

# **Multi-Domain Operations Workshop**

## *Optimizing the Test & Evaluation Process for Multi-Domain Operations*

Pre-Workshop Tutorials are a separate fee from the Workshop.  
Single Tutorial - \$205, Two Tutorials - \$385

**19-July      Tutorials**

**8:00 a.m. – 12:00 p.m.      Morning Tutorials**

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### **Fundamentals of Telemetry Ground Stations**

*Mark McWhorter, V.P. of Sales & Marketing, Lumistar Inc.*

This course is designed to present to the student the fundamental design features of a typical range telemetry ground system. Topics to be discussed will be the major sub-systems and components used, such as track antenna, multicoupler, receiver/combiner, demodulation, bit synchronization, data recording and playback, time, decommutation and simulation, and real time displays of telemetered parameters. The student will be exposed to a few mathematical exercises, such as “link analysis” calculations to help determine the “sensitivity” of the ground station and resultant system tradeoffs. After having completed the course, the student will have a better understanding of concepts related to RF and data processing of flight telemetry.

### **Introduction to Cybersecurity Test and Evaluation**

*Jean Petty, The MITRE Corporation*

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.

### **Laser System Propagation T&E Challenges**

*Douglas Nelson, PhD, Teknicare, Inc., Senior Combat Engineer and Mark Stevens, P.E., Naval Postgraduate School, Senior Lecturer*

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### **Predicting & Validating Prototype Performance -**

*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.

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**1:00 p.m. – 5:00 p.m.      Afternoon Tutorials**

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### **Cybersecurity for Telemetry Systems**

*Brian L. Simonin, Southwest Range Services*

Cybersecurity is now a complete requirement for all Telemetry sensors on our test ranges. This Short Course will cover what is Cybersecurity and RMF and how does this impact deploying Telemetry software and instrumentation on the range. It will also cover the process of integrating equipment on a Test Support IP Network and the requirements that you must undergo to ensure your systems are secure, compliant, and operational for a myriad of mission activities. Class slides have been approved by the WSMR Cybersecurity Office for Telemetry vendor dissemination. However, the slides may be adapted for other enclaves such as Optics, Radar, GPS, and Real-Time operations.

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### **T&E in a Digital Engineering Environment**

*Hans Miller & Jean Petty, The MITRE Corporation*

This tutorial will review digital engineering concepts in general and then deep dive into specifics for test and evaluation (T&E) in a digital engineering environment. The course will review concepts, methods, tools, and best practices for five Digital Engineering topic areas including models, an authoritative source of truth, technological innovation, innovative infrastructure, and workforce. Each topic area will be addressed in general, followed by discussion of specific issues and challenges for T&E. Discussion areas will include:

- How planning and the evaluation components of T&E need to evolve in the DE environment, given Model Based Systems Engineering, Mission Engineering, and automated testing.
- The characteristics of T&E tools within the DE environment and considerations and methods for automated tools selection.
- Data access, data sharing, and hurdles for building an authoritative source of truth.
- Special concerns for Cyber T&E in a Digital Engineering environment.
- Digital Engineering infrastructure and infrastructure providers.
- T&E workforce within a Digital Engineering ecosystem.
- Gaps in current infrastructure, capabilities, workforce, etc.

This course is intended for T&E professionals who are new to Digital Engineering or are beginning to implement Digital Engineering in their T&E practices. The course will include lecture, discussion, and interactive exercises.

### **T&E as a Part of Agile Development**

*Robin Poston, PhD - System Testing Excellence Program, University of Memphis, and Wayne Dumais - Deputy T&E, Department of Homeland Security (DHS)*

To discuss T&E in support of agile development, we need to explore the sequence of the evolution of the agile methods, rationale for the application of different methods, compare traditional and agile software development approaches, discuss research conclusions regarding the agile method's impact on software performance, review benefits and challenges of agile, and appreciate the fit of agile methods with Systems Acquisition Life Cycle. Furthermore, in this tutorial we will also discuss when to use agile, the role of the tester on agile projects, and various kinds of testing applicable to agile software developments.

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### **TRMC Solutions for MDO and Distributed Testing**

*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

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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.