief Engineer (CHENG) within the office of the Deputy Assistant Secretary of the Navy for Research, Development, Test and Engineering. He leads the Navy's engineering enterprise-wide efforts as a national expert in systems engineering to include development, integration and testing of complex Department of Navy (DON) warfare systems – in support of development, design, construction/fabrication, test and evaluation, operations, and life cycle support of all naval systems. Mr. Mann serves as the on-site technical/programmatic expert for acquisition-related Systems Engineering processes. Prior to his role as the DON CHENG, Mr. Mann was Division Technical Director for Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD), where he was responsible for the division's technical capabilities, program planning, technical authority, workforce development, and strategic investments.

Mr. Mann served as Acting Principal Deputy Director for the DoD Test Resource Management Center and led execution of statutory and regulatory responsibilities, including a Major Range and Test Facility Base capability assessment, strategic planning, congressional reports, Test and Evaluation (T&E) infrastructure investments and DoD T&E budget certification. He also completed a four-year assignment at White Sands Missile Range as the Executive Technical Director leading all Joint T&E responsibilities. During his first SES role, he supported the Under Secretary of Defense for Acquisition, Technology, and Logistics as the Assistant Deputy Director for Land Warfare Portfolio of Major Programs. Prior, he was Joint Program Manager, leading procurement, fielding, and sustainment for the Mine Resistant Ambush Protected (MRAP) Vehicles Program at Marine Corps Systems Command, Quantico, Va. With an eventual of more than $44 billion, MRAP became the highest priority acquisition program in the DoD, successfully delivering more than 27,000 vehicles to two theaters of operation.

Craig Miller serves as President, Government Systems at Viasat, Inc. In this role, he is responsible for leading the Company's global defense business, which exceeds $1 billion in annual revenues by delivering cost-effective, innovative solutions to challenging defense requirements in satellite networks, tactical data links, information assurance, and cyber security. Craig joined Viasat in 1995, and has held numerous technology, business and strategic leadership roles. Prior to serving as President of Government Systems, he was the segment's Chief Technology Officer where he was responsible for establishing and communicating the technical strategy and roadmaps for a diverse portfolio of defense products and services: including satellite communications, tactical networks, information assurance, cyber/network security and Intelligence, Surveillance and Reconnaissance.

Craig also launched the Viasat Government Systems Space Business, which created XVI, the first Link 16-enabled LEO satellite; Viasat's mobile satellite communications gateway systems; and Viasat's Hybrid Adaptive Network capabilities. In addition to his role within Viasat's Government Systems business, Craig also worked with the design team of Viasat's Space and Commercial Networks group, which developed the ViaSat-3 satellite constellation. In this role, he contributed to the design of Viasat's next-generation satellite communications constellation and served as a liaison between Viasat's commercial and government business segments. Prior to Viasat, Craig worked at Hughes Missile Systems Group in Tucson, Arizona, where he was responsible for implementation of Electronic Counter Measures for the AAMRAM Missile System.

Ryan Norman serves as the Test Resource Management Center's (TRMC) Chief Data Officer (CDO), where he is responsible for developing and overseeing execution of the strategic plan, underlying architecture, and related investments necessary to help improve T&E Knowledge Management and analysis capabilities across the DoD. Mr. Norman also serves as the TRMC's lead for Joint Mission Environments, where he is responsible for leading the Joint Mission Environment Test Capability (JMETC) team that provides distributed Test & Evaluation (T&E) infrastructure, enterprise services, and technical expertise to facilities across the Department of Defense (DoD). This role includes acting as the Director for the Test & Training Enabling Architecture (TENA) Software Development Activity (SDA), which maintains and evolves an integration architecture that ensures live-virtual-constructive interoperability within and between test and training ranges. Since joining the TRMC in 2008, Mr. Norman has held several additional positions including: Project Manager for the Cyber Operations Research and Network Analysis (CORONA) project; TRMC's Senior Engineer for Cyberspace Test Capabilities; Chief Engineer of the JMETC program; and TRMC Lead for Army

Range Oversight. Mr. Norman previously served at U.S. Army Redstone Test Center (RTC) as Software Architect. Mr. Norman holds a Bachelor of Science degree in Computer Science from the Georgia Institute of Technology and is a DoD certified acquisition professional in the T&E, Information Technology, and Program Management career fields.

Carroll P. "Rick" Quade is the Department of Navy Test and Evaluation Executive and acts as the senior advisor on all test and evaluation matters to the ASN RDA and the Chief of Naval Operations. Mr. Quade is the functional leader for the T&E acquisition workforce career field and is responsible for the development and implementation of T&E policies that support acquisition program planning and execution.

Mr. Quade also serves as the Director, Navy Innovation, Technology Requirements, and Test & Evaluation (OPNAV N94) on the staff of the Chief of Naval Operations (OPNAV). In this position, Mr. Quade is responsible for setting requirements and programming resources for T&E infrastructure, Training Ranges, Targets and Science and Technology. In this capacity, he integrates and resources a portfolio of enabling capabilities that comprises approximately $3.9 billion in annual funding.

Mr. Quade was appointed to the Senior Executive Service in July 2014. Prior to his appointment, he was the PMA-231 Hawkeye/Greyhound Program Assistant Program Manager for Test and Evaluation. He has also served as the Program Manager for the Major Ranges and Test Facility Base and was the Division Head of the Atlantic Targets and Marine Operations Division.

Shani Rivera is a Graduate Research Assistant in the Industrial, Manufacturing and Systems Engineering Department at The University of Texas at El Paso (UTEP). She earned a B.S (2015) and a M.S. in Industrial Engineering from UTEP (2020). Currently, she is PhD student of computational science program. Her research interests focus on modeling and simulation of complex systems, and data-driven learning methods for AI testing. Prior to joining in the Industrial, Manufacturing and Systems Engineering Department at (UTEP), Shani Rivera worked as manufacturing and quality Engineer at BD Dickinson and Schneider Electric.

George Rumford is the Director (acting) and Principal Deputy for the Department of Defense (DoD) Test Resource Management Center (TRMC). The TRMC is a field activity under the Under Secretary of Defense for Research and Engineering responsible for the Department's test and evaluation infrastructure. The primary mission of the TRMC is to ensure the Department is ready to test new systems in development.

In addition, Mr. Rumford is responsible for the Department's cyber test capabilities, including the National Cyber Range Complex.

Mr. Rumford started his 30-year career in test and evaluation at White Sands Missile Range, and he received degrees with honors in Electrical Engineering and in Computer Engineering from the University of Missouri.

Kenny Sanchez is the Executing Agent for the C4T Test Technology Area (TTA). Before he became the EA for C4T, he was the Chief Engineer for the Airborne Instrumentation Division (AID) at NAWCWD Point Mugu, CA. He has also supported CTEIP programs such as the Commercial Based Instrumentation Telemetry System (CBITS) project as the Software and Firmware Subject Matter Expert (SME). Kenny obtained his bachelor's degree in Computer Engineering in 2008 from California State University of Northridge and his Master's Degree in Systems Engineering Management from the Naval Postgraduate School in 2019.

Dr. Marcella Shelby joined PSL as the Strategic Initiatives Officer in August 2020. As SIO, Marcella supports business and economic development initiatives, and oversees student programs. Marcella brings over 20 years of experience working in community and economic development.

Dr. Shelby started her career in program management for nonprofit organizations in Texas with a focus on family and community empowerment. In 2005, she began working with the National Association of Latino Elected and Appointed Officials (NALEO) Educational Fund, a national nonprofit involved in increasing Latino civic engagement and participation. At NALEO, she developed governance curriculum and lead trainings for elected and appointed officials throughout the country. She served as Deputy Director of Constituency Services and Director of Strategic Initiatives at NALEO.

Since 2015, Marcella has worked as a business and strategy consultant for small businesses and nonprofits, and served as faculty member, teaching both undergraduate and graduate courses. She has taught economics, public policy and administration, business statistics and research methods at New Mexico State University, Dona Ana Community College, California Lutheran University, Oxnard College and Moorpark College.

Norman G. (Jerry) Tyree is the Deputy to the Commander and Technical Director, White Sands Test Center (WSTC), Army Test and Evaluation Command (ATEC) at White Sands Missile Range (WSMR). He is responsible for command direction, resource management, supervision and leadership of a team of civilian and contractor personnel engaged in Research, Development, Test and Evaluation activities for the Department of Defense providing test program design, planning, measurements, data collection, conduct, analysis and reporting. He directs the development of new philosophies, methods and test technologies for the test and evaluation of future capabilities and current materiel ranging from sensors and laser weapons, command and control systems, tactical networks, sensors, UAVs, and tactical missiles to integrated air and missile defense systems.

Prior to being selected as the Deputy Commander and Technical Director of the White Sands Test Center, Mr. Tyree served as the Director of Materiel Test at WSMR from August 2012 to January 2017 where he led a team of engineers, technicians and analyst in test design, conduct and reporting directly interfacing with Program Managers and Executive Offices on achieving acquisition goals. During his tenure as Director Materiel Test, Mr. Tyree was selected for a unique developmental assignment under the Army Military

Deputy for the Assistant Secretary of the Army Acquisition Logistics Technology (ASA(ALT)) where he established methodologies for effective and efficient operational assessment of the common operating environment and assisted with analysis of Army acquisition programs.

From 2007 to 2012, Mr. Tyree served as the Deputy for Materiel to Brigade Modernization Command and PEO Integration Staff Engineer providing guidance and direction on Army Acquisition, program management, resources and technical capabilities for Network Integration Evaluations and technical oversight and guidance on the Doctrine, Organization, Training, Logistics, Materiel, Personnel and Facilities (DOTLMPF) assessments. As Staff Engineer, Systems of Systems Integration (SoS-I) Directorate he served as technical expert and lead Engineer for Army capability set integration design, training and fielding. Mr. Tyree played a key role in transitioning systems of systems concept from FCS to the establishment of the Agile Process and Network Integration Evaluations.

Geoff Wilson is the Program Manager of the Test and Evaluation / Science and Technology Program (T&E/S&T) and Hypersonics Test Lead for the Test Resource Management Center (TRMC). He is responsible for development, execution and transition of science and technology projects enhancing the Department of Defense's test infrastructure along with the development and implementation of the Department's strategy to improve and modernize hypersonics test infrastructure.

Mr. Wilson began his career in private industry with the Lockheed Martin Space Systems Business Unit. As an engineer there, he was tasked with the design of components that would comprise the primary structure for the Service Module on the Orion manned spacecraft program before assuming a role in satellite operations responsible for the mission planning of on orbit satellite systems.

He later transitioned to a position with General Infomatics, Inc. supporting the Test Resource Management Center (TRMC). While supporting the TRMC, Mr. Wilson became heavily involved in Test and Evaluation (T&E) where he provided program support to the T&E/S&T Program. Mr. Wilson's position with General Infomatics, Inc also included an extended assignment to the White Sands Test Center (WSTC) Range Operations Directorate to set up, operate and maintain WSTC instrumentation and data support elements for missile system Developmental and Operational Test. Following his position with General Infomatics, Inc, Mr. Wilson was selected to be the Deputy Program Manager for T&E/S&T before transitioning to Program Manager, where he currently serves.

Geoff Wilson holds a Bachelor of Science in Aerospace Engineering from Virginia Tech and a Masters of Business Administration (MBA) from George Mason University.

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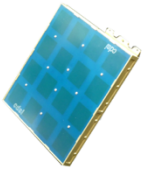

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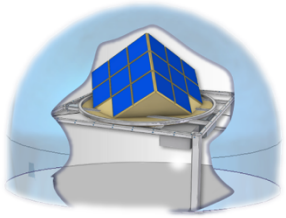

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