Pre-Workshop Tutorials

Fees: One ½ day – $300, Two ½ days – $500, One full day $500. Lunch is on-own.

Tuesday, May 14	8:00AM – 5:00PM

Basics of Aircraft Instrumentation Systems – An 8-hour class
Bruce Johnson, NAWC AD

This course will cover a wide variety of topics related to Aircraft Instrumentation. Data, Acquisition, Telemetry, Instrumentation System Block Diagram, Standards, Data Requirements, Transducers Specifications, Video, Avionics Busses (e.g. 1553, ARINC-429, Ethernet etc.), Using Requirements to Configure an Analog Data Channel, Creating a PCM Map to Obtain a Sample Rate, Telemetry Bandwidth, Record Time, GPS, Audio, Telemetry Attributes Transfer Standard (TMATS), and Measurement Uncertainty - Interpreting the Results, current and future Beyond Line Of Sight (BLOS) concepts of operation. This is great introduction for new hires or a refresher for current employees.

Tuesday, May 14	8:00AM – 12:00PM

5G NR Specification and System Engineering Aspects
Dr. Achilles Kogiantis, Altio Labs

5G NR is an international wireless cellular system specification, developed by the 3GPP organization members. Currently its fourth release (Rel-18) is being standardized, while products compliant with the three earlier releases are being widely deployed in the United States and the rest of the world. 5G is expected to increasingly dominate the worldwide cellular communication market due to its flexibility, wide adoption, and an ever-expanding supplier global ecosystem. This tutorial is intended to familiarize the Testing Range professionals with a) the key features of the 5G standards specifications – the basic vision, network architecture, and air-interface details down to the physical and MAC-layer characteristics, and b) the aspects that are important to the Test & Evaluation engineers that relate to aeronautical mobile telemetry: differences with currently used telemetry systems, new capabilities offered via the 5G system on air-interface performance and architectural flexibility. The tutorial covers the key design choices of 5G NR and a description of key feature definitions including MIMO techniques, Non-Terrestrial Networks, Ultra Reliable Low Latency, Integrated Access and Backhaul, Handover mechanism improvements, and the disaggregated Radio Access Network architecture.

Laser System Propagation T&E Challenges
Douglas Nelson, Teknicare, Inc

An introduction to the challenges of testing and evaluating the propagation of Laser Systems. An overview of the basic physics and terminology of these systems is included. The unique propagation effects of Laser Systems are also discussed to provide a foundation for test objectives. Test and evaluation needs for propagation of Laser Systems including diagnostic beam propagation and atmospheric measurements are briefly examined.

Basics of Telemetry
Rob Holland, Delta Information Systems

This course provides a very high-level introduction of basic telemetry concepts and components. The presentation begins onboard the vehicle under test discussing sensors, signal conditioning, commutation, modulation and transmission. It continues on the ground with antennas, receivers, data distribution, decommutation, processing and display. The tutorial includes additional concepts like forward error correction, telemetry over IP, IRIG 106 Chapter 10 and 11 recording and distribution formats as well as IRIG 106 Chapter 7 packet data over PCM.

IRIG 106-17 Chapter 7 Packet Telemetry Downlink Basics and Implementation Fundamentals
Johnny Pappas, Safran Data Systems, Inc.

This course will focus on presenting information to establish a basic understanding of IRIG 106, Chapter 7, Packet Telemetry Downlink Standard. It will focus on the implementation of airborne and ground system hardware, what to consider for use cases using Chapter 7 Packet TM and methods to handle Chapter 7, Packet Telemetry data on the ground. The class will address how to multiplex packet telemetry into you existing IRIG Chapter 4 PCM legacy stream. Other subjects such as latency, compatibility with Test Range Instrumentation System compatibility such as RF Transmission, data recording, RF Receiving, Ground Reproduction, and Chapter 10 data processing methods.

Fundamentals of Test and Evaluation: Planning & Design – Part 1
Chas McKee, Taverene Analytics

In this high-level one-day course we will review the fundamentals of T&E which are covered in the CTEP Foundational exam. The course includes an introduction with a short history of T&E in the Federal Government and an overview of the DoD Acquisition Process (with a few references to DHS and FAA acquisition processes). The class then focuses on the CTEP Body of Knowledge (BOK) including the four subject domains: **Test and Evaluation Planning** (Requirements Analysis, T&E strategy, Evaluation approach, Test Planning, T&E Cost

Management, Contracting for T&E, Organizational planning, Risk identification and management, Specialized Types of testing); **T&E Design** (Test Adequacy and Scientific Test and analysis techniques); **Test and Evaluation Execution** (Test Control Management, Data Management, and Test Safety / Certification); and **Test Data Analysis, Evaluation and Reporting** (Data Verification and Validation, Validation of Test Results, Evaluation, Reporting, Cyber Resilience / Cybersecurity Analysis, Model Validation, and Data Analytics). The course will cover the first two domains, Test Planning and Test Design, and will be covered in the morning. Test & Evaluation Execution and Test Data Analysis and Reporting will be covered in the afternoon.

Tuesday, May 14	1:00PM – 5:00PM

Fundamentals of T&E: Execution Analysis/Reporting – Part 2
Chas McKee, Taverene Analytics

In this high-level one-day course we will review the fundamentals of T&E which are covered in the CTEP Foundational exam. The course includes an introduction with a short history of T&E in the Federal Government and an overview of the DoD Acquisition Process (with a few references to DHS and FAA acquisition processes). The class then focuses on the CTEP Body of Knowledge (BOK) including the four subject domains: **Test and Evaluation Planning** (Requirements Analysis, T&E strategy, Evaluation approach, Test Planning, T&E Cost Management, Contracting for T&E, Organizational planning, Risk identification and management, Specialized Types of testing); **T&E Design** (Test Adequacy and Scientific Test and analysis techniques); **Test and Evaluation Execution** (Test Control Management, Data Management, and Test Safety / Certification); and **Test Data Analysis, Evaluation and Reporting** (Data Verification and Validation, Validation of Test Results, Evaluation, Reporting, Cyber Resilience / Cybersecurity Analysis, Model Validation, and Data Analytics). The course will cover the first two domains, Test Planning and Test Design, and will be covered in the morning. Test & Evaluation Execution and Test Data Analysis and Reporting will be covered in the afternoon.

Fundamentals of Telemetry Ground Stations
Mark McWhorter, Lumistar

This short course is designed to provide a fundamental high-level overview of aeronautical flight telemetry ground stations, followed by a brief presentation of actual ground station hardware. The student will see how ground stations are set up to operate in real time, including the many basic parameters required to successfully receive telemetry data at the ground stations. Ideas related to Mission Planning and techniques for insuring System Maintenance and Readiness will be offered.

TENA/JMETC Solutions for Test and Training
Gene Hudgins, KBR/TENA

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 addresses using the well-established TENA and JMETC tools and capabilities combined with BDA tools and techniques to reduce risk in an often-uncertain environment; regularly saving ranges time and money in the process.

The Power of Data: Leveraging AI & ML for Enhanced Test & Evaluation
Chris Thomas, EMC/DELL

This session delves into the transformative potential of Artificial Intelligence (AI) and Machine Learning (ML) techniques in the realm of Test & Evaluation (T&E). With the proliferation of data in modern systems, traditional approaches to T&E are facing challenges in scalability, efficiency, and accuracy. The session explores how AI and ML methodologies offer innovative solutions to these challenges by harnessing the power of data analytics, predictive modeling, and automation. Through case studies and practical insights, attendees will gain a comprehensive understanding of how AI and ML can optimize T&E processes, leading to improved decision-making, reduced costs, and accelerated development cycles. From adaptive testing strategies to anomaly detection and beyond, this session empowers professionals to unlock the full potential of data-driven approaches in T&E, driving innovation and excellence in their organizations.