

OCTOBER 8-12  
2018  
September 2018

49<sup>th</sup>

INTERNATIONAL  
SYMPOSIUM

SOCIETY OF FLIGHT TEST ENGINEERS

Hosted by the Coastal Empire Chapter  
at the DeSoto Hotel  
Savannah, GA



Sponsored By  
**Gulfstream**<sup>™</sup>  
A GENERAL DYNAMICS COMPANY



# Tomorrow's Flight Test

## October 8 - 12, 2018

### Savannah, GA

These are exciting times. Some of us are evaluating platforms intended to take "ordinary" people into space. Some are going to be testing electric or hybrid propulsion vehicles intended for normal, non-experimental use. Some continue testing increasingly-capable unmanned platforms for military use while others are helping introduce unmanned systems for civilian applications. Even seemingly-routine aircraft designs are incorporating ever-newer technologies. There is a lot to look forward to and that's why the Coastal Empire chapter chose the theme "Tomorrow's Flight Test" for this year's Symposium. As we FTEs approach things we have never done before, we may not be able to rely on doing things the way we always have in the past. With this Symposium's agenda, we hope you will come to Savannah and take the opportunity to temporarily set aside what you already know – what you are already doing or have done – and consider how you might approach doing something new, something you have never done before. Even as you return to the same job and the same challenges following this Symposium, stimulated thinking may help you find a better approach to the same tasks. Learning about less-familiar types of testing can also prepare you for unexpected, future changes in assignment. Consider too that forethought is generally one of the most important soft skills in our business, so please come with the mindset to question, evaluate and re-think your current approaches.

Even though we will be considering our potential future, we remain products of our past. In case you have not heard, 2018 is the 50th anniversary of the Society! In this past half-century, technology has definitely changed. But our personal needs as flight test practitioners have not. We all continue struggling to learn anew what others often already know. Many barriers to information transfer exist – some of them legitimate. With the Society, we have a forum which helps incentivize the extra work required to transcend those barriers. In honor of our predecessors who saw fit to create this forum, we will also be taking a little time to reflect on our history even as we peer into the future.

This will all take place in a thoroughly-enjoyable setting. Massive live oaks with hanging Spanish Moss abound along nearby streets and in adjacent squares. Several nearby buildings are on the National Register of Historic Places. We have a large selection of dining establishments and local ordinances permit carry of open containers within the confines of the Historic District. The Coastal Empire chapter envisions Savannah being an ideal setting for you to form new relationships – and renew existing ones – with your fellow flight testers.

**Coastal Empire Chapter**  
Society of Flight Test Engineers

# Agenda Overview



	MONDAY 8 WELCOME TO SAVANNAH	TUESDAY 9 TECHNICAL AGENDA	WEDNESDAY 10 TECHNICAL AGENDA	THURSDAY 11 TECHNICAL AGENDA
AM	<p>REGISTRATION</p> <p>WORKSHOP: DISPLAY SCREEN GUIDELINES</p> <p>MORNING TRAINING CLASSES</p>	<p>REGISTRATION</p> <p>SYMPOSIUM WELCOME</p> <p>MORNING SPEAKER BLOCK</p> <p>KEYNOTE ADDRESS GENTRY LEE (NASA JPL)</p>	<p>MORNING SPEAKER BLOCK</p>	<p>MORNING SPEAKER BLOCK</p>
	LUNCH	LUNCH	LUNCH	LUNCH
PM	<p>REGISTRATION</p> <p>ABM TECH COUNCIL</p> <p>AFTERNOON TRAINING CLASSES</p> <p>WELCOME RECEPTION</p>	<p>REGISTRATION</p> <p>AFTERNOON SPEAKER BLOCK</p> <p>IDEAS FOR THE FUTURE WADE SMITH (FAA)</p>	<p>AFTERNOON SPEAKER BLOCK</p> <p>SOCIAL EVENT DOWNTOWN SAVANNAH</p>	<p>AFTERNOON SPEAKER BLOCK</p> <p>PRE-BANQUET SOCIAL MIXER</p> <p>AWARDS BANQUET</p>

SCHEDULE IS SUBJECT TO CHANGE. CHECK [WWW.COASTALEMPIRESFTE.ORG](http://WWW.COASTALEMPIRESFTE.ORG) REGULARLY FOR LATEST AGENDA.

Join us on Friday for a Gulfstream Tour  
 Signup at [CoastalEmpireSFTE.com/Tours](http://CoastalEmpireSFTE.com/Tours)

# Monday Agenda

## October 8

See Page 11 for Workshop and Training Class Descriptions  
 Venue Layout on Page 34



# Tuesday Agenda

## October 9

All Presentations in Oglethorpe Ballrooms - Venue Layout on Page 34

Join us for a **07:00 Breakfast Buffet**

Available only to DeSoto Hotel Guests

0800

### SYMPOSIUM WELCOME & OPENING REMARKS

0900

V-280 VALOR FIRST FLIGHT BUILD-UP: PREPARING FOR A TECHNOLOGY DEMONSTRATION  
CHRISTENSEN & SMITH - BELL HELICOPTER

1000

VISUALIZING FLIGHT TEST DATA INTERACTIVELY WITH OPEN SOURCE TOOLS  
STARNES - GEORGIA TECH

### BREAK

1100

KEYNOTE ADDRESS: BALANCING INNOVATION & RISK IN APPLYING NEW TECHNOLOGY  
GENTRY LEE, CHIEF ENGINEER, JET PROPULSION LABORATORY (JPL)

1200

### LUNCH BREAK

1300

1400

THE BALANCING ACT: SMOKE DETECTION, PENETRATION, AND EVACUATION TESTING  
HENRY - GULFSTREAM

FLIGHT TESTING WITH FOREIGN CIVIL AVIATION AUTHORITIES  
CRAWFORD & MCDONALD - BOEING

### BREAK

1500

USE OF AES ENCRYPTION WITH AIRBORNE TELEMETRY DATA  
JORDAN - USN

1600

DESIGN AND DEVELOPMENT OF A HIGH-SPEED AUTONOMOUS UAS FOR BEYOND LINE OF SIGHT OPERATIONS  
MCCRINK & GREGORY - OHIO STATE

"IDEAS FOR THE FUTURE OF FLIGHT TESTING"  
WADE SMITH - FAA

1700

1800

ALL TIME BLOCKS ARE APPROXIMATE.

SCHEDULE IS SUBJECT TO CHANGE. CHECK [WWW.COASTALEMPIRESFTE.ORG](http://WWW.COASTALEMPIRESFTE.ORG) REGULARLY FOR LATEST AGENDA.

# Wednesday Agenda

## October 10

All Presentations in Oglethorpe Ballrooms -- Venue Layout on Page 34

Join us for a **07:00 Breakfast Buffet**

Available only to DeSoto Hotel Guests

0800

0900

COMPUTER VISION METHODS FOR FLOW CONE ANALYSIS  
MALONE - BOEING

PREPARING NEW TEST ENGINEERS FOR HIGH RISK FLIGHT TESTING ON THE GRIPEN AIRCRAFT  
HÖRBERG - SAAB

1000

EVOLUTION OF TEST PLANNING AND EXECUTION FOR NATURAL ICING TESTING  
POVALL - BOMBARDIER

**BREAK**

1100

DATA SCIENCE WORKFLOWS: A FLIGHT TEST CASE STUDY  
STANFORD - GULFSTREAM

QUANTITATIVE MEASUREMENT TECHNIQUES FOR VIBRATION AND BUFFET  
MEYER - FLORIDA TECH

1200

**LUNCH BREAK**

1300

1400

QUALIFICATION OF MQ-9B FOR SATCOM TAXI, TAKEOFF, AND LANDING  
CANZONIERI & PITTENGER - GENERAL ATOMICS

AN ARCHITECTURE FOR STORE SEPARATION ANALYSIS IN QUASI REAL-TIME USING PHOTOGRAMMETRY  
LEITE - IPEV

**BREAK**

1500

THE SYSTEMS THEORETIC PROCESS ANALYSIS APPLIED TO AIR FORCE FLIGHT TEST SAFETY METHODOLOGIES  
TIBBS & BISHOP - USAF

1600

F-35A DRAG CHUTE AND ICY RUNWAY TESTING  
NORTON - LOCKHEED MARTIN (RET'D)

ACCEPTING NO UNNECESSARY RISK – TESTING AUTOPILOT-COUPLED TCAS ON THE G650  
MONDT - GULFSTREAM

1700

1800

# Thursday Agenda October 11

All Presentations in Oglethorpe Ballrooms -- Venue Layout on Page 34

Join us for a **07:00 Breakfast Buffet**  
Available only to DeSoto Hotel Guests

0800

**HIGH ANGLE OF ATTACK TESTING ON GULFSTREAM'S NEWEST RANGE OF BUSINESS CLASS AIRPLANES**  
SPACKMAN - GULFSTREAM

0900

**SURROGATE MODELLING AND DATA ANALYTICS FOR FLIGHT LOAD ANALYSIS**  
WANG - UNIVERSITY OF SOUTH CAROLINA

1000

**CONSIDERATIONS FOR SELECTING FLIGHT TEST LOCATIONS**  
JONES - BOEING

**BREAK**

1100

**EVOLUTION OF USAF TPS: SYSTEMS-ENGINEERING FOUNDATION**  
MONTES - USAF

**ACTIVE FEEL SYSTEMS IN LIGHT GENERAL AVIATION AIRCRAFT**  
BORJA - IN-FLIGHT SIMULATION

1200

**LUNCH BREAK**

1300

1400

**UH-1Y WIND ENVELOPE EXPANSION TESTING ABOARD LPD 19: PLOTTING A COURSE FOR THE FUTURE**  
FINNEGAN & KENNEDY - USN

**FTE LESSONS LEARNED FROM THE SPACE SHUTTLE PROGRAM**  
CAROTHERS - BOMBARDIER

**BREAK**

1500

**FTE CAREER DISCUSSION PANEL**  
BOEING, BELL, GULFSTREAM, USN

1600

**CLOSING REMARKS**

1700

1800

**PRE-BANQUET SOCIAL MIXER**

1900

**AWARDS BANQUET**

2000

2300

# Featured Speakers

## GENTRY LEE

Chief Engineer  
Jet Propulsion Laboratory  
Keynote Speaker

Gentry Lee is Chief Engineer for the Solar System Exploration Directorate at the Jet Propulsion Laboratory (JPL) in Pasadena, California. In that position Mr. Lee is responsible for the engineering integrity of all the robotic planetary missions managed by JPL for NASA. His major recent work includes the engineering oversight of the fantastically successful and popular Curiosity rover mission to Mars in August 2012, the Dawn mission to the asteroids Vesta and Ceres, the Juno mission to Jupiter, and the GRAIL mission to the Moon. Previously, Mr. Lee provided guidance and oversight for the engineering aspects of the Phoenix and twin rover missions to Mars, as well as NASA's successful Deep Impact and Stardust missions.



## COLIN MILLER

VP Flight Operations  
Gulfstream Aerospace Co.  
Awards Banquet Speaker

Colin Miller is the Vice President of Flight Operations for Gulfstream Aerospace Corporation. The department has responsibility for developmental flight test, production test, sales and demonstration flights, and corporate transportation. Colin has been with Gulfstream for five years with a prior position as an Experimental Test Pilot on the G500 program. Prior to Gulfstream, Colin served in the United States Air Force as an operational F-15C and F-117A pilot, as an F-15, F-16, and F-22 experimental test pilot, and as a Flight Test Squadron, Group, and Wing Commander; serving six total experimental test tours. Colin has a bachelor's degree in Mechanical Engineering from Virginia Tech, and a master's degree in management. He is a distinguished graduate of the United States Air Force Test Pilot School and an Associate Fellow of the Society of Experimental Test Pilots. Colin lives with his wife, Jacquie, and daughters Katie and Grace in Savannah Georgia.

## WADE SMITH

Brigadier General, USAF (Ret'd)  
Flight Test Manager  
Atlanta Aircraft Certification Office  
Federal Aviation Administration

A biography for Wade Smith will be included in the release material at the Symposium. Wade is designing his presentation to highlight his vision for the future of flight testing.



# Registration & Reservations

**FULL RATE - \$745**

Contact us for reduced rates for students or unsponsored members.

**TRAINING CLASSES - MONDAY, OCTOBER 8**

Join us at one of the four classes offered by expert instructors. Most attendees will be able to attend one morning and one afternoon session. Participants of the morning training classes will not be able to attend the Real-Time Data Displays Workshop as they occur simultaneously in different rooms.

Register for the Classes when you register for the Symposium.

**Each class is \$45.**

**Test and Evaluation of Commercial Unmanned Aerial System Payloads**

Instructor: John Minor

**Propulsive Lift**

Instructor: Dr. Ralph Kimberlin

**Aircraft Based Winds Measurement**

Instructors: Al Lawless & Clay Harden

**A Course in Telemetry**

Instructor: Glenn Rosenthal

**ADDITIONAL BANQUET TICKETS**

The standard symposium ticket includes one (1) Banquet Dinner Ticket.

Additional tickets for guests can be purchased at \$99.

**HOTEL RESERVATIONS**

Attendees and Guests can remain onsite and look forward to the most convenient stay at the DeSoto Hotel in historic downtown Savannah

A Group Rate of \$179/night is available October 3rd to October 16  
Reservations made after September 18, 2018 are at the DeSoto standard rate  
Reservation information available on our website

[coastalempiresfte.org](http://coastalempiresfte.org)

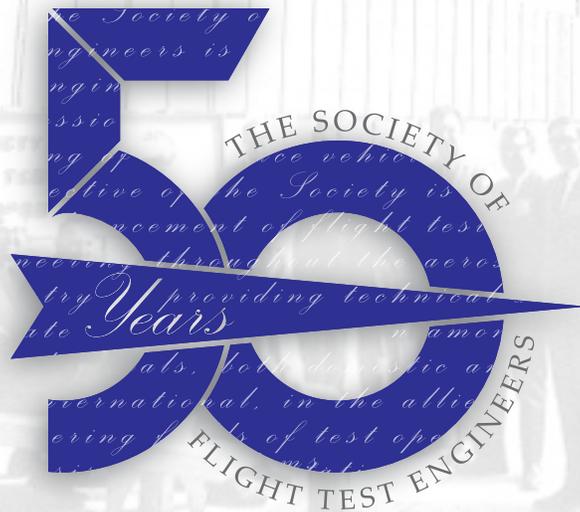
In honor of the 50<sup>th</sup> Anniversary of our Society:

# A Fireside Chat

Tuesday Oct 9, 2018 @ 7:00 pm

The Coastal Empire Chapter has arranged for Charter members to be available to discuss and chat about their experiences establishing the Society in Seattle 50 years ago! The venue will be the gorgeous library, behind and above the bar at the deSoto (Edgar's Proof and Provision - photo below).

Bring your Scotch of choice for an evening with the Founders.



# Friday Gulfstream Tour

Friday October 12



Join us for a Tour of Gulfstream Flight Test, Labs, Simulators and Final Assembly. The guided tour will depart via chartered bus from the deSoto Hotel (Symposium site) on **Friday Oct, 12 @ 8:00 am** and end with dropoffs at the Savannah International Airport at 1:00 pm and the deSoto at 1:30 pm.

**Register for the Tour and See Sample Videos at  
[CoastalEmpireSFTE.org/TOURS](http://CoastalEmpireSFTE.org/TOURS)**

**Tour Limited to the first 50 Registrants.**



This Workshop is being convened to publish guidelines for real-time data display screens in a new chapter of the SFTE Reference Handbook. Discussion will focus on screens whose real-time use during flight test activities (in TM or onboard test article) is required for safe conduct of the mission. Guidelines will be developed for those screens' development and use. This event will be hosted from a room at the DeSoto hotel Monday morning but will be open to remote participation via Webex. **We're Looking for Volunteers to Participate! Please email [coastalempiresfte@gmail.com](mailto:coastalempiresfte@gmail.com) if you would like to participate in-person or remotely.**

**No Cost Involved – only your personal time and energy.**

## Details on Technical Classes

### **Test and Evaluation of Commercial Unmanned Aerial System Payloads**

The sensor systems carried aboard an unmanned aerial system are typically called "the payload". The sensor payload may contain a single sensor, or a number of sensors that are integrated to work together, or can be operated separately. The sensor payload is typically designed to meet the requirements for a specific remote sensing mission such as 3D mapping, precision agriculture, or the intelligence, surveillance, and reconnaissance (ISR) mission. Payloads can be one of the most expensive systems to design, develop, build, and integrate onto the UAS, often costing millions of dollars for military applications. The payload is so important that the mission could not be performed without a payload that is designed for the mission, integrated into the unmanned vehicle, and adequately tested to ensure it meets all mission requirements. This short course discusses the payloads commonly found on commercial UASs and how to test and evaluate them for commercial applications.

### **Aircraft Based Winds Measurement**

Presents an approach for using only aircraft data to determine winds during flight or taxi – including sideslip conditions. This aircraft-based wind (ABW) method can use flight test or production instrumentation. Included are theoretical and practical discussions based on experience using test data, and comparison between ABW vs. ground-based wind measurement. ABW may complement or potentially replace traditional methods used for crosswind or field performance testing, and may enhance accident investigations.

### **Propulsive Lift**

Today we see more aircraft concepts involving propulsive lift devices. This course will cover the theory and flight test results of the Ball-Bartoe Jetwing aircraft. The Ball-Bartoe Jetwing was a single engine upper surface blowing concept which achieved supercirculation lift and STOL performance by ducting all engine air through the leading edge of the wing and ejecting it over the top surface of the wing through a slot nozzle. This nozzle extended along approximately 70% of the wing span. A Coanda flap was mounted at the trailing edge of the blown portion of the wing. In addition to the main wing, a smaller wing panel was mounted above the slot nozzle. The air passage between the main wing and the smaller upper wing acted as an ejector to reduce installed thrust losses. For high speed applications that concept could be used without this upper wing. A thrust reversing method was also incorporated into the concept. The thrust was reversed by rotating the top of the slot nozzle so as to close the nozzle and open a reverse flow path. While this program occurred over 30 years ago, the results and lessons should be re-examined prior to flight testing today's concepts.

### **A Course in Telemetry**

This workshop exposes the attendee to the methods used in flight test for telemetry monitoring. The course covers in the aircraft from the monitoring sensors, data acquisition, serial PCM encoding and RF transmission on the aircraft to the ground. The discussion will continue with ground receivers, clock recovery and bit recognition in varying environments, frame alignment of the data and then decommutation of the PCM stream back to the original parameter words including a discussion for advanced frame and word decommutation techniques. Finally, different methods of real-time analysis of the decommutated words will be discussed with examples shown from user real data PCM streams.



# Gulfstream™

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## Thank You

Join us in thanking Gulfstream for being the Premium Sponsor of the 49<sup>th</sup> International Symposium of the Society of Flight Test Engineers. Their generous donation allows the Society to further its mission.

## About Gulfstream

Gulfstream has led the evolution of business and personal aviation since the 1958 debut of the Gulfstream I, the world's first purpose-built business aircraft. Today, Gulfstream produces the world's most advanced business aircraft, with innovations from nose to tail and wingtip to wingtip, all while offering unmatched global product support and service.

Gulfstream's commitment to excellence reflects that of its parent company, General Dynamics. Headquartered in Falls Church, Virginia, General Dynamics is a market leader in business aviation; land and expeditionary combat systems, armaments and munitions; shipbuilding and marine systems; and information systems and technologies.

General Dynamics' workforce numbers more than 95,000 employees worldwide.

Gulfstream engineers, manufactures and services the world's finest business aircraft. Headquartered in Savannah, Georgia, USA, Gulfstream operates facilities on four continents and employs more than 15,000 people worldwide.

[www.gulfstream.com](http://www.gulfstream.com)



Gulfstream G600

# Block Hotel Rate Ends September 18!

see [coastalempireSFTE.org](http://coastalempireSFTE.org) for SFTE Group Rate booking information



## THE NEW DEFINITION OF Southern Style



One defining characteristic of Savannah's Historic District is its relatively-rare rectangular layout. James Oglethorpe devised this pattern in 1733, shortly after landing in the New World and founding the Georgia Colony. The plan called for a repeating series of "wards", each surrounding an open square. This system was devised to aid efficient flow of traffic as residents went about public and private life.

Symposium guests staying at the DeSoto will enjoy a centralized location to all the best Savannah has to offer – no rental car required.

### **Compared to Staying Offsite, Guest Will Enjoy:**

- Easy Access to the Symposium and Nearby Social Experiences
- The 50th Anniversary Fireside Chat
- Free Breakfast Monday through Friday
- A Recently Renovated, Historic Hotel
- Avoiding City Parking (roughly \$20/day and difficult to find)

This SFTE Symposium block rate expires September 18. The Hotel anticipates a busy season and rates are already at \$189/night for independent reservations. These are likely to increase further for this time of year in Savannah

**ACTIVE FEEL SYSTEMS IN LIGHT GENERAL AVIATION AIRCRAFT**

Flight Level Engineering is equipping its 5-DOF variable stability in-flight simulator aircraft with an active stick and active rudder pedals. No certified light general aviation aircraft is equipped with an active stick and active rudder pedals. The FAA is sponsoring this work to determine the airworthiness requirements for Part 23 FBW aircraft and associated Methods of Compliance. Specific challenges will be discussed as well as the progression of designs that lead to a final hardware and software solution. Results from ground testing and flight testing will be shown as well as pitfalls experienced. The required hardware and software safety systems as they pertain to a variable stability aircraft will also be explained. The application of these safety systems to certified systems will be discussed via flight test techniques, mission task elements, and proposed methods of compliance.

**AN ARCHITECTURE FOR STORE SEPARATION ANALYSIS IN QUASI REAL-TIME USING PHOTOGRAMMETRY**

The Brazilian Air Force Instituto de Pesquisas e Ensaios em Voo ("Flight Test and Research Institute" - IPEV) is currently developing a new airborne near real-time Optical Tracking System (OTS) to be used for store separation flight test campaigns. Such system should determine the released store Time-Space Positioning Information (TSPI) data and send such information to be merged with the Flight Test Instrumentation (FTI) data set. With this new tool it would become possible, in near real-time, to correlate the simulated 6DoF trajectory with the real one to provide the confidence degree of the trajectory estimation model (e.g. simulation runs from CFD analysis) to provide a solid preview whereas the next separation test point is still considered safe or not and to improve test campaign efficiency without jeopardizing its safety levels. Several approaches have been highlighted in the literature to improve this particular Flight Test Campaign (FTC) efficiency and to reduce its costs. In this paper it will be presented the proposed architecture, the development and experimental evaluation of the software, the calibration process for the optical system, the determination of associated uncertainties, and the preliminary test results by static ejection test. Further developments should encompass the final system integration into the existing photogrammetric POD and its evaluation by a real FTC.

**FLIGHT TESTING WITH FOREIGN CIVIL AVIATION AUTHORITIES**

In addition to FAA type certification, a number of foreign civil aviation authorities (CAA) require validation of type certification prior to operation by an operator in their jurisdiction. Many times this validation requires flight test involvement, including a dedicated flight test with the CAA test pilot and flight test engineers. At Boeing, the successful execution of this flight test relies on one flight test engineer, known as the Foreign Validation Focal, to bridge the gap between the CAA, Boeing Flight Test, and other Boeing organizations. This process requires the focal to balance the desires of the foreign CAA with Boeing schedule pressures during final stages of a type certification program, while building a positive working relationship with the CAA. Learn the history of The Boeing Company's approach to flight testing with foreign CAAs and how the approach has evolved over the years, presented by current and former Foreign Validation Focals.

**COMPUTER VISION METHODS FOR FLOW CONE ANALYSIS**

This report presents a new method for the processing and analysis of "Flow Cone" visualization images. Traditional methods of analyzing flow cone images are time consuming, requiring the viewing of each video sequence frame by frame to manually note or map the flow cone motion and orientation, during each test sequence. Presented here, is a newly developed computer vision application for flow cone image analysis. Whereby flow cone image sequences are digitally processed to produce a composite flow vector image and data set. This new technique, provides near real-time processing of flow cone images in flight as well as post-test processing of test sequences. The new method can be performed on multiple image sequences from multiple sources. This report provides an overview of the image processing process, an explanation of the computer vision techniques and processed image and data examples.

**CONSIDERATIONS FOR SELECTING FLIGHT TEST LOCATIONS**

Where do I test? This paper discusses the considerations when selecting airport locations for flight tests. It includes a brief description of data requirements that drive test programs to remote facilities, planning complications, and technical challenges. Specific test sites are examined, with attention given to airport environment, safety, runway features, navigational aids and local resources and infrastructure. A look into ILS characteristics, an analysis of beam quality and type determination, and finally some open questions and lessons learned are presented.

**SURROGATE MODELING AND DATA ANALYTICS FOR FLIGHT LOAD ANALYSIS**

Determining the stability and control characteristics at the edge of the flight envelope is one of the most challenging aspects of the aircraft development. In an AFTC-sponsored project, we are developing an innovative data analytics framework and tool that encapsulates a suite of surrogate modeling techniques for robust and accurate analysis of combined static and dynamic flight loads. Specifically, the surrogate models are based on the parsimonious regression, including the orthogonal functions and sparsity-promoting regression, and the analysis results are verified using flight load data. Our results show that the surrogate models not only accurately capture the most representative load-driving factors with the uncertainty of parameter estimation and prediction typically less than 5-10%, but also allow automated parameter selection for enhanced tool autonomy. The proposed methodology could potentially bridge the gap between emerging data analytics technologies (e.g., model updating, sensitivity analysis, and others) and in-situ flight test analysis and planning.

**DATA SCIENCE WORKFLOWS: A FLIGHT TEST CASE STUDY**

Many of us within the aerospace industry work in “data-intensive” environments, and the goal for this paper is to expose the audience to approaches formalized in the field of data science to help gather, sort, store, make sense of, and create actionable information from the abundant data we have available. Specific examples of data science workflows from the author’s work in support of aircraft performance testing can be shown along with lessons learned. These include the concepts of separating the analysis from the raw data, using reproducible research methods, and applying best practices of data visualization. The author proposes that those of us involved in flight test engineering can learn from the community of data scientists that specialize in the methods of handling data with the intent of making our jobs easier, more consistent, and more repeatable leading to more objective decision-making and better end results.

**F-35A DRAG CHUTE AND ICY RUNWAY TESTING**

The Norwegian Air Force required a drag chute on their new F-35A fighters to assist in stopping their aircraft on icy runways, among other benefits. Incorporating the drag parachute into the low-observable aircraft required hardware added atop the fuselage and enclosed in an articulated fairing. This arrangement presented unique testing challenges. Safely achieving the maximum airspeed for parachute deployment and jettison mandated inflight execution. Apart from hardware/software integration, testing focused on ground handling with drag chute deployment on dry and wet runways. Operations on icy surfaces, even in the absence of the drag chute, were undertaken to support F-35A certification for icy runway operations that had not been previously performed. The unique drag chute installation, the long lapse since testing of such systems, plus the icy runway trials that have also become rare, yielded a rich trove of lessons. Relating these is hoped to benefit programs and testers that follow.

**ACCEPTING NO UNNECESSARY RISK: TESTING AUTOPILOT-COUPLED TCAS ON THE G650**

A block software upgrade on the G650 will include a function to couple the autopilot and autothrottle to targets established from Resolution Advisories issued by TCAS. While proper vetting of this “new and novel” feature drove more numerous and more aggressive inflight encounters than typically employed for basic TCAS tests, the team sought to minimize the number of formation-flight operations involved. A special installation was devised to simulate airborne encounters. A TCAS ramp test set was used onboard during flight in conjunction with a secondary, top TCAS antenna mounted inside the fuselage. The test set vendor was engaged to increase the sophistication of its “target” aircraft behavior to generate desired Resolution Advisory types within the test aircraft. Derivation of test requirements for the number and aggressiveness of encounters are discussed. The aircraft installation and test set modifications are detailed. Analytical results of the automated escape maneuver are presented.

**EVOLUTION OF TEST PLANNING AND EXECUTION FOR NATURAL ICING TESTING**

Natural icing testing is a unique part of the test program required to certify aircraft to operate in all weathers. Over the last 3 years BFTC have conducted natural icing testing for development and certification on 2 clean sheet aircraft programs (C-Series and Global 7000), including 4 measured icing campaigns and 1 unmeasured. This presentation will discuss the learning associated with Bombardier’s first 2 FBW aircraft programs, including the development of operational methodologies to combine institutional knowledge and new ideas. It will also cover the changes in approach that longer range, larger cabin aircraft allow in this test regime, and how the incorporation of FBW technology has changed the test approach from an overall certification point of view, as well as lessons learned on best practices to conduct testing in this challenging regime.

**DESIGN AND DEVELOPMENT OF A RECORD SETTING HIGH-SPEED AUTONOMOUS UAV FOR BEYOND LINE OF SIGHT OPERATIONS**

On August 30, 2017, a team of Ohio State researchers and students set world records (pending official review) for speed (147 mph) and distance over an out-and-back course (28 miles) for a fully autonomous unmanned aerial vehicle (UAV) named the Avanti. This presentation will cover the development of the high-speed small UAS, its custom avionics, design of the command and control links, and the verification and validation flight-tests carried out before the record attempt. Numerous RF and structural failures occurred during the months preceding the attempt. The fundamental lessons learned during these trying moments will be discussed in the hopes that valuable insight into the process required to field new high-performance UAS systems might be disseminated. Finally, the talk will conclude with a discussion of the crew resource management dilemmas that can occur when conducting a record flight while combatting stress, fatigue, systems failures, weather, and the unknown unknowns.

**SPILLING THE SILVERWARE: HIGH ANGLE OF ATTACK TESTING ON GULFSTREAM'S NEWEST RANGE OF BUSINESS CLASS AIRPLANES**

The High Incidence Protection Function that exists within the Gulfstream G500 and G600 Control Law (CLAW) is designed to protect the airplane from aerodynamic stall during scenarios likely to be encountered in-service. Flight testing required an understanding of CLAW architecture, certification framework, likely in-service scenarios for which effective stall protection was required, and test maneuvers that would accurately simulate these scenarios. Flight Test Risk Management was another important element – what are the hazards, how do we deal with them, and what data were available to provide confidence that our “Get Out” plan would work? This paper provides a synopsis of the flight testing conducted to develop the Alpha Limiter for Gulfstream’s latest airplane models. Aerodynamic Stall testing, Alpha Limiter development, an unplanned airborne event, subsequent re-design, and eventual repeat flight testing – the process is described in detail, along with lessons learned and a summary of how Gulfstream’s test practices have evolved throughout the program.

**PREPARING NEW TEST ENGINEERS FOR HIGH RISK FLIGHT TESTING ON THE GRIPEN AIRCRAFT**

Updated control laws tailored for aft heavy store configurations have been developed for the Gripen fighter aircraft. The flight tests performed included high risk carefree testing with a test team consisting of several new and unexperienced test engineers. A great deal of effort was spent on preparing the team and making sure sufficient understanding, knowledge and experience was gained prior to the flight tests. Examples of activities include connecting a simulator to the control room to practice communication and strategies to be used in case of departure. Also, rehearsal carefree flight tests with the well tested previous flight control system edition was used to prepare both pilots and the test team. The results include successful flight testing of the updated control laws as well as team members with new experiences that will be very useful for future flight tests, for example with the Gripen E aircraft currently undergoing initial envelope expansion.

**QUALIFICATION OF MQ-9B FOR SATCOM TAXI, TAKEOFF AND LANDING**

In 2017, General Atomics Aeronautical Systems, Inc. (GA-ASI) successfully demonstrated its Automatic Takeoff and Landing Capability (ATLC) using a Satellite Communications (SATCOM) data link for its MQ-9B SkyGuardian™/SeaGuardian Remotely Piloted Aircraft (RPA). The demonstration also included the first SATCOM taxi of the MQ-9B. This paper will describe the testing strategy needed to qualify the MQ-9B aircraft for SATCOM taxi, takeoff, and landing. Three subjects will be described in detail. First, the overall system test philosophy used for development of the test plan. Second the test methodology used for each phase. Third the test safety concerns that were addressed for this test series.

**QUANTITATIVE MEASUREMENT TECHNIQUES FOR VIBRATION AND BUFFET**

Buffet onset plays a part in determining the range of allowable operating speeds, load factors and altitudes in transport category airplanes. Current flight test techniques involve a qualitative assessment by the pilot to determine points of buffet onset, which can be problematic in cases where buffet onset is not well defined. This paper presents a method using a parameter developed from smoothed accelerometer data to supplement and support pilot comments. While no quantitative certification criteria currently exist for buffet magnitude, this parameter is proposed as a measurement to be included in future guidance material. Additionally, similar measurements are gaining importance in the operational sector, where passenger ride quality and turbulence avoidance are a concern. Methods for incorporating this parameter into existing digital avionics suites typical of modern light aircraft are proposed to build upon ride quality monitoring and turbulence forecasting improvements already in work for operators of large airplanes.

**FTE LESSONS LEARNED FROM THE SPACE SHUTTLE PROGRAM**

Many times in flight test, we assume that if something goes wrong we can just return to base to sort things out. With the Space Shuttle, quickly returning to base was rarely an option. For the few situations where it was, doing so would have cost hundreds of millions of dollars and delay the next launch by months. Moreover, a successful landing was not guaranteed for several abort scenarios. To ensure successful missions, the Space Shuttle team spent significant time on pre-flight analysis, mission planning, and flight operations training. Although flight test organizations conduct missions at a much faster pace than the Space Shuttle, there are lessons from the Space Shuttle program that can be applied to traditional flight test. This brief will provide an overview of Space Shuttle ascent aborts, training provided to the Mission Control team, and what flight test engineers can learn from the Space Shuttle program.

**THE BALANCING ACT: SMOKE DETECTION, PENETRATION, AND EVACUATION TESTING**

At the intersection of environmental control systems engineering (ECS), doors engineering, and completions engineering lies a small, yet significant piece of aircraft type certification... smoke detection, penetration, and evacuation testing. While compliance demonstration to the applicable smoke requirements is often considered minor in the grand scheme of a certification flight test program, Gulfstream Aerospace Corporation's experience conducting this test under development and certification efforts for the GVII-G500 showed that baggage compartment smoke testing results are highly sensitive to test equipment, ECS zone flow, and internal baggage door design. This presentation will use specific test events to illustrate the importance of early development testing with a holistic aircraft lens of focus, test equipment review relative to progressive smoke detector technology, and overall integration of applicable engineering disciplines during early phases of design.

**THE SYSTEMS-THEORETIC PROCESS ANALYSIS APPLIED TO AIR FORCE TEST SAFETY METHODOLOGIES**

Created at MIT, the Systems-Theoretic Process Analysis (STPA) is a tool used for identification of hazards and mitigations. The role of the STPA in USAF acquisition was explored to establish safety design requirements and safety mitigations traceable to unsafe control actions. This tool was investigated by the Air Force Test Center for incorporation into their test safety process. This effort supported the 2018 Air Force Materiel Command Strategic Plan. It offered the potential to guide consistent and repeatable safety planning for developmental systems regardless of technological maturity or amount of existing system data. Cross-enterprise teams from Edwards, Eglin, Holloman, and Arnold AFBs were assembled to use STPA to create multiple flight/ground test safety plans over the course of 1 year. Although several limitations were identified, STPA was found to be effective in preventing mishaps by identifying safety requirements sufficiently early to influence system design and assist in flight test planning.

**UH-1Y WIND ENVELOPE EXPANSION TESTING ABOARD LPD 19: PLOTTING A COURSE FOR THE FUTURE**

For years, the UH-1Y and AH-1Z were only allowed to operate within a very limited Launch/Recovery (L/R) envelope aboard LPD 17 class ships. Previous attempts to expand the envelope uncovered unexpected and unsafe results. Due to limited ship assets, follow-on testing was never conducted, and the restrictive UH-1Y L/R envelope impaired fleet mission accomplishment. So, when the opportunity arose to perform envelope expansion with a UH-1Y, the test team jumped at the chance. However, there were many unusual factors surrounding this test which introduced potential risks, including the location of the supporting ship. The ship and aircraft were actively deployed to the Mediterranean Sea, and would be conducting live military operations during the test window. This paper will discuss the many unusual risk factors, the test team's mitigation for each factor, the lessons learned from testing, and how those lessons will improve safety, efficiency, flexibility, and overall success of future shipboard tests.

**USE OF AES ENCRYPTION WITH AIRBORNE TELEMETRY DATA**

Traditional airborne instrumentation systems are required to use government encryption. These systems typically require specific hardware with storage and use requirements. While this encryption method works well for large installed systems, it is not suited for one time use systems, specifically those used for weapon separation, the cost, logistics, and size prevent easy incorporation. Programs that face size and funding constraints preventing the use of traditional encryption methods have been limited to waiver encryption requirements or limit testing capability. To overcome these limitations alternative encryption methods have been investigated. Commercial encryption methods have improved in recent years and Advanced Encryption Standard (AES) is now able to provide an approved encryption capability with a low overall cost per use and a size that can fit in even the smallest telemetry systems. AES can also be implemented using a combination of hardware and/or software providing for increased flexibility and capability over traditional encryption methods.

**V-280 VALOR FIRST FLIGHT BUILD-UP: PREPARING FOR A TECHNOLOGY DEMONSTRATION**

The Bell V-280 Valor is a third-generation tiltrotor being developed for the US Government as part of the Joint Multi-Role Technology Demonstrator program to inform the requirements and reduce risk for the Future Vertical Lift program of record. The V-280 completed first flight in December 2017. This paper will show how experimental risk management was applied to prepare for and execute the build-up testing required to achieve first flight of a technology demonstrator in a short period of time. Examples will be provided from the first power disconnect, first high flapping ground run, and first unrestrained ground run. Lessons will be shared on first flight preparation, risk management, and build-up.

**VISUALIZING FLIGHT TEST DATA INTERACTIVELY WITH OPEN SOURCE TOOLS**

Flight testing produces a large amount of data, some of which needs to be visualized to best understand the interaction of the systems or variables being assessed. This visualization is best done interactively as this allows the engineer to explore and investigate the data. Current technologies are limited in their ability to plot large data sets interactively as they have performance constraints as the number of data points increase. Datashader is an open source solution specifically focused on plotting large data sets and is able to overcome these limitations through smart aggregation techniques. Datashader, in conjunction with Bokeh, is able to render millions of data points in the browser in a way that supports interactivity (e.g. pan and zoom). This talk will demonstrate Datashader and Bokeh using publically available Automatic Dependent Surveillance-Broadcast (ADS-B) data, a worldwide dataset consisting of over 7M reports per day.

**EVOLUTION OF USAF TPS: SYSTEMS-ENGINEERING FOUNDATION**

The United States Air Force Test Pilot School develops materiel leaders and disciplined testers for the United States and allied military services. Its tradition of teaching a standard curriculum to all students regardless of original background (e.g., pilot, cyber operator, engineer, etc.) creates a diverse graduate pool of acquisition professionals that share the same mindset. Historically, the program remained mostly unchanged from World War II through the 1980s, merely teaching students the skillsets needed to determine performance and flight characteristics of aircraft. In the last few decades, notable milestones have marked significant improvements in the scientific rigor at the school, including gaining accreditation to award a Master of Science degree in Flight Test Engineering. Now, motivated by the rise of highly sophisticated weapons systems and exacerbated by the phenomena inherent in cyberspace, faculty are deliberately making substantive improvements to the education paradigm to enable graduates to decompose systems to design test and evaluation strategies regardless of technology domain. This curriculum begins by establishing and reinforcing foundational systems-engineering principles that include abstracting system goals and functions, architecting reliable test programs, and scoping investigations for appropriate validity; these principles form a bedrock on which legacy tools and skills can be properly scoped. The result is a blend of systems theory, scientific tenets, and applied techniques and procedures. The updated paradigm is being implemented in the year-long graduate program via newly developed course content, updates to the overall curriculum structure, and application of the new principles within students' research projects. It has also been shown to be scalable to any other length of test-and-evaluation workforce training, with some recent short-course development directly benefiting from the new approach. A roadmap for the future direction of the mindset evolution will include further curriculum restructuring, more student opportunities to apply principles, and further advancements in how the school assesses students.

## Static Displays

To accommodate more technical content from the overwhelming response to the Call for Papers, the Coastal Empire Chapter is proud to host these two great static displays alongside the on-stage presentations.

**FLIGHT TEST STEM PROJECT**

Daniel Hrehov, Flight Test Engineering Consultant

**HOW TO KEEP YOUR FLIGHT TEST DATA FROM BEING ORPHANED**

Brandon Munday, NAVAIR Associate Fellow

# Presenter Profiles



**PREPARING NEW TEST ENGINEERS FOR HIGH RISK FLIGHT TESTING ON THE GRIPEN AIRCRAFT**  
**Dr. Marianne Hörberg, Saab**

Dr. Marianne Hörberg currently works as a flight test engineer at SAAB Flight Test and Verification. She is responsible for development of test methods for aerodynamic, flight mechanic and performance testing of fighter aircraft, and her work also includes flight testing of flight control systems. Prior to her flight testing career she worked with electronic warfare at the Swedish Defense Research Agency. In 2009 she received her PhD in Aeronautical Engineering at the Royal Institute of Technology in Stockholm, Sweden, focusing on aircraft trajectory optimization.



**ACTIVE FEEL SYSTEMS IN LIGHT GENERAL AVIATION AIRCRAFT**  
**Dr. Martos Borja, In-Flight Simulation**

Dr. Borja Martos is president of Flight Level Engineering. Until October 2014 he was a research professor and head of research flight operations in Aviation Systems and Flight Research at the University of Tennessee Space Institute (UTSI). He holds a B.S. and a M.S. in Aerospace Engineering from ERAU, and a Ph.D. from UTSI. He has over ten years of experience as a flight test engineer and in directing and teaching academic courses and short courses in aircraft performance, flying, and handling qualities. He is an expert in fly-by-wire in-flight simulator aircraft and active/passive feel systems. Dr. Martos has an FAA airline transport pilot rating with instrument and multiengine instructor ratings. He has over 2500 hours of pilot time and over 500 hours in research aircraft as a flight test engineer.



**BOEING FLIGHT TESTING WITH FOREIGN CIVIL AVIATION AUTHORITIES**  
**Kristin Crawford and Darren McDonald, Boeing**

Kristin Crawford is a flight test engineer in the Stability and Controls group. She joined Boeing Flight Test in 2012, worked as a 787 field service representative in 2015, and returned to flight test as the Foreign Validation Focal in 2016. As a flight test engineer, Kristin has participated in experimental flight test programs on the 747, 767, and 777 as well as several versions of the 737 and 787.



Darren McDonald is the 777-9 Flight Test Value Stream Leader and is an Associate Technical Fellow in the Flight Test Engineering Stability & Control group. He is a Senior Member of the Society of Flight Test Engineers (SFTE), and has authored and presented papers with the AIAA, SFTE, and the Society of Experimental Test Pilots (SETP). As a flight test analysis engineer, Darren has participated in experimental flight test programs on the 707, 717, 757, and 767, as well as several versions of 737, 747, 777, and the 787.

# Presenter Profiles



## **COMPUTER VISION METHODS FOR FLOW CONE ANALYSIS** **Mark Malone, Boeing**

Mark Malone, joined the Boeing Company 1986 as a member of the Boeing Physics and Technology group. Here he worked on optical and imaging projects in support of military aircraft, rocket and missile programs. These projects included the first industrial X-Ray computed tomography inspection system for rocket motors. From 1990-2005 he was a member of the flight test Data Systems Group and the Boeing aircraft accident investigation team as a forensic imaging and photogrammetry expert. He is currently a physicist and Associate Technical Fellow in the Boeing flight test engineering technology group. He is developing imaging applications and systems for flight test aerodynamics and flow visualization testing. He received his B.S. in Physics and Mathematics in 1985 from University of Washington and a Masters Certificate in Image Science from Rochester Institute of Technology in 1999. Mark is a 1990 graduate of the M.I.T Egerton Center high speed imaging course..



## **CONSIDERATIONS FOR SELECTING FLIGHT TEST LOCATIONS** **Brian Jones, Boeing**

Brian Jones is a Flight Test Engineer with The Boeing Company. He has worked in the Autoflight Analysis group since he joined the company in 2005, primarily working on flight controls, automatic flight/autoland, and avionics systems. He has participated in experimental flight test programs on both commercial and military aircraft, including the 737, 747, 767, 777 and 787. He graduated from West Virginia University in 2004 with Bachelor of Science degrees in Aerospace and Mechanical Engineering. He is a member of the Society of Flight Test Engineers (SFTE) and Experimental Aircraft Association (EAA). He lives in Seattle, WA with his wife and



## **SURROGATE MODELING AND DATA ANALYTICS FOR FLIGHT LOAD ANALYSIS** **Dr. Yi Wang, University of South Carolina**

Yi Wang obtained his B.S. and M.S. in Machinery and Energy Engineering from Shanghai Jiao Tong University, P.R.China in 1998 and 2000, respectively; and his Ph.D. in Mechanical Engineering from the Carnegie Mellon University in 2005. Currently he is an associate professor of mechanical engineering at the University of South Carolina (USC). His research focuses on data mining and management, large-scale and/or real-time data analytics, machines learning, surrogate and reduced-order modeling, and numerical analysis of multiphysics systems. The applications of these technologies span spacecraft thermal analysis, aeroservoelasticity and aerothermoservoelasticity, massive computational data management, real-time load data analysis, integrated multi-scale fluidics systems (design, fabrication, and experimentation). Prior to joining USC, Dr. Wang served as the R&D Director at the CFD Research Corporation, where he demonstrated a proven track record of identifying, launching, and growing strategically important R&D programs for both software/hardware development. He has over 80 publications in book chapters, journals, and conference proceedings and holds 5 US patents. Dr. Wang has served as a single PI on 30 research projects and a Co-PI on 13 projects funded by various federal agencies.



## **DATA SCIENCE WORKFLOWS: A FLIGHT TEST CASE STUDY** **Ryan Stanford, Gulfstream Aerospace**

Ryan Stanford is a graduate of aerospace engineering from North Carolina State University. After graduating he worked in aircraft performance and flight test for NAVAIR at Pax River supporting the E-2D and JSF programs. In 2013 he accepted a position at Gulfstream Aerospace in Savannah to work as a performance engineer supporting development and certification of the G500/G600. He completed his master's in engineering from Purdue University in 2016 and now works in the preliminary design group for Gulfstream. He is a student pilot and a member of SFTE and AIAA.

# Presenter Profiles



## **DESIGN AND DEVELOPMENT OF A RECORD SETTING HIGH-SPEED AUTONOMOUS UAV FOR BEYOND LINE OF SIGHT OPERATIONS**

**Matthew McCrink, the Ohio State University**

Dr. Matthew H. McCrink is a Research Scientist at The Ohio State University. His research interests include unmanned flight vehicle design and testing. This broad field includes a focus on embedded systems design and vehicle state estimation and control. Through the course of his work, Dr. McCrink has designed, built, and tested one full-scale aircraft and 23 unique unmanned aerial vehicles. With OSU, he currently holds the world speed and distance record for a fully autonomous, beyond line-of-sight aircraft. In addition to this work, he has designed and built numerous small-scale inertial navigation systems used for unmanned, full-scale, and rocket vehicle analysis. He is currently serving as a lead technical engineer for the Ohio State ASSURE FAA Center of Excellence focused on integration of UAS into the NAS.



## **F-35A DRAG CHUTE AND ICY RUNWAY TESTING**

**Bill Norton, Lockheed-Martin**

William J. Norton is a flight test engineer, continuing a career begun during 20 years as a US Air Force officer where he also served as aircrew on test aircraft. Bill has held numerous positions in many organizations on dozens of aerospace programs spanning all aircraft types. He has penned scores of technical papers, fourteen books, and a multitude of magazine articles. Bill is a civil pilot with numerous ratings, restored and operates a DHC-1 Chipmunk, and built a Rutan Long-EZ. He holds a Masters in Aeronautical Engineering. Bill is happily married to the lovely and talented Anya Victoria Eriksson.



## **EVOLUTION OF TEST PLANNING AND EXECUTION FOR NATURAL ICING TESTING**

**Ben Povall, Bombardier Aerospace**

Ben Povall is a Flight Test Engineer Specialist at the Bombardier Flight Test Center in Wichita, KS, where he is currently the Lead Flight Test Engineer for FTV2 on the Global 7000 program. He started his career at BAE Systems Warton, UK working in the Flight Test Engineering department initially on Eurofighter Typhoon and Harrier GR9 before moving to the Nimrod MRA4 program as an Operations and Planning FTE. Following this he was assigned to NAS Patuxent River, MD as a part of the UK contingent supporting as an FTE on the F-35B, where he primarily supported Loads, Flying Qualities and Weapon Separation Testing as both a Test Conductor and Test Director. In 2014 he left BAE Systems and moved to Mirabel, QC to join Bombardier where he was the Lead FTE for FTV2 and Flight Test Team Lead for FTV7 during the C Series certification program, prior to moving to Wichita, KS to join the Global 7000 program. Ben earned a Master of Engineering degree in Aerospace Engineering from the University of Liverpool in 2006.



## **EVOLUTION OF USAF TPS: SYSTEMS-ENGINEERING FOUNDATION**

**Lt. Col. Daniel R. Montes, USAF Test Pilot School**

Lieutenant Colonel Dan Montes is an aerospace engineer and flight tester serving as the outgoing Director of Curriculum at the United States Air Force (USAF) Test Pilot School (TPS). He earned a bachelor's degree from the USAF Academy, master's degrees from the AF Institute of Technology and TPS, and a PhD from MIT. LtCol Montes has researched urgent-need technologies for AF special operators, managed the development of the Massive Ordnance Penetrator (MOP), and has been a test engineer for several air-to-air and air-to-ground weapons programs as well as the F-22, B-1, B-2, B-52, X-47, and X-51 programs. He will be starting a job with the AF Office of Scientific Research this fall in Santiago, Chile.

# Presenter Profiles



## **QUALIFICATION OF MQ-9B FOR SATCOM TAXI, TAKEOFF, AND LANDING** **Kevin Canzonieri and Matt Pittenger, General Atomics**

Kevin Canzonieri has been a flight test engineer since joining GA-ASI in 2010. He has experience with systems and flight test on many GA-ASI RPA platforms including MQ-1 Predator, MQ-1C Grey Eagle, MQ-9 Reaper, and Avenger. Most recently he was the lead systems test engineer for Predator XP and is currently the lead systems test engineer for MQ-9B SkyGuardian. As a flight test director for GA-ASI with a performance and flying qualities qualification he has been working with auto takeoff and landing on various RPA platforms since 2011. Prior to joining GA-ASI he worked as a student researcher in the Rensselaer Polytechnic Institute Flow Control Lab and the UCLA Energy & Propulsion Laboratory. He has also had internships at NASA Langley Research Center's Research and Technology Directorate, Flow Physics and Control Branch.



Matt Pittenger is a Systems Test & Qualification Engineer at General Atomics Aeronautical Systems Inc. (GA-ASI) at their Flight Test Facility in Palmdale, CA. He has been in Test Engineering for 8 years, splitting that time between GA-ASI and a green energy company in Silicon Valley. As a Flight Test Engineer, his primary focus areas have been in Propulsion and Flying Qualities; more specifically to include efforts in electrical system upgrades, flight envelope expansion, improving aircraft endurance, and automatic takeoff and landing. In 2009, he graduated from California Polytechnic State University, San Luis Obispo with a B.S. in Aerospace Engineering while also completing his fixed-wing Flight Instructor certification.



## **QUANTITATIVE MEASUREMENT TECHNIQUES FOR VIBRATION AND BUFFET** **Ted Meyer, Florida Institute of Technology**

Ted Meyer has worked in the general aviation industry for 12 years. After starting out cleaning and maintaining airplanes in high school, he earned a BS in Aerospace Engineering & Engineering Mechanics from the University of Cincinnati. During that time, he was selected by Gulfstream Aerospace for their Co-Op program and accepted a full-time offer after graduation. He worked in structural design engineering for 2 years, followed by flight test engineering for 4 years. He recently completed a Master's of Science in Flight Test Engineering at the Florida Institute of Technology, and currently works as first officer on a privately owned Beechjet 400a. He is a Multiengine Instrument Flight Instructor (MEII) and has flown 26 airplane types from gliders to jets.



## **FTE LESSONS LEARNED FROM THE SPACE SHUTTLE PROGRAM** **Steve Carothers, Bombardier Aerospace**

The author, Steve Carothers, is a Flight Test Engineer at the Bombardier Flight Test Center in Wichita, KS. His flight test experience centers mainly on avionics testing, but he also participated in the C Series Community Noise testing effort. In addition to his testing duties, Steve is the software tools focal for flight operations. Steve earned a Bachelor of Science degree in Aerospace Engineering with honors from Wichita State University. Prior to joining Bombardier, Steve worked for 15 years at the NASA Johnson Space Center as a Space Shuttle flight controller in Mission Control. His primary duties there were to provide real-time support as an Ascent/Entry Guidance & Procedures Officer during launch, deorbit, and landing. Steve also worked as a Rendezvous Onboard Navigation Officer where he helped the Space Shuttle rendezvous with the International Space Station and the Hubble Space Telescope.

# Presenter Profiles



## **HIGH ANGLE OF ATTACK TESTING ON GULFSTREAM'S NEWEST RANGE OF BUSINESS CLASS AIRPLANES** **Tim Spackman, Gulfstream Aerospace**

Tim Spackman is a Graduate of the University of New South Wales (2005 and 2013), a Graduate of the Empire Test Pilots' School (2010), and a former Royal Australian Air Force (RAAF) Flight Test Engineer. He has flight test experience in more than 25 different aircraft types, ranging from single-seat fighters to business jets, and currently works with the Gulfstream Aerospace Corporation in Savannah, GA, as a Performance and Flying Qualities Flight Test Engineer. Having graduated from his Bachelor degree, and subsequently from ETPS, Tim worked with the Australian Defence Force's Aircraft Research and Development Unit (ARDU), where he conducted a range of testing including Air-Air Refuelling, Weapons Clearance and initial flight testing of a Bristol Boxkite replica – the first military airplane ever flown by the Australian Defence Force. Tim left the RAAF in 2013 to take up a position with Gulfstream; in the years since, he has conducted numerous high angle-of-attack, flying qualities, performance and control law development and test programs on the G500 and G600 model airplanes.



## **THE BALANCING ACT - SMOKE DETECTION, PENETRATION, AND EVACUATION TESTING** **Rachel Henry, Gulfstream Aerospace**

A graduate from Georgia Institute of Technology (2015) with a Bachelor of Science in Mechanical Engineering, Rachel Henry began her Flight Test career in February of 2016 with previous experience at Gulfstream Aerospace in Production Engineering, Flight Sciences, and Human Factors Engineering. Since stepping into Flight Test two years ago, Rachel has earned a certification in Flight Test Engineering through the Florida Institute of Technology (2016) graduate program and conducted numerous Powerplant & Systems test efforts on the GVII-G500 and GVII-G600 certification programs. Environmental Control Systems, Anti-ice Systems, Smoke Evacuation, Community Flyover Noise, Flammable Fluids Drainage, and Water Ingestion tests have composed the majority makeup of Rachel's test conduct experience at Gulfstream in her short time as a Flight Test Engineer.



## **THE SYSTEMS THEORETIC PROCESS ANALYSIS APPLIED TO AIR FORCE FLIGHT TEST SAFETY METHODOLOGIES** **Capt. Michael Tibbs and Lowell Bishop, US Air Force**

Capt. Michael L. Tibbs is the Flight Commander, Operations Engineering Flight, 419th Flight Test Squadron, Edwards AFB, Calif. As Flight Commander, he leads a flight of 20 military, civilian, and contractor engineers and manages the test planning and execution of \$67M B-1, B-2, and B-52 developmental test programs. As a B-1, B-2, and B-52 test conductor, he leads mission planning and ensures the safe and effective execution of ground and flight tests. He also serves as a B-52, F-16, and C-12 on-board flight test engineer. As a unit test safety officer and project safety lead, he helps create, approve, and manage test program safety plans.



Mr. Lowell Bishop is a Test Systems Safety Engineer on a rotational assignment to the 412th Test Wing's Test Safety Office at Edwards Air Force Base, California. In this role, he serves as an independent safety reviewer to all projects executed under Test Wing oversight, enabling safe and effective execution of the USAF test programs. He has chaired 28 safety reviews across 17 different platforms, which ensured all test unique hazards were identified and mitigations were implemented, thus reducing the residual risk level of testing for Test Wing personnel and resources.



## **VISUALIZING FLIGHT TEST DATA INTERACTIVELY WITH OPEN SOURCE TOOLS** **Luke Starnes, Georgia Tech Research Institute**

Luke Starnes received a BS degree in Electrical Engineering and MS degrees in International Politics and Business from Georgia Tech. He works for the Georgia Tech Research Institute (GTRI) where he is the Chief Engineer of the Electronic Systems Laboratory. During his 15+ year career, Luke has been involved in defense technologies where he has primarily focused on avionics and mission system integration for fighter aircraft. The test and evaluation of these programs generates a large quantity of data. The team regularly processes terabytes of flight test data to evaluate the performance of their embedded avionics software. The employed data analysis process has been migrated to a Python-based tool chain. While their data exploration and analysis needs are atypical, they strive to leverage tools and best practices employed by the community. Luke serves as the co-organizer of the Atlanta Jupyter User Group.

# Presenter Profiles



## **UH-1Y WIND ENVELOPE EXPANSION TESTING ABOARD LPD 19 - PLOTTING A COURSE FOR THE FUTURE** **Kristen Finnegan and Maj. Joseph Kennedy, US Navy**

Kristen Finnegan is a flight test engineer working for the Naval Air Warfare Center (NAVAIR). She currently works in the rotary wing ship suitability group, which primarily conducts envelope expansion and compatibility testing of military helicopters aboard Navy ships. She has led tests for the Navy, Marine Corps, and Coast Guard, and has supported tests aboard sixteen US Navy ships. She graduated with a Bachelors degree in Aerospace Engineering from Penn State University and is currently working on completing a Masters degree in Flight Test Engineering from Florida Institute of Technology. She's an active member of the Patuxent River chapter of SFTE. In 2015, Kristen completed the Rotary Wing Long Course at the United States Naval Test Pilot School. She was a graduating member of Class 148, along with her co-presenter, Major Joe Kennedy.



Major Joe Kennedy is a Marine Corps developmental test pilot and project manager at Air Test and Evaluation Squadron TWO ONE (HX-21) for the AH-1W and AH-1Z Cobra, and UH-1Y Huey aircraft. Prior to becoming a test pilot, Major Kennedy flew the UH-1Y during two combat deployments in support of OPERATION ENDURING FREEDOM. He also served as a UH-1Y instructor pilot for three years. Maj Kennedy graduated with a Bachelor's Degree in Quantitative Economics from the United States Naval Academy. He's a provisional associate member of the Society of Experimental Test Pilots and a graduate of the United States Naval Test Pilot School, Class 148. He and his co-presenter, Ms. Kristen Finnegan, were Test Pilot School classmates. Maj Kennedy enjoys spending time with his wife Rachel, son Blake, and daughter Hannah.



## **USE OF AES ENCRYPTION WITH AIRBORNE TELEMETRY DATA** **Mark Jordan, US Navy**

Mark Jordan is a Sores Compatibility Test and Evaluation Specialist Engineer at NAVAIR Air Vehicle Stores Compatibility Division. He holds a Bachelor of Science in Aerospace Engineering from the University of Florida and a Master's in Computer Science from the Florida Institute of Technology (FIT). His publications include Adding New Instrumentation to Aircraft Platforms, Lessons Learned from Cross Agency and Cross Discipline Testing, Captive Carriage Miniature Telemetry, Limitations to CAD Model use for Real World Stores Compatibility Testing and "Is the Data Valid".



## **ACCEPTING NO UNNECESSARY RISK - TESTING AUTOPILOT-COUPLED TCAS ON THE G650** **Mark Mondt, Gulfstream Aerospace**

Mark Mondt graduated from the Wichita State University in 1994 with a B.S. in Aerospace Engineering and in 2000 with a M.S. in Engineering Management. Mark has been a licensed private pilot (SEL) since 1998 and a registered professional engineer (KS) since 2001. His first assignment in flight test came in 2000 at Boeing's Integrated Defense Systems unit in Wichita. While there, Mark contributed on programs such as E-6B MDS/ADWS, International Head-of-State conversions and 767 Tanker (GTTA, predecessor to KC-46) before becoming a Test Manager for programs including B-52 CONECT and the Dutch Air Force (K)DC-10 Cockpit Upgrade. In 2008, he transitioned to Bombardier Aerospace where he worked on the Global 5000/6000 incorporation of Collins' ProLine Fusion and on Learjet 85 FTV1. In 2014, Mark took his current assignment with Gulfstream in Savannah then became a candidate ODA Flight Analyst for avionics working on the G500/G600 and G650 programs. Mark joined the Society in 2003 and has been active ever since, serving one term as President of the Wichita Chapter then two terms as national Secretary and one term as national Vice-President. Mark currently serves as chairman of the 2018 Symposium and Vice-President of the Coastal Empire chapter. Over the years, Mark has presented papers at the local and national level, including one Best in Symposium award (Co-Presenter in 2004). More recently, Mark has tried his hand at writing. His first publication, "The Tao of Flight Test", is available on Amazon. Outside of flight test, Mark enjoys training for endurance athletic events.

# Presenter Profiles



## **V-280 VALOR FIRST FLIGHT BUILD-UP - PREPARING FOR A TECHNOLOGY DEMONSTRATION** **Errick Smith, Kevin Christensen, Don Grove, and Paul Ryan, Bell Flight**

Errick Smith is an Experimental Flight Test Engineer at Bell currently supporting the V-280 Valor Joint Multi-Role Technology Demonstrator program. Errick joined the Bell team in 2014 and has supported both the V-22 NVIA instrumentation build-up effort and the 412EPI Increased Gross Weight Test Program prior to transitioning full time to the V-280 Valor Program. He holds a Bachelor of Science Degree in Aerospace Engineering with a minor concentration in Business Administration from Embry Riddle Aeronautical University in Daytona Beach, FL. While studying at Embry-Riddle, Errick worked with the School's Flight Research Center where he supported various flight test programs. Additionally, Errick has also attended coursework at the National Test Pilot School in Mojave, California. Errick is a FAA certified fixed-wing and rotorcraft pilot with over 500 hours of PIC time and 12 years of flying experience in over 20 different aircraft.



Kevin Christensen has over 32 years of experience in aviation and has been directly involved with the development and flight testing of both military and commercial aircraft for more than 21 years. He has 3,500 hours of flight time in nearly 50 aircraft. Kevin joined Bell in 2005 after retiring from the US Air Force. While in the USAF, Kevin served as a test pilot in both the F/A-22 and F-16, was Flying Qualities Branch Chief at the USAF Test Pilot School, and commanded the USAF's weapons test squadron. With Bell, Kevin was the handling qualities lead for the ARH-70A, where he was instrumental in improving the flight control design to meet the US Army's ADS-33 handling qualities criteria. He also was a designer and flight test lead for Bell's advanced control law design and demonstration project. These fly-by-wire control laws fed directly into Bell's current fly-by-wire aircraft. Kevin has also served as the Bell flight test lead for the AW609 Civil Tiltrotor. In this capacity, he planned and directed numerous flight test evaluations in areas including vortex ring state, handling qualities, loads, and ASE. Kevin is a distinguished graduate from the USAF Academy with a BS in Astronautical Engineering. He also holds a MS in Astronautical and Astronautical Engineering from the University of Washington where he specialized in control system theory and design. Kevin is a distinguished graduate of the USAF TPS, an Associate Fellow of the SETP, and a member of the Vertical Flight Society. He has published four papers, and has also written and published the Stores Separation chapter for the 2003 SETP Handbook. Kevin also holds four patents for his advanced control law designs. Kevin is currently the Test and Evaluation Manager for the Bell V-280 Valor Joint Multi-Role Technology Demonstrator.



Don Grove is currently Bell's Chief Tiltrotor Test Pilot and lead test pilot for the V-280 Valor concept demonstration. He is a 21-year Air Force veteran and has been with Bell since retiring in June 2014. A Distinguished Graduate from the US Naval Test Pilot School, he conducted developmental testing in HH-60G and CV-22 aircraft while in the Air Force. Since being with Bell, he has been the lead test pilot on numerous V-22 concept demonstration test programs, including live weapons fire, aerial refueler, and engine inlet barrier filter. As lead test pilot for the V-280, he was integral to the design and conducted First Flight in December 2017 and initial envelope expansion in early 2018. Grove received a B.S. in Mathematics from the US Air Force Academy, M.S. in Astronautical Science from Embry-Riddle Aeronautical University, and M.S. in Military Operational Art and Science from Air University.



Paul Ryan retired from the United States Marine Corps (USMC) in 2016 with over 30 years of service and subsequently joined Bell Helicopter as an active Experimental Flight Test Pilot. Paul is a graduate of the United States Naval Academy, and has graduate degrees from Embry Riddle Aeronautical University, Georgia Tech and the National Defense University. He attended and graduated from the United States Navy Test Pilot School (USNTPS) in 1998. To date, Paul has accrued over 10 years of Flight Test experience and over 5,000 hours of total flight time, of which over 2,000 hours are in Tiltrotor aircraft. He participated in the first flight of the Bell V-280 Valor AVCD and is one of the primary test pilots for the program.

# Presenter Profiles



## **AN ARCHITECTURE FOR STORE SEPARATION ANALYSIS IN QUASI REAL-TIME USING PHOTOGRAMMETRY**

**Luiz Eduardo Guarino Vasconcelos, Nelson Paiva Oliveira Leite, André Yoshimi Kusumoto, Cristina Moniz Araujo Lopes**

Luiz Eduardo Guarino Vasconcelos is a Software Engineer with 16 years of experience. PhD Student in Space Sciences and Technologies at the Aeronautics Institute of Technology (ITA). In 2002 he joined the Brazilian Flight Test and Research Institute (IPEV) where he stayed for 16 years working with flight tests, developing applications for real-time analysis involving image processing, sensor calibration and software engineering techniques. The last 5 years he has been involved to the development of computational solutions for store separation analysis. In 2016 he joined the National Institute for Space Research (INPE) where he works for weather forecast software development. He has dozens international publications. He is a professor at Faculty of Technology (FATEC) teaching web programming, database, security and distributed systems. He is also a professor in the postgraduate on Projects and Development of Web and Mobile Applications at UNIFATEA teaching courses of agile methodologies, application security, software testing, web and mobile development. He has participation in startups and in research projects.



Nelson Paiva Oliveira Leite, in 1981 he was graduated in Electronic Engineering and later in the same year he was hired as a junior engineer by the Research and Development Institute (IPD) Flight Test Subdivision (PAR-V), which today is the Flight Test and Research Institute (IPEV), where he is the Head of the Research and Development Division (EPD). During his professional life, he mostly worked with Flight Test Instrumentation (FTI) and Real-Time Data Acquisition/Processing Systems in several experimental Flight Test Campaigns (e.g. T-27, A-1, C-97 and A-29). In 1986 he was involved in the creation of the Brazilian Air Force Flight Test School (EFEV), which in 2004 was accredited by SETP. From the beginning he always taught at EFEV. In 2006 he received his PhD degree at Technological Institute of Aeronautics (ITA). He has the Santos Dumont Medal of honor, the Brazilian Flight Test Golden Medal of honor and the Air Force Military Merit Medal of honor. Actually, he is the program manager for the development and integration of advanced flight test tools for IPEV and the responsible of technical cooperation with ONERA and DLR for flight test related PhD programs. He is also the responsible for keeping the IPEV's corporative membership with SFTE, SETP and ITEA.



André Yoshimi Kusumoto, he is a Senior Technologist at Brazilian Flight Test and Research Institute (IPEV) where he is IT Project Manager, head of Software Development Team and researcher in the Institute's projects. He is currently working for the development of new real-time processing tools for telemetry stations using computer vision techniques. He got his Master's Degree in Space Sciences and Technologies with the Aeronautics Institute of Technology (ITA) and has large experience in Computer Science, working mainly in the following subjects: Digital Image Processing, Computer Vision and Computational Systems Analysis. In addition, he is a Professor of Computer Graphics, Image Processing and Software Engineering at Universidade Paulista (UNIP).



Cristina Moniz Araujo Lopes is a PhD in Chemistry at State University of Campinas (UNICAMP, 2003) with a sandwich period at the Institut für Makromolekulare Chemie / Albert-Ludwigs Universität Freiburg, Germany. Master in Chemistry at UNICAMP (1997) and Graduate in Technological Chemistry at UNICAMP (1994). She is currently a Researcher at the Institute of Aeronautics and Space (IAE). She is a permanent Professor of the postgraduate program in Space Sciences and Technologies (ITA / IAE / IEAv). She is also the coordinator of the Space Systems area, Tests and Launches. She is the President of the Academic Programs Council of IAE. She is the Representative of Scientific Initiation of IAE with CNPq and she has experience in the area of materials, with specialization in polymers, aerospace materials, nanocomposites, hybrid composites, ballistic shielding, and electromagnetic shielding.

# Class Instructors



**Dr. John L. Minor** has 40+ years of aerospace experience. He is an internationally recognized subject matter expert on airborne sensor systems, unmanned aerial vehicles/systems, systems engineering, and flight test and evaluation. During his career John served on the technical staff of the Air Force Flight Test Center, the USAF Test Pilot School, the 46th Test Wing, Lockheed Martin, the Lockheed Skunk Works®, Loral, and Sverdrup Technology. He began his career with the 9th Strategic Reconnaissance Wing as a sensor system specialist on the SR-71 and U-2 aircraft. Since, he has worked on a number of high-value military programs as a flight test engineer to include the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN), the F/A-18D (RC) Tactical Reconnaissance (TAC RECCCE), the Advanced Tactical Air Reconnaissance System (ATARS), the BQM-145A Medium Range Unmanned Air Vehicle, and the RQ-3A TIER III Minus (DarkStar) High Altitude-Low Observable-Endurance (HALE) Unmanned Air Vehicle, as well as numerous other classified programs. John is a graduate of the USAF Test Pilot School (TPS) Class 87B and was the TPS Technical Director from 2004-2008 and a Master Instructor from 1999-2003. John is a Fellow and a Past President of SFTE (2004-2006) and he was the 2010 recipient of the Kelly Johnson Award. Mr. Minor retired from Hill AFB after a 28 year Air Force career. He is currently the Provost of Unmanned Vehicle University where he leads a full spectrum of education and training programs designed for the future workforce for commercial unmanned systems to include graduate degrees in unmanned systems engineering, vocational-technical certificate programs in unmanned systems, and UAS pilot training.



**Dr. Ralph Kimberlin** wrote the text book "Flight Testing of Fixed-Wing Aircraft". He is a Fellow of the Society of Experimental Test Pilots with 8500 flight hours in over 250 different aircraft including 25 first flights. He earned a Doctor of Engineering from the Technical University of Aachen, Germany. He is a U.S. Naval Academy graduate and was commissioned as an Air Force officer. While serving in Vietnam, he was one of three officers responsible for the development and combat evaluation of the AC-47 side-firing gun ship. He was a test pilot and flight test engineer for Piper, Rockwell International, and Beech Aircraft companies for 10 years. He was a professor and program chair at the University of Tennessee Space Institute for 27 years. Dr. Kimberlin has taught courses in Performance Flight Test and Stability & Control Flight Test at Florida Tech since 2012.



**Al Lawless** has been active in the SFTE since 1987, serving as Antelope Valley Chapter Vice President and President, Board Director, and Technical Council Chairman since 2004. He earned SFTE's Director Award in 2000 and was elected Fellow in 2009. His background emphasized performance and flying qualities, first as a USAF blue-suit FTE working HH-60, B-52 F-16, and Agility Research. He was then instructor and Chief of Academics at the National Test Pilot School, then transitioned into civil certification as Lead FTE on the Cessna Sovereign. He moved to international certification as Head of Flight Test for Grob Aerospace in Germany, then spent over nine years helping build Honda Aircraft's Flight Test Department as Chief FTE. Al is a Multi-engine Commercial Instrument pilot, Piper Cherokee owner, Flight Analyst DER, and currently manages the Honda Aircraft Performance Group. SFTE presented him the Kelly Johnson Award in 2015.

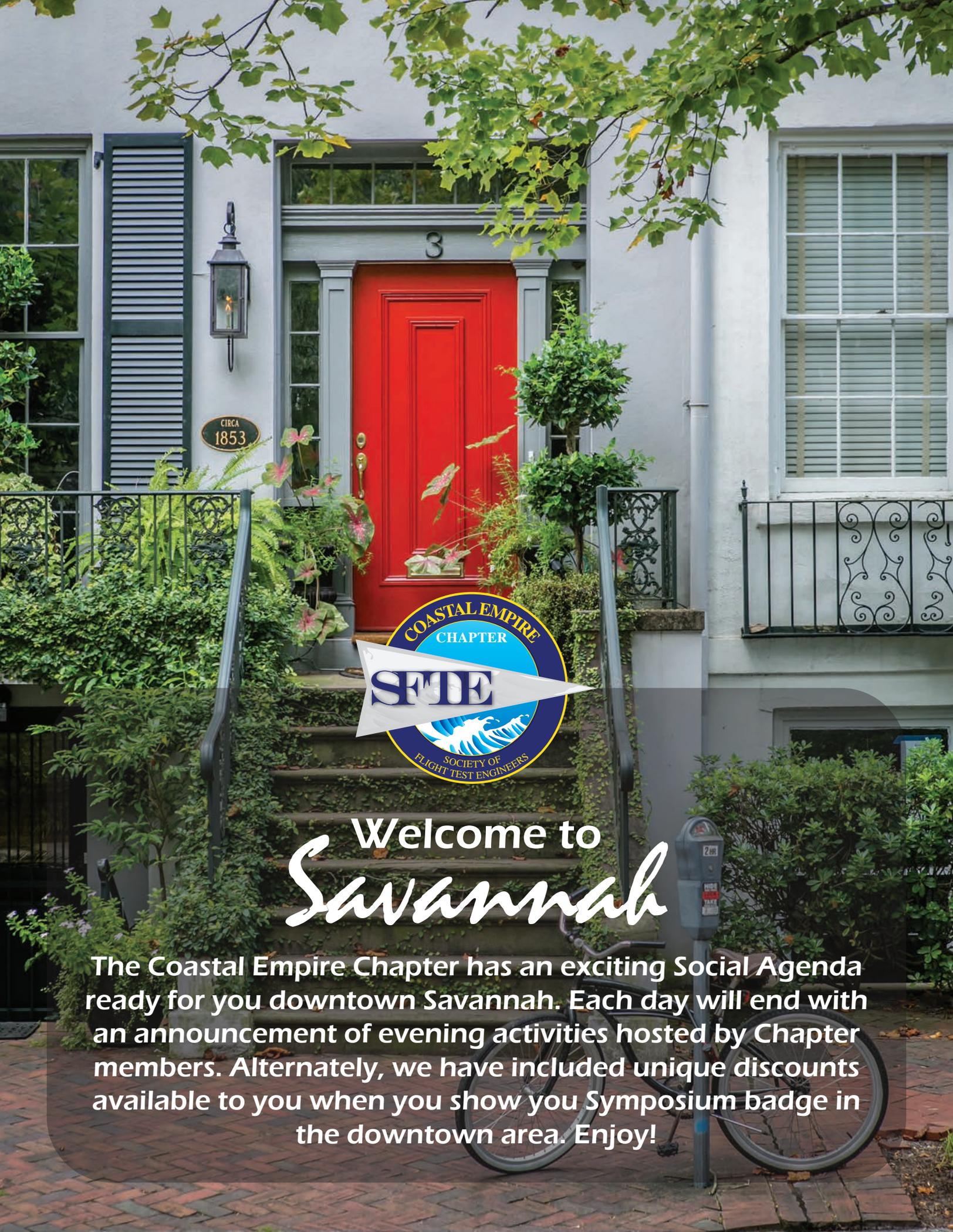


**Clay Harden** has worked in Flight Sciences Engineering for several aircraft manufacturers, including Lockheed, Honda Aircraft and Gulfstream. His work has been mostly in the fields of flight dynamics, simulation architecture, and flight control law design, but also touches on loads analysis, flutter analysis and flight testing, and aircraft performance. Analysis and flight testing for handling qualities has been a highlight of his career. Clay authored and co-authored several AIAA papers on these topics. Clay is also Commercial Instrument rated pilot, and enjoys introducing other engineers to the joys of light airplane flying. He and his lovely bride of 23 years have six children.



**Glenn Rosenthal** is the Founder, President, and CEO of Ulyssix Technologies, Inc. and the President and Founder of DATT Summit. After graduating from Carnegie-Mellon University, Glenn started his career at Texas Instruments. He then joined Metraplex corporation as senior engineer while working up to CEO/President and then it was sold to Herley Industries. After Herley, Glenn went to SBS Technologies. In 2000, Glenn and Dawn, his wife, started Ulyssix Technologies, Inc. to create a company with total emphasis of supporting the telemetry customer without the plans of acquisition or going public. In 2014, Glenn and Dawn created the Defense and Aerospace Test & Telemetry (DATT) Summit, aiming to change the paradigm of technical conferences by creating a training, education and networking Summit for the test and telemetry market.





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# Welcome to *Savannah*

The Coastal Empire Chapter has an exciting Social Agenda ready for you downtown Savannah. Each day will end with an announcement of evening activities hosted by Chapter members. Alternately, we have included unique discounts available to you when you show you Symposium badge in the downtown area. Enjoy!

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bayousavannah.com

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111 W Bay St. • 912.721.4800  
ruths-chris.com

10% off food for groups booked in our private dining rooms. Not valid on holidays or on our happy hour menu.

### Spanky's River Street

317 E River St. • 912.236.3009  
spankysriverstreet.com

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tubbysseafood.com

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131 W River St. • 912.644.7172  
fiddlersriverstreet.com

\$5 off orders of \$20+. Discount good for food and beverage purchase. Cannot be used with any other offers.

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dubspubriverstreet.com

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10% off dine-in purchase. Excludes Alcohol and Gratuity. One offer per table please.

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lizzysgrill.com

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kevinbarrys.com

10% off food and alcohol per check.

### B Matthews Eatery

325 E Bay St. • 912.233.1319  
bmatthewseatery.com

10% off food.

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savannahriverhouse.com

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stayinsavannah.com

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treksavannah.com  
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oatlandisland.org

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webbmilitarymuseum.com

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andrewlowhouse.com

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savannahheritagetour.com

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tybeemarinescience.org

\$15% off one-hour programs. (beach, marsh, water, or science center)

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oldsavannahatours.com

\$5 off any daily historic tour (overview or on/off) retail ticket price.

### Adventure Tours in Motion (Segway, E-Bikes)

303 Tattnall St. • 912.495.5556  
adventuretoursinmotion.com

15% off ticket.

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203 E York St. • 912.373.6651  
genteelandbard.com

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americanprohibitionmuseum.com

\$9 entry for museum.

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facebook.com/finethingsunder20

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Flight Level Engineering, LLC (FLE) is an aerospace research and development company based in Daytona Beach, FL. It specializes in variable stability in-flight simulators, research ground simulators and displays, active/passive artificial feel systems, and flight test education and research. Our training assets include two variable stability aircraft, including the only airworthy 6 Degrees of Freedom (DoF) variable stability aircraft in the world. Our principal training activity is to provide ground and flight test training to test pilots and flight test engineers in a short course format. Currently, our major customers include the FAA, and airframe manufacturers of military, business, and regional jets.

Florida Institute of Technology (FIT) is an accredited, coeducational, independently controlled and supported university committed to the pursuit of excellence in teaching and research. The Flight Test Engineering Program seeks to expand the student's knowledge, skills and abilities in the field of Aircraft Flight Testing. Flight test engineering involves performance evaluation of existing aircraft, rather than designing aircraft to meet performance specifications. Core courses teach engineers how to test an aircraft safely, measure aircraft performance and determine aircraft flying qualities. Students learn the necessary measurement techniques, instrumentation and data analysis methods required to collect and reduce flight test data to standard atmospheric conditions and then expand those results for publication in pilots operating handbooks. Flight test results are also used for improving the design of future aircraft. Additionally, students learn how to test and evaluate various aircraft mechanical and electrical subsystems including propulsion, structure and avionics.



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Kulite Semiconductor Products, Inc., is the leading manufacturer of miniature high frequency & flight qualified pressure transducers, wind tunnel engine pressure probes & turbine blade implants, for development & manufacture of helicopters, business jets, commuters, commercial and military aircraft. Kulite representative, Steve Carter is attending the symposium as a member of the Society of Flight Test Engineers. He is interested in the latest advances in the flight test industry as well as understanding the pressure measurement needs of the flight test community.

Modern Technology Solutions, Inc. (MTSI) is a 100% employee-owned engineering services and technology solutions firm with more than 900 employees across a network of offices and client sites. Our core capabilities include test & evaluation, modeling & simulation, acquisition support, software engineering, Intel, and cybersecurity.



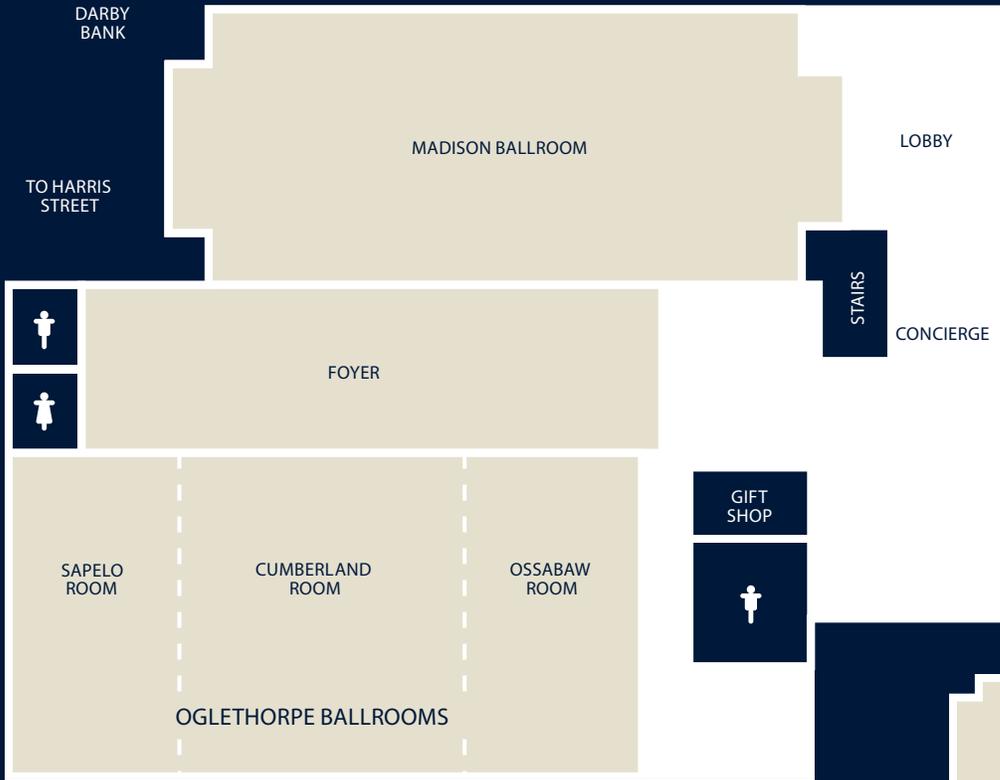
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# CONFERENCES & EVENT ROOMS

## FLOOR MAPS

### BALLROOMS AND FOYER



### KEY

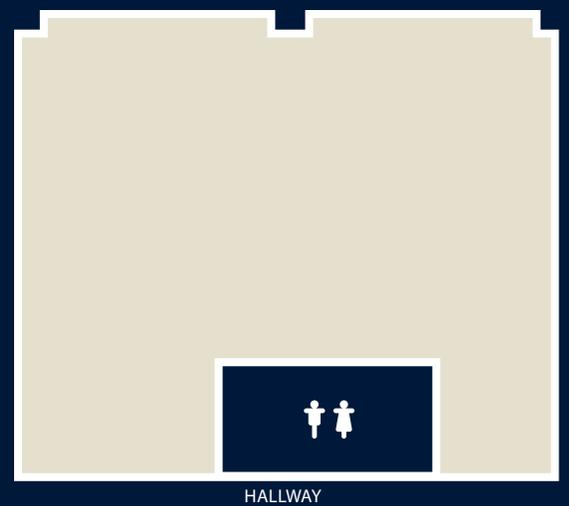
- Meeting/Conference Rooms
- Amenities



### MEETING ROOMS

OUTDOOR PATIO & POOL

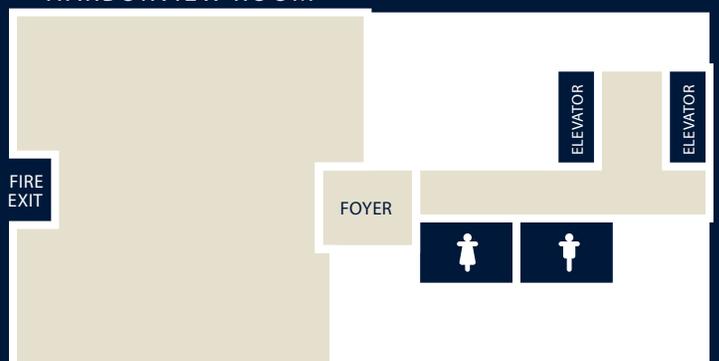
### MEETING ROOM



### PULASKI ROOM



### 15TH FLOOR HARBORVIEW ROOM



The objective of the SFTE Coastal Empire Chapter is to provide, in the areas of coastal Georgia and South Carolina, opportunities for promoting the advancement of flight test engineering through technical and fraternal communication among engineers whose principal professional interest is the flight testing of manned aircraft and those engineers in the allied fields of test operations, analysis, instrumentation and data systems.

We welcome you to Savannah, GA and invite you to see the latest Symposium and Chapter news at:

[www.CoastalEmpireSFTE.org](http://www.CoastalEmpireSFTE.org)



# COASTAL EMPIRE CHAPTER

SOCIETY OF FLIGHT TEST ENGINEERS