11th Annual Verification and Validation Summit - 2016

"The Right Things Done Right"

Event Record

The 11th Annual Verification & Validation (V&V) Summit was held at the Resorts Hotel in Atlantic City NJ on September 14-15, 2016. Over 180 participants attended the annual summit. There were 17 speakers from FAA, the Department of Defense (DOD), the NJ Air National Guard, the U.S. Air Force, NASA, MITRE, the Software Engineering Institute (SEI), and the Stockton Aviation Research and Technology Park (SARTP), who addressed this year's theme: "*The Right Things Done Right.*"

To provide additional perspectives on how to address Enterprise Capability V&V challenges, the following three videos were presented: *"Why good leaders make you feel safe"; "How a driverless car sees the road"; and "5 ways to listen better"*.

The V&V Summit was planned, conducted and facilitated by the FAA V&V Strategies and Practices Branch, under the direction of the Branch Manager, John Frederick. The V&V Summit coordinator was Test Standards Board member, Joseph Burns. The 17 expert speakers at the summit addressed the following topics:

- **Shelley Yak** – Director, Federal Aviation Administration William J. Hughes Technical Center: Ms. Yak opened the Summit with words relating the theme to the FAA Mission. She also emphasized the benefit working earlier in the lifecycle during Concept & Requirements Development.
- **Dr. C. David Brown** – Deputy Assistant Secretary of Defense DT&E/Director of Test Resource Management Center: Dr. Brown discussed "Evolving T&E Techniques" and promoted early T&E involvement.
- **Constance E. Morgan** – Systems Engineer, MITRE Corporation's Center for Advanced Aviation System Development: Discussed "Concept Maturity Framework": Ms. Morgan expanded upon the Technology Readiness Levels (TRLs, in use now by FAA), which ranks the core methods used to deliver a capability, to include other dimensions: Concept & Capabilities. The Concept Element includes rating the maturity of: Concept, Validation Methods, ConOps Update, and identified issues. Capability ratings include: Functionality Scope, Validation Methods, Operational Situations, Integration and Issues.
- **Nathan Tash** – Deputy Assistant Administrator for Acquisition and Business Services: Discussed "FAA Acquisition Reforms": Mr. Tash reviewed the history of implementation and modification of FAA's Acquisition Management System (AMS). He reported that AMS has demonstrated better acquisition performance metrics than those agencies still operating under Federal Acquisition Regulations (FARs), and was instrumental in removing FAA from the "GAO High Risk List" in January 2009. Requirements for a Test and Evaluation Master Plan have been restored after having been removed in an earlier AMS change.
- **Colonel John DiDonna** – 177th Fighter Wing Base Commander, New Jersey Air National Guard: Discussed "Doing it Right, a Military Perspective": Colonel DiDonna discussed the preparation of his forces for battle, and his principles of effective leadership. He also discussed the value of effective communications and distributed decision-making.

- **Joseph Sheairs** – Executive Director, Stockton Aviation Research and Technology Park (SARTP), and Deputy Director, Unmanned Aircraft Systems (UAS) Test Site: Mr. Sheairs updated the group on the SARTP, between Delilah Road and the access road for the WJHTC and the Airport. He said that the first building should be complete by April 2018. SARTP is targeted for companies other than those currently providing contract services to WJHTC. He discussed some of the projects, noting that many are not in the field of air traffic control. He also discussed the levels of membership, and that membership is required for becoming a tenant of the building.
- **Kimberly Simpson** – NASA Engineering & Safety Center Systems Engineering Technical Discipline Verification & Validation Co-Lead: Discussed "Analysis and Visualization Tools for V&V": Ms. Simpson discussed the implementation of Model-Based Systems Engineering techniques as suited to open systems, and System-of-Systems T&E. Tools for managing a system architecture, (such as Tom Sawyer "Perspectives" software and JIRA for issue tracking), are more flexible and efficient than "document-based" development, and closer to being a "source of truth."
- **John Frederick** – Manager, FAA, V&V Strategies and Practices Branch: Discussed "Strategy for Delivering NAS Capabilities": Mr. Frederick reviewed the status of the T&E Strategy for delivering NAS Enterprise Capabilities. He identified solutions that focus on people, processes, and tools to address system-of-systems NAS challenges.
- **Michael Ogundoju** – Systems Engineer, FAA, V&V Strategies & Practices Branch: Discussed "Use of Storyboarding for Trajectory Based Operations (TBO)": Mr. Ogundoju demonstrated a variety of scenarios for TBO. The storyboards allow groups of stakeholders to understand scenarios better than reading documents, and serves as a validation tool for the development of concepts and requirements for the FAA's Next Generation Air Transportation System.
- **Ryan Williams** – FAA, Management & Program Analyst: Discussed "Test and Evaluation Acquisition Career Development Tools and Certification": Mr. Williams explained the process for T&E Certification, one of eleven certification programs being managed by the Acquisition Career Management Office. There are Career Guides available and checklists for working toward certification levels of Basic, Intermediate and Advanced.
- **Donald Firesmith** – Principal Engineer, Client Technical Solutions, Software Solutions Division, Software Engineering Institute: Discussed "Testing in a Non-Deterministic World": Deterministic testing relies on assumptions of Controllability, and Observability, and the presence of a reference or "Oracle" as what behavior to expect. Without these assumptions, bugs are very difficult to reproduce and confirm. Mr. Firesmith provided four pages of recommendations on how to address this difficulty.
- **Kerianne Gross** – Research Aerospace Engineer, V&V of Complex and Autonomous Systems, Air Force Research Laboratory: Discussed "Verification and Validation of Complex and Autonomous Systems": Because autonomous systems are designed to adjust their behavior, they lack determinism and lead to a "state space explosion." Ms. Gross recommended developing "Assurance Cases" which are supported by: 1) Analytical Proofs of Early Design; 2) corresponding Code Synthesis; 3) Modeling & Simulation, as well as T&E, and 4) including measures built in for "Run Time Assurance." She described several tools and methods to aid in the analysis, design, and validation of autonomous systems.
- **Chris Dumesnil –** Manager, NAS Technical Services Division, Mike Monroney Aeronautical Center (MMAC): Discussed "Academy Training Systems": Mr. Dumesnil reviewed the many facilities at the MMAC for performing V&V of FAA systems, as well as training. He noted that the NAS Technical Evaluation Program (NASTEP) performs V&V of the services that maintenance technicians provide.
- **Jim Eck** – Assistant Administrator for NextGen: Discussed "NextGen and the Significance of V&V": Mr. Eck challenged all of the attendees to encourage the whole V&V community to

creatively collaborate, brainstorming ways to test the complex, adaptive non-deterministic system-of-systems being developed to provide NAS Enterprise Capabilities.

- **Dan Murray** – Manager, Space Transportation Development Division, FAA's Office of Commercial Space Transportation: Discussed "Commercial Space": Mr. Murray described the development of a Space Data Integrator, with Enhanced Situation Display. The goals are to 1) Reduce the amount of airspace that is closed to commercial traffic during a launch or landing, 2) Respond to any contingencies while it is closed, and 3) Release the airspace back to normal operations as soon as possible. He also highlighted program successes.
- **Ruben Bigio** – Information Security Lead, FAA WJHTC's Cybersecurity Test Facility (CyTF): Discussed "V&V Processes in Cybersecurity": The CyTF at the WJHTC has been developed with a number of partners (Lincoln Labs, MITRE, DoT, Boeing and others) and supports several types of response and exploration teams.
- **Michael Konyak** – Laboratory Integration Lead, FAA WJHTC's Laboratory Services Division: Discussed "Evolving the NAS Laboratories": Mr. Konyak diagrammed the multitude of existing laboratory facilities, and discussed efforts to increase integration among them. Communications infrastructure is being expanded, and more capabilities for modeling, simulation, emulation, and intelligent agent modeling are being planned.

This V&V Summit, "The Right Things Done Right!" explored how V&V addresses the questions "Is the system built right?" and "Is the right system built?" The summit explored these two ideas in environments that are complex, and where Enterprise-level Capabilities are often not delivered in single systems, but rather in a System-of-Systems framework. Many of the subsystems involved have behaviors that are non-deterministic, or even autonomous. Speakers addressed techniques such as Model-Based Systems Engineering, with integrated tools that move away from "document-based" system development and implementation. Assistant Administrator for NextGen, Jim Eck, encouraged the stakeholders to collaborate in ways that make use of "both sides of our brains" to find solutions to the V&V challenges of these complexities. Videos of TED Talks were interspersed with the speakers, and highlighted the need for strong, adaptive leadership, with listening skills, and increased levels of trust.

All FAA participants at this year's V&V Summit received FAA eLearning Management System (eLMS) credits (course # FAA3002000). V&V Summit feedback forms were collected at the end of each day and will be assessed to improve future summits. The 11th Annual V&V Summit presentations, final agenda, video links, and pictures can be found on the internet at: http://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/v&vsummit/v&vsummits.html.