



**Monday, October 20<sup>th</sup>**

*NOTE: Short courses are a separate fee from the Conference.*

*Full-day course \$650*

9:00-5:00      **BASICS OF AIRCRAFT INSTRUMENTATION**

Instructor:    David Hodack, Chief Engineer, NAWCAD

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. This is great introduction for new hires or a refresher for current employees.

9:00-5:00      **FUNDAMENTALS OF MICROWAVE AND RF IN AERONAUTICAL TELEMETRY SYSTEMS**

Instructor:    Mark McWhorter, Lumistar

This course begins with an overview of electromagnetic theory and the many common uses of RF microwaves today. Concepts such as the frequency spectrum, basic physics of electro-magnetic wave reflection and propagation, standing waves, power density, phase and polarity are discussed. The second section discusses RF microwave components typically found in telemetry systems, touching on design and applications. Consideration of antennas, transmissions lines, couplers/splitters/combiners, hybrids, RF amplifiers, VCOs, isolators, attenuators, modulators, etc. is given. Concepts such as intermodulation, dynamic range and linearity are introduced. The final section of the course addresses the application of an end-to-end digital telemetry transceiving system. A typical airborne to ground station radio link is presented with emphasis placed on RF-centric issues impacting radio link performance.

9:00-5:00      **INTRODUCTION TO ANALYZING ETHERNET DATA**

Instructor:    Jason Berry, JT4

With the proliferation of Ethernet as a data transport on multiple commercial and military aircraft and weapon systems it is becoming even more important to get a basic understanding of how to analyze Ethernet data. This course will start with an introduction to the OSI model and lay out the basics that make up Ethernet traffic. Then we'll look at the open source Wireshark program and go through a crash course in using it to examine different types of Ethernet traffic. We'll also examine wireless traffic and how it differs from traditional wired Ethernet. Finally, we'll look at using the Python programming language along with several libraries to actually analyze and decode data embedded in Ethernet traffic.



9:00-5:00      **INTRODUCTION TO SATELLITE COMMUNICATIONS AND TELEMETRY STANDARDS**

Instructor:      Robert Ritter, IMI Technology

The Introduction to Satellite Communications short course provides an overview of the theories and international standards for various means of space communications. It includes descriptions of practical applications for high-latency and error-prone links, describes the RF link characteristics, modulation schemes, various forms of error detection, correction and compression, practical mechanisms for data networking in space, considerations for IP, concerns over security, new applications of short and medium distance links, and interoperability interests between civil and defense systems. Questions related to new standards proposed for user interfaces are also explored. Optical communications and the new proposed Unified Space Link Protocols will also be introduced as the path forward for the international standards body, CCSDS (the Consultative Committee for Space Data Systems).

9:00-5:00      **IRIG CHAPTER 7 PACKET TELEMETRY DOWNLINK BASIS AND IMPLEMENTATION FUNDAMENTALS**

Instructor:      Johnny Pappas, Safran Defense & Space, 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 your existing IRIG Chapter 4 legacy PCM 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.

9:00-5:00      **IRIG 106 CHAPTER 10/11 DIGITAL RECORDING STANDARDS**

Instructor:      Mark Buckley, Telspan Data and Alfredo Berard, 96 RANSS/RNRE

This course will present an in-depth look at the latest IRIG 106 Chapter 10/11 Digital Recording Standards. Each section within the standard will be covered along with implementation, compliancy, interoperability, data processing and validation methods. Lessons learned and insight into development and applications of recorders/reproducers, test equipment and processing software throughout the test and operational communities will also be presented. A review of emerging implementations and the next release of the standard will also be conducted.



9:00-5:00      **SIGNALS AND MODULATION**

Instructor:      Dr. Stephen Horan, *Professor Emeritus, New Mexico State University*

This course is directed towards personnel with limited experience in digital communications and modulation schemes. The course examines the relationships between the elements engineers use to send data from its source to its destination over a radio link. The class begins with how designers represent and sample the signals. Next, we will examine how the modulation and demodulation techniques preserve the signal's integrity, including signal bandwidth representations, system noise estimations, and data link imperfections that will affect the end-to-end link performance. Finally, we will look at RF safety and systems-level concerns for the designer to address data system requirements, transmission regulations and constraints, and end-to-end analysis and planning.

**1:00-5:00      TELEMETRY FUNDAMENTALS: A JOURNEY FROM SENSOR TO DISPLAY**

Instructor:      Gary Thom, *Delta Information Systems, Inc.*

**This course is  
½ day \$500**

Dive into the fascinating world of telemetry with this introductory course. Gain a high-level understanding of key concepts and components, starting with onboard vehicle systems such as sensors, signal conditioning, modulation, and transmission. Transition to ground-based operations, exploring receivers, data distribution, decommutation, processing, and display. Discover additional topics like IRIG 106 Ch 10 and 11 recording and distribution formats, along with IRIG 106 Chapter 7 packet data over PCM. Get ready to unlock the secrets of telemetry!

9:00-5:00      **TELEMETRY OVER IP**

Instructors:      Mark Roseberry, *NetAcquire Corporation*

This course begins by introducing the capability of transporting PCM telemetry over an IP network (TMoIP), including discussion of the benefits and limitations of this technology. Essential network topics are covered including the OSI network model and associated TMoIP network protocols. Three key RCC IRIG standards for TMoIP are described: IRIG 218, IRIG 106 Chapter 10 over UDP, and TmNS. Interactive and scripted setup, configuration, status, and diagnostics approaches are presented. Advanced topics include minimizing latency, handling poor-quality WAN networks, inter-vendor interoperability, reliability and redundancy, one-to-many and mesh networks, configurable quality-of-service, and time/data correlation. The course ends with an overview of current and future trends in IP convergence and cloud-based architectures.



9:00-5:00      **TELEMETRY APPLICATIONS FROM THE TRMCS JOINT MISSION ENVIRONMENT TESTING CAPABILITY (JMETC) PORTFOLIO FOLLOWED BY CHEETAS FOR BEGINNERS**

Instructors:    Gene Hudgins, KBR, TENA/JMETC & Douglas Audirsch, KBR, CHEETAS User Support

Telemetry operations often require personnel to be on-site with receive systems or at remote consoles, leading to increased travel demands and potential operator shortages. The integration of remote-control capabilities and centralized data collection can significantly reduce operational costs while enhancing real-time system insights. The Test and Training Enabling Architecture (TENA) and the Joint Mission Environment Test Capability (JMETC), combined with Big Data tools and techniques, enable more efficient use of current and future telemetry range resources. These technologies facilitate range resource integration, which is essential for validating system performance in a cost-effective manner. This session will explore the current and future impact of TENA, JMETC, and Big Data Analytics on the test and evaluation (T&E) community, as well as their benefits to range operations and the warfighter.

Following this discussion, the course will transition to CHEETAS for Beginners, introducing attendees to the Cloud Hybrid Edge-to-Enterprise Evaluation & Test Analysis Suite (CHEETAS) framework. CHEETAS provides a vendor- and hardware-agnostic tool suite for building evaluation infrastructure across diverse acquisition portfolios. Offered at no cost by the Test Resource Management Center (TRMC), CHEETAS supports time-series data ingestion in formats such as IRIG 106 Chapter 10, DarV3, and CSV, while also enabling live data streaming from TENA.

This beginner-friendly session will cover fundamental CHEETAS functionalities, including:

- Navigating the CHEETAS Dashboard and Entity Editor
- Importing, viewing, and editing Interface Control Documents (ICDs)
- Processing and querying telemetry data
- Managing entities and parameter sets
- Playing back data and video for analysis
- Installing and updating UI modules

By attending this combined session, participants will gain a comprehensive understanding of how JMETC portfolio tools, including TENA, Big Data Analytics, and CHEETAS, are shaping the future of telemetry operations. Whether you're looking to optimize range resource management or get started with CHEETAS, this course will provide valuable insights and hands-on knowledge.



9:00-5:00

**TmNS TELEMETRY NETWORKS**

Instructors: Thomas Grace, NAVAIR Patuxent River & Todd Newton, SwRI

This course introduces participants to telemetric networks to gain an understanding of telemetric networking principles, applicable networking technologies, trade-offs in applying networks to telemetry, and end-to-end telemetric applications. Specifically, the RCC Telemetry Network Standard (TmNS) and its application will be presented illustrating the test article network, radio access network, range operations network, mission control network, system management operations, and telemetric applications. Sprinkled throughout the course are selected networking technology topics to help aid in the networking discussions. This course is intended for anyone who needs an introduction to TmNS technologies and system capabilities. It will be useful for participants to have a basic knowledge of networking concepts. This short course is particularly beneficial for persons responsible for or involved in flight test instrumentation and telemetry systems.