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Welcome to the 38th Digital Avionics Systems Conference

Greetings! Welcome to the 38th Digital Avionics Systems Conference. I am delighted to present a terrific technical conference that is focused on a theme, "UTM to ATM Airspace Integration – role of spectrum, AI, machine learning and automation", that will shape the future of aviation for generations to come. We can envision avionics systems that learn from its environment, then extrapolate that knowledge to future scenarios using AI-based decision support systems (DSS) mimicking human learning. The DSS could be self-contained within the autonomous platform or shared and distributed through the cloud. Knowledge sharing among autonomous systems will require very high throughput, secure and resilient communication networks. A new strategy for wireless spectrum allocation and usage will be required to meet the demand of these future aviation networks. Leading research from around the Globe will be presented over three days at this conference on ATM, UTM, Communications, Navigation and Surveillance (CNS), UAS, Integrated Modular Avionics and Technologies (IMA), Cyber Security & Software (CSS), and Human Factors. These researches are not only pushing the boundaries of airspace integration through AI, machine learning and automation, they are also paving the way for safer, cost effective, environmentally friendly and efficient airspace operations.

The opening keynote address for the conference will be presented by Lt. Colonel Randy "Laz" Gordon, PhD. As a decorated war veteran, a Harvard and MIT scholar, a Presidential Fellow nominee and a technology innovation leader at the US Air Force, Lt. Colonel Gordon will share his wisdom to make our air space more secure through avionics innovations.

Dr. Parimal Kopardekar will lead an Opening Panel discussion on Tuesday after Dr. Gordon's keynote address. Dr. Kopardekar is one of the most influential forces behind UTM research as a technologist and acting director of NASA Aeronautics Research Institute. Jessie Mooberry from Airbus, Jennifer Richter from Akin Gump, Jon Damush from Boeing NeXt, Dr. Tom Prevot from Uber Elevate, and Jonathan Evans from Verizon will be joining Dr. Kopardekar on the panel. These experts are leading innovations within their organizations and collectively in the industry to bring Urban Air Mobility from dream to reality.

On Wednesday morning, Mr. Akbar Sultan, the ASOP Director at NASA will provide the 2nd keynote address of the conference. Mr. Sultan is establishing partnerships among the government, industry and academia to elevate technologies that improve airspace safety and capacity. After Mr. Sultan, Mr. Chris VanBuiten from Sikorsky Innovations will discuss how his organization is developing technologies for reduced crew and autonomous operations. The final keynote speaker for Wednesday will be Mr. Marouan Chida, the Head of Digital Transformation and Innovation at Single European Sky ATM Research (SESAR) Joint Undertaking. Mr. Chida will discuss SESAR initiatives in UAS, airspace integration and autonomy.

Wednesday afternoon and Thursday morning will be dedicated to technical sessions. Wednesday evening, I invite you to join me for dinner and recreation at the USS Midway, the aircraft carrier named after the famed World War II battle. At the Midway museum, we will re-live some of the aviation history and life on board an aircraft carrier.

Please attend the Thursday Awards Lunch where we will present the Best of Tracks, Best of Conference, and Best Student Paper awards. In addition, AIAA Digital Avionics Technical Committee (DATC) will present the John C. Ruth Avionics Award and the Best Institution Award. The conference will conclude on Thursday afternoon with a joint meeting of the IEEE AESS Avionics Systems Panel and the Cyber Security Panel. This joint meeting will be open to all attendees of the conference and I invite you all to participate.

I want to thank you for your attendance. Our Technical Program Chair, Co-Chair, Track and Session Chairs worked diligently for months to present you with over two hundred excellent papers grouped in eight tracks. Please make best use of your time to participate in as many presentations as possible to gain valuable insights from their research. I request that you participate in the student poster session on Tuesday late afternoon. This is the first year in the history of DASC we have an Young Professionals and Women-in-Engineering networking event combined with our exhibitors' reception and the student paper award poster session. Please join us at the reception to encourage the students and young professionals from the local San Diego community to join and grow their careers during this exciting time in aviation. I want to thank the tutorial

presenters at DASC who provide an opportunity for young and seasoned professionals alike to learn and brush up on their skills.

My sincere thanks to the sponsors and exhibitors whose active participation and contribution make DASC the premiere event for avionics. Finally, I want to acknowledge and thank my organizing committee, the track and session chairs, the outstanding staff of Conference Catalysts and the volunteers who supported me through the year to offer all participants a memorable, successful, learning experience.

Regards,

Aloke Roy

2019 Digital Avionics Systems Conference – General Chair
IEEE AESS Avionics System Panel Chair

Mr. Aloke Roy is a senior program manager with Honeywell Advanced Technology. He currently manages data communication, information security and radio technology development programs supporting Honeywell Aerospace.

Previously, Mr. Roy was director of programs at Flextronics Corporation managing several major telecommunications OEM accounts. In this role, Mr. Roy was responsible for business development, outsourcing, and globalization of hardware design activities supporting large volume contract electronic manufacturing. His prior experiences include various positions at AT&T Bell Laboratories and ARINC Aviation Systems Division. As systems engineering director at ARINC, Mr. Roy oversaw development of SATCOM, HF, VDL, ATN, ATIS, and PDC standards and services.

Currently, Mr. Roy chairs RTCA Special Committee 223, which is developing the Internet Protocol Suite standards. He is an advisor to FAA at ICAO Communications Panel, and the ICAO Trust Framework Study Group. Mr. Roy is the Chair of IEEE AESS Avionics System Panel and is a member of the AIAA Digital Avionics Technical Committee.

Mr. Roy holds several patents on aeronautical, wireless and secure communications.

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Welcome to San Diego, California!

On behalf of the DASC, we welcome you to San Diego.

San Diego offers outdoor coastal and canyon beauty in a warm but gentle climate that is unique among the world's urban centers. San Diego, settled by the Kumaayay Native Americans for some thousands of years, made history as the first European settlement of the US west coast in 1787, at a site quite near our conference venue. Today, San Diego is the eight largest US city offering internationally famous recreation, sights, industry, events and weather that draw visitors year-round. Local attractions include the world's finest zoo, Balboa Park, the year-round recreation found along our beaches and shores, along with more recent fame for craft beer and a vital downtown that draws visitors to the city again and again.

San Diego's climate also provided ideal flying conditions needed in the earliest days of aviation. In San Diego, Ryan Air developed and built the first plane to successfully make a transatlantic flight, and Charles Lindbergh's journey from New York to Paris really began in San Diego. The local airport was constructed the next year and was named for him as a result. The first practical seaplane, too, was developed here in San Diego at Naval Air Station North Island; it is one of many sites to blend San Diego's connection to both aviation and its role as home to the world's largest naval fleet. Today, San Diego is a modern hub of the aerospace industry which accounts for nearly one fifth of innovation in the region. We are pleased that so many of the leaders in aerospace are joining us for the DASC this year.

The organizing committee has assembled an outstanding technical program of papers and presentations, highlighting technical advances in our field and providing every opportunity for the personal discussions and industry interactions that are so important. To enhance your conference experience, we're pleased to have arranged both an evening of networking featuring local industry young professionals and an excursion of attendees to the USS Midway, a San Diego landmark as a museum that made history for its missions and size as an aircraft carrier.

Our conference committee welcomes you to the 38th DASC. We are certain that your visit will be a uniquely enjoyable experience.

Kathleen Kramer, on behalf of the Organizing Committee

38th DASC Local Arrangements Chair

Social Program & Special Events

Welcome Reception
Monday, September 9, 5:30 pm – 7:00 pm
Location: Foyer

Take advantage of this opportunity to mingle and connect with other DASC attendees in your industry, meet new people and exchange fresh ideas.

Young Professionals, Women-in-Engineering, Exhibitor Reception, and Student Poster Session
Tuesday, September 10, 5:30 pm – 7:00 pm
Location: Foyer & Terrazza Ballroom

An evening offering multiple events from networking with young professionals, visiting exhibits from various organizations, and discussing relevant and emerging topics in avionics and aviation.

Conference Banquet Dinner & Special Event
Wednesday, September 11, 6:00 pm - 10:30 pm
Location: The USS Midway Museum

This year's special event will be held Wednesday evening at The USS Midway Museum (*910 N Harbor Dr., San Diego, CA, 92101).* All full conference registrations include access to the banquet dinner. Additional guest tickets can be purchased at the registration desk during conference registration hours.

Transportation to the dinner will be provided. Buses will begin to depart from the hotel at 6:00 pm.

38th DASC Awards Luncheon
Thursday, September 12, 12:30 pm – 2:30 pm
Location: Monte Carlo & St. Tropez

Each year, significant accomplishments of certain individuals in the field of digital avionics are recognized. We will present awards for the papers presented at the conference that were selected as Best of Track. Then we will announce the paper that was selected as Best of Conference, which is awarded Best Paper Award. We will also recognize the upcoming leaders in industry that won student awards.

AIAA DATC Distinguished Institution Award

The Distinguished Institution Award is presented to an organization in recognition of outstanding achievements and invaluable contributions to the development and transfer of critical technologies that address international priorities through research, technology development, and systems integration. It is also given to recognize the organization's generous support to the success of the AIAA Digital Avionics Technical Committee (DATC); the Integrated Communications, Navigation, and Surveillance Conference (ICNS); and the Digital Avionics Systems Conference (DASC). The 2019 winner is Volpe National Transportation Systems Center of Cambridge, MA.

David Lubkowski Memorial for Advancement in Digital Avionics Best Paper Award

The Conference Awards Chair forms a selection committee that is led by the AIAA DATC and is responsible for selecting the David Lubkowski Memorial for Advancement in Digital Avionics Best Paper Award. The award is sponsored by MITRE/CAASD and consists of a trophy and a cash award of $1000. The winner of the 38th DASC best paper award will be announced at the conference awards luncheon.

The AIAA Dr. John C. Ruth Digital Avionics Systems Award.

This award is named in honor of the founding chairman of the AIAA Digital Avionics Technical Committee (TC), member of the institute's Board of Directors and prolific volunteer for AIAA activities. He was known by numerous people as Mr. Avionics for his proactive and meaningful contributions to and his expertise in the field of digital avionics while employed in the government and industry. The name of the AIAA Digital Avionics Systems Award was changed to honor Dr. Ruth in 2007. The award is given for "Outstanding achievement in technical management and/or implementation of digital avionics in space or aeronautical systems to include analysis, design, development or application." This year's award is given to the Airborne Collision Avoidance System X (ACAS X) team with lead members Mykel Kochenderfer of Stanford University, James Kuchar and Wes Olson of MIT Lincoln Laboratory, Joshua Silbermann of JHU/APL, and Neal Suchy of the FAA. The award citation reads "for the development of the Airborne Collision Avoidance System X using machine learning technology, statistical risk assessment and flight test campaigns."

Conference Sponsors and Co-Sponsors

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NASA's Airspace Operations and Safety Program (AOSP) works with the Federal Aviation Administration, industry and academic partners to conceive and develop Next Generation Air Transportation System (NextGen) technologies to further improve the safety of current and future aircraft. As radar-based air traffic control transitions to a NextGen satellite-based system to enhance safety, capacity and efficiency on runways and in flight, AOSP-developed NextGen methods and means will provide advanced automated support to air navigation service providers and aircraft operators to reduce air-travel times and delays, and to ensure greater safety in all weather conditions.

AOSP Projects develop and demonstrate airspace domain capabilities as foundational components of NextGen; open up the airspace to emergent users, vehicles, and missions by developing and demonstrating new service-based paradigm leveraging UTM principles; discover the impact on safety of growing complexity introduced by modernization and develop innovative solutions that mitigating these risks in accordance with target levels of safety; and, develop and validate airspace integration performance requirements to enable access to UAS in low-altitude airspace.

NASA's Unmanned Aircraft Systems Integration in the National Airspace System, or UAS in the NAS Project works on identifying, developing and testing the technologies and procedures that will make it possible for UAS to have routine access to airspace occupied by human-piloted aircraft. The UAS-NAS project uses modeling, simulations and flight tests to develop and test technologies that provide safe, effective, secure capabilities including detect and avoid (DAA) and command and control (C2).

Teams of NASA researchers have been working with the UAS community since 2011 to address the technical barriers to routine UAS operations. Data results from UAS-NAS work inform the minimum operational performance standards that the Federal Aviation Administration (FAA) is using for development of technical standards and operational approval guidance. Four NASA centers support the UAS-NAS project: NASA's Ames Research Center and Armstrong Flight Research Center in California, Glenn Research Center in Ohio, and Langley Research Center in Virginia. The UAS-NAS project is within the Integrated Aviation Systems Research Program, managed by NASA's Aeronautics Research Mission Directorate at NASA Headquarters in Washington, D.C.

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The MITRE Corporation is a not-for-profit organization that provides systems engineering, research and development, and information technology support to government agencies. MITRE operates federally funded research and development centers, including the FAA's Center for Advanced Aviation System Development (CAASD), and has worked with the FAA for over 55 years. MITRE also performs ATM/CNS systems engineering for many foreign civil aviation organizations

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Honeywell (www.honeywell.com) is a Fortune 100 technology company that delivers industry specific solutions that include aerospace products and services; control technologies for buildings and industry; and performance materials globally. Our technologies help everything from aircraft, buildings, manufacturing plants, supply chains, and workers become more connected to make our world smarter, safer, and more sustainable.

Presagis is a global leader in modeling, simulation, and embedded software solutions. Our Embedded Graphics division is at the forefront of avionics software design for certifiable cockpit displays and a global leader and provider of user-interface development tools for the aerospace, defense, security, and critical infrastructure markets. We have been delivering first-in-class cockpit graphics design tools for the last 30 years and more than 15 years delivering DO178-certifiable solutions. Presagis provides the tools and services necessary to bring its clients' new products to market fast, and with reduced risk. Our latest generation of tools combine the reliability clients need for mission- and safety-critical graphics development with leading-edge technology developed for modern cockpit graphics. They also support the ARINC 661 standards for CDS and UA development; CDS developers can easily create or modify standard or custom widgets while developing a CDS and a widget library. VAPS XT, Presagis' flagship product, is an easy to use tool that supports the complete lifecycle of the development of cockpit graphics systems. It allows HMI engineers to capture requirements and design, express functionality in integrated state charts and automatically generate code that implements the design.

Presagis serves hundreds of customers worldwide, including many of the industry's most respected organizations such as Boeing, Airbus, Collins Aerospace, Lockheed Martin, BAE Systems, Leonardo, Thales and CAE among others. For more information, visit www.presagis.com/EmbeddedGraphics.

Green Hills Software is the worldwide leader in embedded software safety and security for high-assurance avionics applications. Currently deployed in dozens of aerospace platforms ranging from helicopters and tactical fighters to satellites and spacecraft, Green Hills INTEGRITY®-178 RTOS was the first commercial operating system used for certification to DO-178B/ED-12B for airborne safety. The same software is also the top security solution, as the INTEGRITY-178 RTOS is the only commercial operating system ever certified to NSA's Separation Kernel Protection Profile (SKPP) and Common Criteria EAL 6+. The INTEGRITY-178 tuMP™ multicore RTOS extends that safety and security pedigree to multicore computing and is the first and only RTOS certified conformant to the current revision of the Future Airborne Capability Environment (FACE™) technical standard, edition 3.0, for both safety and security profiles. INTEGRITY-178 tuMP goes beyond the typical safety-critical RTOS by directly addressing CAST-32A concerns over multicore interference by providing a broad range of features and libraries to test and mitigate multicore interference. In particular, the Bandwidth Allocation and Monitoring (BAM) capability enables software system architects enforce bandwidth allocations to a processor's shared resources on a core-by-core basis. Together, these capabilities greatly reduce multicore certification risk and enable faster time-to-market by simplifying the verification and analysis activities while also significantly lowering the cost of long-term sustainment and future growth of the system.

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AFuzion's avionics design and certification engineers are currently assisting 20 clients in:

- DO-178C
- DO-254
- DO-326A / ED-202A
- ARP4754A
- ARP4761
- DO-278A
- DO-200B
- NASA & Navy Standards
- Military Certification

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GA-ASI provides pilot training, support services for RPA field operations, and manufactures a variety of state-of-the-art ground control stations. It also focuses on providing integrated sensor payloads and software for Intelligence, Surveillance and Reconnaissance (ISR) aircraft platforms and develops high energy lasers, electro-optic sensors, and meta-material antennas.

Established in 1992, GA-ASI is leading the industry to new levels of performance, reliability and operational capability. GA-ASI aircraft have flown six million flight hours, and the company has expanded the acceptance and application of RPA systems around the world.

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6 EVENTS UNDER 1 ROOF

Exhibitors

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NASA explores new technologies to make aircraft quieter and faster, get you gate-to-gate safely and on time, and transform aviation into a new economic engine at all altitudes.

38th DASC Week at a Glance

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The USS Midway
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Opening Remarks & Keynote

Tuesday, 8:00 am

Keynote Speaker

Lt. Colonel Randy "Laz" Gordon, PhD

United States Air Force

Lt. Colonel Randy "Laz" Gordon, PhD is currently serving as the Lead for the Secretary of the Air Force's AI Technology Accelerator. Prior to this, he served on the Secretary of the Air Force's AFWERX technology innovation team with business, academia, and Airmen. He is also a Presidential Fellow, Harvard Business School Alumnus, DARPA Fellow, and Massachusetts Institute of Technology Fellow. He served the F-22 Combined Test Force as its commander and has additional flight test pilot experience in the F-15C/E, A-10A/C, F-16A/C, Bombardier BD-700 Global Express business jet, and 70 other military and civilian aircraft.

Opening Panel

Tuesday, 9:00 am

Panel Moderator

Dr. Parimal Kopardekar

Acting Director of NASA Aeronautics Research Institute, NASA's Senior Technologist for Air Transportation Systems and Principal Investigator for the Unmanned Aircraft Systems Traffic Management (UTM)

Dr. Parimal Kopardekar (PK) serves as the Acting Director of NASA Aeronautics Research Institute (NARI). In that capacity, he is responsible for exploring new trends and needs related to aeronautics. He also serves as NASA's senior technologist for Air Transportation Systems and principal investigator for the Unmanned Aircraft Systems Traffic Management (UTM). For UTM, he and the team won the Service to America Medals (known as Oscars of Federal Workforce) in Promising Innovation Category in 2018. He was named in top 25 most influential people in commercial UAS industry in 2017. He also won NASA exceptional technology medal in 2016. He is co-author of over 50 publications with 3 best paper awards. He is passionate about airspace operations, autonomy, advanced air mobility, and digital manufacturing and supply chains in aeronautics. He is co-editor-in-chief of Journal of Aerospace Operations and a fellow of American Institute of Aeronautics and Astronautics.

Panelists

Jonathan Evans

VP of Global Aviation Policy
Verizon

Jonathan Evans is VP of Global Aviation Policy at Verizon, and board president of the Global UTM Association (GUTMA). He actively participates in sculpting technical standards and regulatory policy for the rapidly evolving aerial robotic and digital air traffic management industries. And as a Verizon executive he brings voice to introducing LTE and 5G as aviation-grade technologies available and appropriate as key infrastructure to this era of increasingly automated, connected, and networked aircraft deployments. Jonathan was a professional aviator for 18 years, serving as a UH60 Blackhawk pilot and network administrator in the US Army, as well as an EMS helicopter pilot in civilian life. He holds an Airline Transport Pilot certificate (ATP), is licensed to fly both helicopters and multi-engine airplanes with over 3500 of flight experience, and holds a bachelor's degree in professional aeronautics from Embry-Riddle Aeronautical University.

In November of 2012, while on duty as a Life Flight pilot in Oregon, Jonathan co-founded Skyward, a drone-operations management software company, and enjoyed growing and leading it as CEO through over $8M of venture capital and its ultimate acquisition by Verizon in February of 2017. Skyward has been a pioneering industrial stakeholder in providing companies safe, efficient access to the nation's regulated airspace, and continues to lead a new industrial category in connected aviation as a Verizon company.

Jennifer L. Richter

Partner
Akin Gump

Jennifer L. Richter is a partner with Akin Gump Strauss Hauer & Feld and represents a number of clients on UAS/drone strategy, development and operation. Jennifer has represented technology and communications companies and investors for more than two decades. She is ranked by Chambers USA as a leading lawyer in telecommunications, and she has been named a Super Lawyer for communications law multiple times. She brings years of in-depth experience in the communications field to her clients in the industry, possessing an insider's knowledge of the business, gained while serving as vice president and general counsel of a wireless communications company she helped to build and sell to Sprint Corporation. Jennifer was a voting member on the FAA's Aviation Rulemaking Committee that studied and made recommendations to the FAA Administrator regarding technology to enable remote tracking and identification of UAS.

Jennifer is an active participant in NASA's UTM working groups. She also is a subject matter expert on the FCC's Technological Advisory Council on UAS and the Department of Homeland Security's CIPAC that is studying how to protect critical infrastructure from drones. For the CTIA/NASA UAS Working Group, Jennifer is active with members, the FCC and the FAA on spectrum solutions for UAS. The reliability, safety and security of UAS is highly dependent on the reliability, safety and security of the communications links that enable UAS operations, including UAS command/control links, tracking and identification, payload communications, and collision avoidance; it also is essential for managing UAS through a UAS traffic management system (UTM).

Jon Damush

Dir. New Business Ventures
Boeing NeXt

Jon Damush is director of new business ventures for Boeing NeXt, a business division building the ecosystem that will define the future of urban, regional and global mobility. He is responsible for collaboration with third parties to advance Boeing's future mobility initiatives, including oversight of the SkyGrid joint venture that is developing a software platform for the safe integration of unmanned and autonomous vehicles into the global airspace. Jon was formerly the chief growth officer for Insitu, Inc., a Boeing subsidiary whose unmanned products have more than 1.3 million operational flight hours. During his tenure at Insitu, he established the commercial business unit and oversaw the strategy and marketing functions of the company. Damush came to Insitu through Boeing's acquisition of 2d3 Sensing, where he was president and CEO. He holds a Bachelor of Science degree in mechanical and aerospace engineering and a master's degree in business administration from the University of California, Irvine. He is also a licensed commercial pilot and certified flight instructor.

Dr. Tom Prevot

Dir. Engineering, Airspace Systems
Uber Elevate

Dr. Tom Prevot is Director of Engineering for Airspace Systems at Uber Elevate. He and his team are developing airspace systems and cloud services for the future Uber Elevate network of electric Vertical Take-Off and Landing aircraft. Prior to joining Uber in summer 2017, Tom was with NASA Ames Research Center for more than 20 years. He was head of the Airspace Operations Lab and project lead for NASA's UAS Traffic Management (UTM) research. Tom is passionate about developing and evaluating future concepts and technologies for the air transportation system. He has published over 100 conference and journal papers. He earned his doctorate in aerospace engineering from the Munich University of the German Armed Forces in 1995.

Jessie Mooberry

Head of Deployment
Airbus UTM

Jessie Mooberry is head of deployment at Airbus UTM, a group designing the critical infrastructure which will allow new aircraft including air taxis and delivery drones to safely enter and share the skies of our future. She is a technologist at the Peace Innovation Lab at Stanford and started her UAV career, with Uplift Aeronautics, building fixed-wing aircraft out of a garage in Stanford with the world's first humanitarian drone cargo nonprofit. Jessie was one of the first to obtain a commercial drone license in the U.S. She is a Social Enterprise Fellow and Mentor for the Ariane de Rothschild Foundation. In addition, she sits on the Boards of People's Light and WeRobotics.

Panel: Young Professionals & Women in Engineering

Tuesday, 5:30 pm

Panelists

Rima Hajjar-Dalton
System Performance Engineer
Electromagnetic System Division,
General Atomics (GA-EMS)

Hamna Khan
Hardware Engineer
Northrop Grumman

Fatoumata Gaye
Electrical Design Engineer
Cubic Mission Solutions (CMS)

Ellie Hallner
Operations Program Manager (OPM)
Viasat

2nd Day Keynote & Invited Speakers

Wednesday, 8:00 am

Keynote Speaker

Akbar Sultan

AOSP Director, NASA

Mr. Sultan is responsible for NASA's aviation operations and safety research portfolio of more than $120 million across four research centers. AOSP works with the Federal Aviation Administration (FAA), industry and academic partners to conceive and develop Next Generation Air Transportation System (NextGen) technologies to further improve the safety of current and future aircraft moving through the National Airspace System.

NextGen activity includes research to enable service-oriented architecture and integrated demand management operational efficiencies in the surface, terminal, en route, and oceanic operational domains for traditional aircraft, unmanned aircraft systems (UAS), and future autonomous systems. The program is also responsible for aviation safety research in the areas of aircraft state awareness, prevention of aircraft loss of control, verification and validation of complex systems, prognostic safety through data mining, and real-time system-wide safety assurance. A key focus is on developing and demonstrating enhanced systems that will enable routine access to the airspace by emergent users of UAS, especially in support of evolving urban air mobility concepts.

Sultan is the NASA co-lead on the NASA/FAA Research Transition Teams, which are organized to enable efficient and effective transition of NASA research into FAA implementation roadmaps. He is also the NASA liaison to the multiagency NextGen Interagency Planning Office, and leads the program's international collaboration activities. Sultan has 20 years of professional experience in aerospace and air traffic management research and development.

Previously, Sultan was a NASA liaison to the Joint Planning and Development Office in the ongoing development of NextGen, where he led the development of NextGen operational improvements. He also served as the Software Configuration, Release, and Verification and Validation Manager for the Terminal Radar Approach Control automation system at NASA's Ames Research Center in California. There he was responsible for gaining FAA certification for NASA prototype systems in operational field trials.

Sultan received two bachelors of science degrees – in mechanical engineering and in aeronautical science and engineering – from the University of California Davis, and a master's of science degree in aerospace engineering from San José State University.

Invited Speakers

Chris VanBuiten

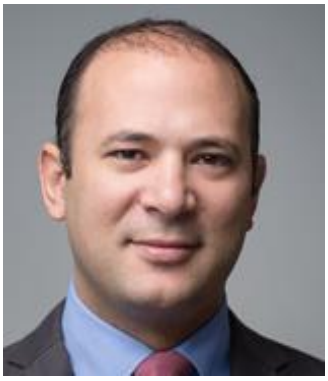
Vice President, Sikorsky Innovations

Chris VanBuiten is Vice President of Sikorsky Innovations for Sikorsky, a Lockheed Martin Company and line of business within the Rotary and Mission Systems business area. In this capacity, he runs the group responsible for maturing next generation technologies, processes and products. Current areas of focus include Future Vertical Lift design, high speed S-97 RAIDER™ prototype and Joint Multi-Role DEFIANT™ demonstrator programs, Autonomy and optionally piloted flight demonstrations, as well as a portfolio of advanced rotor, and fleet management technology programs.

Mr. Van Buiten joined Sikorsky in 1989 and has been engaged in the conceptual and preliminary design of Sikorsky products including the Collier Award winning S-92 commercial transport, CH-53K heavy lift helicopter, and UH-60M BLACK HAWK. He has served as Chief of Preliminary Design and Manager of Advanced Design and has led Sikorsky's Strategic Planning group. He led Sikorsky's acquisition of the PZL Mielec Aircraft Company in Mielec, Poland. He has also served as a Technical Fellow for Advanced System Design. Mr. Van Buiten was a Glenn L. Martin Aerospace Scholar at the University of Maryland where he received a Bachelor of Science in Aerospace degree in 1989. He received a Master of Science in System Design and Management from the Massachusetts Institute of Technology and Sloan School of Business in 1999.

Marouan Chida

Head of Digital Transformation & Innovation, SESAR JU



Marouan Chida is the Head of Digital Transformation & Innovation in SESAR, the European ATM modernization programme.

He is in charge of the strategic research and is leading the digitalization of aviation together with its related technological innovations (ATM/UTM, CNS, Avionics, Autonomy, Artificial Intelligence, Connectivity…. He is experienced in advanced ATM concepts, avionics and ground systems, involved in technology and architecture development across the SESAR programme. Before joining the SJU, Marouan worked for AIRBUS, where he led ATM & Avionics development teams. He is graduated from the Ecole Nationale de l'Aviation Civile (ENAC), the French school of civil aviation, where he achieved an engineering degree in civil aviation as well as a master's degree in Air-Ground Collaborative Systems Engineering."

Tutorial Program

Tutorial Program Chair:
Dr. Krishna Sampigethaya
Embry-Riddle Aeronautical University-Prescott

Intl. Tutorial Co-Chair:
Pavel Paces
Czech Technical University

It is our pleasure to welcome you to the 38th DASC Tutorial Program. We are pleased to offer you beneficial educational opportunities supporting this year's conference theme: *UTM to ATM Airspace Integration Role of Spectrum, AI, Machine Learning and Automation*. This year's tutorial program includes 14 tutorials, including a free tutorial and over 8 new additions, split across two days, in three parallel tracks. Most courses have been selected to directly complement the topics presented in the technical program, ranging from autonomous vehicles, navigation, avionics systems, and aviation cyber security. Some of these courses directly address this year's conference theme.

All DASC tutorials will provide a real-time interactive discussion with the presenters and have well-defined learning objectives and learning outcomes to help focus the course on the needs of the attendee. DASC tutorials are affordable and offer an excellent opportunity to learn directly from experts in the field. Again, this year, we are offering IEEE Continuing Education Units (CEU) for all courses (0.3 CEUs per course). In short, no matter what your educational goals are, the professional development program of the 38th DASC is sure to provide a valuable learning experience. We hope you will take full advantage of the educational program and will benefit both technically and professionally from your participation in the 38th DASC. See you in San Diego!

Sunday, September 8			**Monday, September 9**		
8:00 am – 11:00 am	11:30 am – 2:30 pm	3:00 pm – 6:00 pm	8:00 am – 11:00 am	11:30 am – 2:30 pm	3:00 pm – 6:00 pm
Modern Avionics Architecture	Avionics for All Weather Operations	Artificial Intelligence & Relations to Avionics	An Introduction to Aviation Cyber Security	Aviation Cyber-Security Regulation: Introduction to the DO-326/ED-202-Set Ecosystem	Aviation Cyber-Security Regulation: The DO-326/ED-202-Set Practical Guidance & Considerations (Intermediate)
SM1 Tim Etherington	**SL1** Tim Etherington	**SA1** Pavel Paces	**MM1** Krishna Sampigethaya	**ML1** Aharon David	**MA1** Aharon David
Intelligent Control Architecture for Autonomous Vehicles	Avionics Systems ARP4754A	Avionics Systems ARP4761/A	DO-178C Intro for Avionics Certification, Including UAVs	Detect and Avoid for Unmanned Aircraft Systems	Reliable Navigation for Unmanned Aircraft Systems (UAS)
SM2 Dr. Carlos Insaurralde	**SL2** Vance Hilderman	**SA2** Vance Hilderman	**MM2** Vance Hilderman	**ML2** Giancarmine Fasano	**MA2** Maarten Uijt de Haag
		Tracking and Analysing Global Air Traffic with OpenSky			How to Write a Paper for IEEE MTT-S Journals and Navigate the Review Process **Free Tutorial**
		SA3 Martin Strohmeier/ Matthias Schaefer			**MA3** George E. Ponchak

Tutorial Description

Sunday, September 8

Session 1

SM1: Modern Avionics Architecture

Timothy Etherington, Collins Aerospace

This tutorial explores architectures from numerous civil and military aircraft. Key architecture and design challenges are described for legacy as well as the newest aircraft types. Architectures are examined with comparisons of hardware and avionics functions of each are discussed in detail. Civil aircraft investigated include Boeing 787 and Airbus A350. Military aircraft include F-22 and Rafael. IMA 2G and other advanced concepts will be explored. Specific architecture examples are used to represent real word design challenges and solutions. Integrated and connected aircraft concepts are explored in reference to the integrated modular avionics architectures and how they can support integrated digital datalink and future air traffic management. Architectures have been carefully chosen to cover the following:

- Broad spectrum of aircraft types, military and civilian
- Federated and integrated designs with emphasis on the latest modern commercial and military aircraft
- Emphasis on the latest integrated architectures with partitioning and connected aircraft
- Line Replaceable Unit (LRU) vis-à-vis modular packaging
- Impact of the Modular Open Systems Approach (MOSA) on architecture
- Range of non-essential to flight critical applications and the impact on future designs
- Connected aircraft and design decisions for integrated designs

SL1: Avionics for All Weather Operations

Timothy Etherington, Collins Aerospace

Recent regulatory guidance changes for operations below standard weather minimums have created significant opportunities for avionics to support low visibility approach, landing and takeoff minimums. Changes related to aircraft and crew requirements will be detailed. Enhanced Flight Vision Systems in particular create benefits unique to the new to technology. The tutorial will cover both the airworthiness and operational aspects as they relate to avionics for instrument and visual segments of the approach as well as takeoff and landing for instrument landing systems, GPS, and enhanced vision sensors. Synthetic vision guidance system requirements will be detailed and extension to other approach types will be discussed. Regulatory guidance in FAA Order 8400-13E, RTCA documents DO-315, DO-341, DO-359, DO-374, and Advisory Circular AC 120-118 will be covered in detail as well as when Ops Spec, MSpecs or LOA's are required for various operations. Specifics include:

- Precision Approaches down to 2400 RVR
- 1800 RVR Operations
- 150 foot DH and 1400 RVR
- 100 foot DH and RVR down to 1000
- Operations below 1000 RVR
- Takeoff down to 300 RVR

SA1: Artificial Intelligence & Relations to Avionics

Pavel Paces, Czech Technical University

In this course we are going to introduce concepts of decision making conducted by algorithms which led to current term Artificial Intelligence. The course is built around flight planning algorithms, their performance and suitability for different applications. Within our session we will focus on and summarize advantages and disadvantages of Breadth First Search, A*, Iterative Deepening A*, Theta*, and RRT* algorithms. Their reasoning process and path selection methodology with perspective of aerospace requirements are evaluated. Our focus will be on the randomization element and uncertainty of these algorithms. We will also describe selected evaluation parameters required by FAA and EASA Technical Standard Order (TSO) documents on electronic systems and what are the conflicts between these requirements and the natural

principle of the existing path-planning algorithms. The influence of the performance of the navigation sensors and expected departure and arrival procedures which use the existing navigation means (INS, VOR, NDB, ILS, GPS) will be discussed. Finally, we describe the Artificial Intelligence phenomena and discuss the determinism of the currently used algorithms for flightpath panning and recovery.

Sunday, September 8

Session 2

SM2: Intelligent Control Architecture for Autonomous Vehicles

Carlos C. Insaurralde, University of the West of England, UK

The use of remotely operated vehicles is ultimately limited by economic support costs, and the presence and skills from human operators (pilots). Unmanned craft have the potential to operate with greatly reduced overhead costs and level of operator intervention. The challenging design is for a system that deploys a team of Unmanned Vehicles (UVs) and can perform complex tasks reliably and with minimal (remote) pilot intervention. A critical issue to achieve this is to develop a system with the ability to deal with internal faults, and changes in the environment as well as their impact on sensor outputs used for the planning phase.

The tutorial objective is to present step by step the development process (from requirements to prototyping) of an Intelligent Vehicle Control Architecture (IVCA) that enables multiple collaborating UVs to autonomously carry out missions. The architectural foundation to achieve the IVCA lays on the flexibility of service-oriented computing and agent software technology. An ontological database captures the remote pilot skills, platform capabilities and, changes in the environment. The information captured (stored as knowledge) enables reasoning agents to plan missions based on the current situation. The combination of the two above paradigms makes it possible to develop an IVCA that is able to dynamically reconfigure and adapt itself in order to deal with changes in the operation environment. The ability to perform on-the-fly re-planning of activities when needed increases the chance to succeed in a given mission. The IVCA realization is underpinned by the development of fault-tolerant planning and spooling modules (fault diagnosis and recovery) as well as a module called matchmaker to link services with available capabilities.

The IVCA is generic in nature and can be easily adapted to UVs from different domains (i.e. land, water, and air/space). However, the IVCA aims at a case study where Unmanned Marine Vehicles (UMVs) are required to work cooperatively. They are capable of cooperating autonomously towards the execution of complex activities since they have different but complementary capabilities. The above UMV configuration, where the marine robots are tasked to autonomously do mission works before recovery, is possible at a cost of endowing the UMVs with "intelligence" that in former solutions is provided by remote or even in-situ human pilots.

The IVCA development applies the software/systems engineering principles. The tutorial is structured in four parts. Part I (background) consists of a brief review of technologies related to the IVCA and a comparison of control architectures for autonomous UVs. Part II (requirements analysis and design) entails the user and system requirements, and the system architecture specification/design. Part III (implementation and integration) describes the IVCA realization based on Robot Operating System (ROS) for the above case study. Session IV (verification and validation) deals with the evaluation of the IVCA by means a simulation.

SL2: Avionics Systems ARP4754A

Vance Hilderman, AFuzion Inc.

AE-ARP4754A provides guidance for the development of aircraft and aircraft systems while taking into account the overall aircraft operating environment and functions. ARP4754 was long "suggested" for commercial avionics; the new ARP4754A is now required and increasingly mandatory for all avionics including worldwide militaries and UAV's beginning as early as 2017. ARP-754A is commonly called "DO-178 for Aviation Systems", but it's really much different: ARP4754A requires detailed Safety processes (ARP4761) and data, systems-level planning, traceability, V&V and tight configuration management. While bearing some semblance to DO-178, ARP4754A really covers the Avionics Development Ecosystem and is a mandatory foundation – it must come BEFORE DO-178C. The processes for developing systems

requirements are rigorous and formal processes must be proven in place before software and hardware development begin. This tutorial will cover a selection of topics relating to ARP4754A, such as:

- How ARP4754A fits into the Avionics Development Ecosystem including ARP4761A, DO-178C, and DO-254
- Differences between ARP4754 and ARP4754A
- ARP4754A Planning – what is really required
- Aviation Safety: what is required for ARP4754A
- Handling Derived and Safety Requirements per ARP4754A
- System Requirements – What, Where, Why, and How
- Planning, Development, and Traceability Processes for Systems
- ARP4754A Documentation
- ARP4754A Verification & Validation
- ARP4754A Best Practices & Common Mistakes

SA2: Avionics Systems ARP4761/A

Vance Hilderman, AFuzion Inc.

SAE ARP4761 "Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment" describes guidelines and methods for performing safety assessments associated with showing compliance with aeronautics and space certification requirements of 14CFR/CS 2X.1309 and 33.75. Safety assessments are an essential part of aircraft/system development process. This ARP represents industry best practice and is formally recognized by numerous National Airworthiness Authorities (NAAs), Military Airworthiness Authorities (MAAs), FAA and EASA. The safety assessment process is of fundamental importance in establishing appropriate safety objectives and requirements for the aircraft and its systems, and in determining that the designs satisfy these objectives and requirements.

SAE ARP4761 safety assessments are described as an integral process in ARP4754A "Guidelines for Development of Civil Aircraft and Systems". There are fundamental relationships between safety assessments and the system development processes. This tutorial provides attendees with the knowledge to understand and apply the basic safety assessment techniques, as well as understanding the interaction between safety processes and the overall aircraft or system development processes. Although ARP 4761's context is commercial aircraft, its techniques are also applicable to safety assessment of ground or space vehicles. This tutorial will cover a selection of topics relating to ARP4761, such as:

- Definitions of Key Safety-Related Terminology
- Interaction Between the Safety Assessment Processes (ARP4761) and the Aircraft/System Development Processes (ARP4754A)
- Functional Hazard Assessment (Aircraft/System level FHA)
- Preliminary System Safety Assessment (PSSA)
- Fault Tree Analysis (FTA) and Dependency Diagram (DD)
- Common Cause Analysis (CCA)
- Particular Risks Analysis (PRA),
- Zonal Safety Analysis (ZSA),
- Common Mode Analysis (CMA)
- Failure Modes & Effects Analysis (FMEA)
- Failure Modes & Effects Summary (FMES)
- System Safety Analysis (SSA)

Attendees will receive a free copy of AFuzion's proprietary whitepaper "Avionics Systems & Safety Analysis".

Sunday, September 8

Session 3

SA3: Tracking and Analysing Global Air Traffic with OpenSky

Martin Strohmeier & Matthias Schaefer
OpenSky Network Foundation

This tutorial introduces the OpenSky Network (https://opensky-network.org), a community-based receiver network which continuously collects air traffic surveillance data and makes it accessible to researchers for free. Using a global network of over 1000 Mode S and ADS-B receivers, the

network has collected and provides over 1 PB of surveillance data. This data has been used by academics, authorities and companies around the world for their research, resulting in more than 50 peer-reviewed publications to date. We will provide an overview on how the OpenSky Network works and which data is available. Moreover, using several case studies, they will demonstrate what kind of analyses are possible and how to use OpenSky's data set for your research.

Key Takeaways

- Get to know the "Flightradar24" of the research world
- Learn how to use OpenSky's data and what to expect
- Learn about examples of successful studies with OpenSky's data

Monday, September 9

Session 1

MM1: An Introduction to Aviation Cyber Security

Krishna Sampigethaya, Embry-Riddle Aeronautical University-Prescott

Aviation cyber security is primarily about protecting the safe, secure, economical, efficient, comfortable transport of payload—passengers and cargo—through the air, against adversaries acting via an intangible and evolving cyberspace. It requires all stakeholders to come together to understand, identify, assess, and mitigate new security threats to the global aviation ecosystem. A core challenge for this emerging multi-disciplinary area is that it requires the marriage of two mutually alien topics: aviation and cyber security. This tutorial will provide a bridge to enable this union. The tutorial mainly focuses on the aircraft which is at the core of an increasingly complex, technology-driven aviation ecosystem.

Upon completion of this tutorial, you will be able to comprehensively summarize and skillfully analyze today's aviation cyber security landscape. You will be able to differentiate real vs. perceived as well as emerging vs. future threats. You will be able to recall aviation and cyber security terminology, explain cyber security essentials, and illustrate how cyber security applies to the aircraft and its supporting systems. You will be able to evaluate threats from vulnerabilities as well as risks from threats. You will be able to recognize, examine, and compare some of the state-of-the-art and recent advances in aviation cyber security, including those related to systems in manned and unmanned aircraft, air traffic control, airlines, and airports.

ML1: Aviation Cyber-Security Regulation: Introduction to the DO-326/ED-202-Set Ecosystem

Aharon David, AFuzion Inc.

The international standards D-326A (U.S.) and ED-202A (Europe) titled "Airworthiness Security Process Specification" are the cornerstones of the "DO-326/ED-202 Set": the only Acceptable Means of Compliance (AMC) by FAA & EASA for aviation cyber-security airworthiness certification, as of 2019. The "DO-326/ED-202 Set" also includes companion documents DO-356A/ED-203A: "Airworthiness Security Methods and Considerations" & DO-355/ED-204: "Information Security Guidance for Continuing Airworthiness" (U.S. & Europe) and ED-201: "Aeronautical Information System Security (AISS) Framework Guidance" & ED-205: "Process Standard for Security Certification / Declaration of Air Traffic Management / Air Navigation Services (ATM/ANS) Ground Systems" (Europe only).

This 3-hour fast-paced course will introduce attendees to the background, structure, basic concepts and essential practices of this new, unavoidable set of standards.

MA1: Aviation Cyber-Security Regulation: The DO-326/ED-202-Set Practical Guidance & Considerations (Intermediate)

Aharon David, AFuzion Inc.

The "DO-326/ED-202 Set" provides regulatory "Guidance & Considerations" for the certification & in-service continued airworthiness for cyber-security aspects. This course provides information necessary to help minimize DO-326/ED-202-set compliance risks and costs, while also optimizing cyber-security levels for the development, deployment & in-service phases. The instructor will guide attendees through topics such as aircraft security aspects of safety, systems-approach to security, security planning, the airworthiness security process, and security effectiveness assurance. The entire ecosystem of aviation avionics software development will be revisited to include the DO-326/ED-202-Set as a new, integral member of the "classic" safety-oriented

development process including the SAE standards ARP-4761 for Safety & ARP-4754A for Systems Development, and software & Hardware development standards DO-178C & DO-254, respectively.

Monday, September 9

Session 2

MM2: DO-178C Intro for Avionics Certification, Including UAVs

Vance Hilderman, AFuzion Inc.

Avionics systems for manned and unmanned aircraft world-wide are now mandated to follow "DO-178C or ED-12CC" for literally all phases of development: Safety, Requirements, Design, Code, Test, Quality Assurance, etc. The new DO-178C was introduced in 2012, but the predecessor versions began in the 1980's. Growing from 100 to over 600 pages, this new DO-178C seems complex to follow but almost all aircraft flying today must comply with it: commercial and military planes, UAV's, and rotorcraft. First-time users often complain of costs and schedules doubling while trying to comply. But is DO-178C really complex? What are the true meanings of DO-178C? How can DO-178C be understood and applied cost-effectively the first time? What are the top mistakes when starting DO-178C projects and how to avoid them? What are the best practices for DO-178C avionics requirements, design, code, configuration management, test, QA, and certification including for UAV's? All of these topics are explained in this fast-paced Introductory DO-178C class.

Key Features

- Understanding DO-178C's basic principles: DO-178C explained for the "real world": unmanned and manned aircraft and differences between.
- Understanding DO-178C's true intent by understanding the original authors' goals
- Understanding the avionics development ecosystem of Safety, Software, Hardware and Certification
- Understanding DO-178C's five Plans, three Standards, Requirements, Design, Code, Verification, Quality Assurance, and Configuration Management
- Real-world DO-178C examples, and how to transition from DO-178B to DO-178C
- Common DO-178C initiation mistakes: UAV's and Manned aircraft.

ML2: Detect and Avoid for Unmanned Aircraft Systems

Giancarmine Fasano
The University of Naples Federico II

In the latest years, sense and avoid (SAA), or detect and avoid (DAA), has represented one of the main roadblocks to the integration of unmanned aircraft systems (UAS) operations. This course outlines and reviews architectures, technologies, and algorithms for SAA. First, starting from a discussion about what constitutes a UAS and how it is different than manned aircraft, basic SAA definitions and taxonomies are discussed. Ground-based/airborne and cooperative/non-cooperative architectures are covered. The SAA process is dissected into its fundamental tasks, which are discussed in details. Different sensing algorithms and technologies are presented, including radar and optical systems. Potential and challenges of multi-sensor-based systems and data fusion are pointed out. Techniques for conflict detection, and approaches for remotely operated or autonomous avoidance are introduced. The tutorial ends with an overview of current perspectives and recent progress relevant to SAA for UAS integration in the Air Traffic Management (ATM) system and in the framework of UAS Traffic Management (UTM) / U-Space and Urban Air Mobility.

MA2: Reliable Navigation for Unmanned Aircraft Systems

Maarten Uijt de Haag, Ohio University

This course provides a fundamental background in assured navigation for unmanned aircraft systems (UAS). It first introduces the various UAS/RPAS application domains and operational environments, UAS flight management and path planning, required performance parameters, and autonomy at the various levels of the Guidance, Navigation and Control function. Furthermore, it addresses the foundations of Global Navigation Satellite Systems (GNSS) and inertial navigation and discusses the challenges of operating in the various target environments with sole-means GNSS. Next, augmentation methods and alternative navigation methods will be discussed with a focus on guaranteeing required navigation performance

in, especially, GNSS-challenged environments. Finally, the course will talk about the role of the navigation function in surveillance, geo-fencing and relative navigation in case of swarms of UAS.

Monday, September 9

Session 3

FREE TUTORIAL

MA3: How to Write a Paper for IEEE MTT-S Journals and Navigate the Review Process

George E. Ponchak, NASA Glenn Research Center.

The careers of many people depends on their success in writing and getting their papers published. More important, the scientific process requires that scientific findings be published so that other researchers may build on your ideas or refute your findings. If authors are not able to publish their papers, then their careers are hurt and scientific progress slows and stops. Therefore, it is critical that researchers and engineers understand the process of writing and getting published their papers in reputable and cited journals and scientific conferences. However, often, author's papers are rejected because they did not understand what reviewers, Associate Editors, and Editors are looking for in a paper, even if the technical results are good. This presentation will cover the steps that an author should take to increase the acceptance rate of their papers in journals and conference. It will cover the reasons most papers are rejected and how an author should organize their paper to avoid those reasons. Lastly, it will present what steps you should take if your paper is rejected to get it published in the same journal or in a different journal.

Technical Program

Technical Program Chair:
Rafael Apaza
NASA Glenn Research Center

International Technical Program Chair:
Michael Schnell
DLR – German Aerospace Center

Welcome distinguished participants,

The 38th DASC technical program will continue in its tradition of presenting innovative research and state of the art technology development in avionics and key aviation areas. Advances in science and technology are opening new frontiers for aviation research and development, and this year's technical theme brings into focus innovation in avionics and related disciplines. Concepts which seemed impossible to achieve, not too long ago, are becoming realizable thanks to the accelerated pace at which science and technology fields are advancing. We live in an era in which technological breakthroughs are abundant, and these advances are impacting, disrupting and changing convention in ways not previously imagined. Avionics and related aerospace fields are utilizing these breakthroughs to expand current capabilities and explore new possibilities. The 2019 DASC technical program will offer contemporary topics that include applications of artificial intelligence, airspace investigation that will give access to a new breed of vehicles, unmanned aircraft technologies, advances in cyber security, autonomy and many more.

This year's technical program will present 200 papers in eight track themes. Track topics will offer presentations on new Air Traffic Management concepts including Urban Air Mobility and the management of large and small unmanned aircraft. The explosive growth of information, the amount of data generated by modern systems and the challenges associated with management, transport and confidentiality will be covered in cyber security, future communications and special topics tracks. Advances in human/autonomy teaming, modern approaches to avionics certification, software defined systems are some of the areas addressed in Human Factors and Integrated Avionics Tracks. The technical event will offer in-depth technical treatment on current research and development challenges and identify approaches for their solution. It is our sincere hope that this year's DASC technical program continues to stimulate intellectual debate, awaken curiosity and present new opportunities for furthering the state of digital avionics and aerospace.

We would like to extend our sincere appreciation to track and session chairs, conference staff and volunteers who dedicated countless hours to ensure this event lives up to the high standards it is known for. Finally, we are most thankful to all authors who journeyed to San Diego to share their recent research work with the DASC community.

On behalf of the Technical Program Committee, we extend our warm welcome.

38th DASC Conference Tracks

Air Transportation Management (ATM)
Track Chairs: Bernd Korn and Ralf Mayer

Communications, Navigation and Surveillance (CNS)
Track Chairs: Brent Phillips and Maarten Uijt de Haag

Unmanned Aircraft Systems (UAS)
Track Chair: Brandon Suarez

Integrated Modular Avionics and Technologies (IMA)
Track Chairs: Greg Saccone and Scott Crawford

Human Factors (HF)
Track Chairs: Tim Etherington and Michael Dorneich

Cyber Security and Software (CSS)
Track Chairs: Rainer Koelle and Martin Strohmeier

Special Topics (ST)
Track Chairs: Frank Aguilera and Craig Hange

UAS Traffic Management (UTM)
Track Chairs: Maria Consiglio and Yemaya Bordain

Technical Program Schedule

Tuesday, September 10

The following schedule, dates, and times are subject to change.

Time	Room Sorrento	Room San Marino	Room Capri	Room Riviera	Room Portofino	Room Marseilles	Room Las Palmas	Room Marbella
1:00 pm – 3:00 pm	**ATM-1** Flow Management 1	**UTM-1** ADS-B Applications for sUAS	**CNS-1** Surveillance-Positioning, Navigation and Timing	**UAS-1** DAA	**IMA-1** IMA Multicore Design and Test	**ST-1** Revolutionary Operational Concepts	**CSS-1** Safety and Security for Airworthiness	**ATM-8** Performance & Risk Assessment 1
3:30 pm – 5:30 pm	**ATM-2** Flow Management 2	**UTM -2** UTM TCL3 Evaluations	**CNS-2** Surveillance - AI and Machine Learning	**UAS-2** DAA in Terminal Area	**IMA-2** Certification and Safety	**ST-2** A/C Systems	**CSS-2** Safety/ Security Critical System Design and Verification	**ATM-9** Performance & Risk Assessment 2

Technical Program Schedule

Wednesday, September 11

The following schedule, dates, and times are subject to change.

Time	Room Sorrento	Room San Marino	Room Capri	Room Riviera	Room Portofino	Room Marseilles	Room Las Palmas	Room Marbella
10:30 am – 12:00 pm	**ATM-3** Trajectory Management 1	**UTM-3** Formal Methods and Collision Avoidance for sUAS	**CNS-3** Communications - Cognitive Radios and Software Defined Networks	**UAS-3** Autonomy	**IMA-3** IMA Modelling and Design 1	**ST-3** Computation Hardware	**HF-1** ATM/UTM	**ATM-10** UAM and GA
1:00 pm – 3:00 pm	**ATM-4** Trajectory Management 2	**UTM-4** UTM Technologies for Safety	**CNS-4** Future Communications	**UAS-4** CNS for UAS 1	**IMA-4** IMA Networks	**CSS-3** Secure Communication	**HF-2** Flight Deck Design	**ATM -11** Performance & Risk Assessment 3
3:30 pm – 5:30 pm	**ATM-5** Trajectory Management 3	**UTM-5** Risk, Safety, and Collision Avoidance Approaches	**CNS-5** Communications and Navigation	**UAS-5** CNS for UAS 2	**IMA-5** IMA Modelling and Design 2	**CSS-4** Safety Assurance and Dependability	**HF-3** Human/ Autonomy Teaming	**ATM-12** Information Management

Technical Program Schedule

Thursday, September 12

The following schedule, dates, and times are subject to change.

Time	Room Sorrento	Room San Marino	Room Capri	Room Riviera	Room Portofino	Room Marseilles	Room Las Palmas	Room Marbella
8:00 am – 10:00 am	**ATM-6** Aiport Operations 1	**UTM-6** sUAS Traffic Management and Deconfliction	**CNS-6** Communications - Air Traffic Management (ATM)	**UAS-6** Regulation and Standardization	**ST-4** Navigation Technology & Flight Testing	**CSS-5** Security Concepts and Solutions for UAS/UTM/UAM	**HF-4** Information Awareness and Understanding	**ATM-13** Terminal Operations 1
10:30 am – 12:30 pm	**ATM-7** Airport Operations 2	**UTM-7** UAM Concepts and Technologies	**CNS-7** Navigation	**UAS-7** sUAS DAA	**ST-5** Air Transport System Management	N/A	**HF-5** Information Modeling	**ATM-14** Terminal Operations 2

Technical Sessions

Tuesday, September 10, 1:00 PM – 3:00 PM

	1:00	1:30	2:00	2:30
ATM-1: Flow Management 1 **Session Chair: Thomas Dautermann** **Sorrento**	Building a Time-Based Flow Management Performance Dashboard Hilton Bateman ***MITRE***	Adaptation of an innovative prototype to flow management tasks in an operational context Vincent Kapp ***DSNA***	Simultaneous Traffic Management Initiatives: The Double Delay Problem Frederick Wieland ***Intelligent Automation Inc.***	A Scheduling Algorithm Compatible with a Distributed Management of Arrivals in the National Airspace System Alexander Sadovsky ***NASA***
UTM-1: ADS-B Applications for sUAS **Session Chair: Robert Atkinson** **San Marino**	The Impact of Multipath Propagation on Cooperative Traffic Conflict Detection among Drones Lukas Marcel Schalk ***German Aerospace Center (DLR)***	Variable-Power ADS-B for UAS Brendan Duffy ***National Institute of Aerospace***	Improving Autonomy in GNSS-Challenging Environments by Multi-UAV Cooperation Flavia Causa ***University of Naples Federico II***	sUAS Swarm Navigation using Inertial, Range Radios and Partial GNSS Maarten Uijt de Haag ***TU Berlin***
CNS-1: Surveillance - Positioning, Navigation and Timing **Session Chair: Thomas Gräupl** **Capri**	OpenSky Report 2019: Analysing TCAS in the Real World using Big Data Mattias Schaefer ***University of Kaiserslautern & SeRo Systems GmbH***	Implementation of abnormal flight monitoring employing CMU database customization Guihong Wen ***Shandong Airlines***	Airborne Radar for sUAS Sense and Avoid George Szatkowski ***NASA Langley Research Center***	LDACS-Based Non-cooperative Surveillance Multistatic Radar Design and Detection Coverage Assessment Alexandra Filip-Dhaubhadel ***German Aerospace Center (DLR)***
UAS-1: DAA **Session Chair: Stephen Cook** **Riviera**	ACAS Xu: Integrated Collision Avoidance and Detect and Avoid Capability for UAS Michael P Owen ***MIT Lincoln Laboratory***	Detect and Avoid (DAA) Alerting Performance Comparison: CPDS vs. ACAS-Xu Timothy Grebe ***General Atomics - Aeronautical Systems***	The Apollonian Paradigm in Cockpit and Ground-Based Pilot Display Design Eric Theunissen ***Netherlands Defence Academy***	Advanced Functions for Lowering Nuisance Alerts in a DAA System: Implementation and Performance Evaluation in Real-Time Human-in-the-Loop Testing Gianluca Corraro ***CIRA***
IMA-1: IMA Multicore Design and Test **Session Chairs: Michael R. Jackson & Suzanne Hawkins** **Portofino**	Task Allocation of Safety-Critical Applications on Reconfigurable Multi-Core Architectures with an Application on Control of Propulsion System Thanakorn Khamvilai ***Georgia Institute of Technology***	Interference Analysis of Multicore Shared Resources with a commercial avionics RTOS Hyungshin Kim ***Chungnam National University***	Test platform for autopilot system embedded in a model of multi-core architecture using X-Plane flight simulator Jose M Magalhaes Junior ***Georgia Institute of Technology***	The Power of Dense Silicon: Trending Features and Support at Chip-Level Enabling New Levels of Integration and Dependability for Avionics Systems Jyotika Athavale ***Intel Corp***
ST-1: Revolutionary Operational Concepts **Session Chair: Gano B Chatterji** **Marseilles**	The Future of Drones and their Public Acceptance Miquel Macias ***Technical University of Catalonia (UPC)***	Simulation Tool to Study High Performance Avionic for Active Debris Removal Missions Michael Juillard ***EPFL***	Risk Level Analysis for Hazard Area During Commercial Space Launch Oliver Bojorquez ***San Diego State University***	An improved genetic algorithm for flight test subject allocation problem Yibo Liu ***Shanghai Jiao Tong University***
CSS-1: Safety and Security for Airworthiness **Session Chair: Michael Durling** **Las Palmas**	A Flexibility Framework for OEM Certification of Software Modifications in Aircraft Systems Tatiana M. M. Souza ***Embraer***	Attack Injection into Avionic Systems through Application Code Mutation Aliénor Damien ***Thales AVS & LAAS-CNRS***	Research on Airworthiness certification of Civil aircraft based on Digital virtual flight test technology Xiaoqin Liu ***Shanghai Jiao Tong University***	Tracing Threads of Safety-Critical Functions for Certifying Airworthiness of Military Aircraft Eu-Teum Choi ***Gyeongsang National University***
ATM-8: Performance & Risk Assessment 1 **Session Chair: Alexander Kuenz** **Marbella**	Guaranteeing Safety for Neural Network-Based Aircraft Collision Avoidance Systems Kyle D Julian ***Stanford University***	Conflict-Aware Flight Planning for Avoiding Near Mid-Air Collisions Saswata Paul ***Rensselaer Polytechnic Institute***	Analysis and Preliminary Results of a Concept for Detect and Avoid in the Cockpit Victor Carreno ***Compass Engineering***	Real-Time Mitigation of Loss of Separation Events using Reinforcement Learning Megan Hawley ***Honeywell***

Technical Sessions

Tuesday, September 10, 3:30 PM – 5:30 PM

	3:30	4:00	4:30	5:00
ATM-2: Flow Management 2 **Session Chair: Amal Srivastava** **Sorrento**	Enhanced Demand and Capacity Balancing based on Alternative Trajectory Options and Traffic Volume Hotspot Detection Marc Melgosa ***Technical University of Catalonia***	Integrated Trajectory-Based Operations for Traffic Flow Management in an Increasingly Diverse Future Air Traffic Operations Paul Lee ***NASA Ames Research Center***	Machine Learning Application in Air Traffic Management Resiliency based on Capacity Regulations Rasoul Sanaei ***German Aerospace Center (DLR)***	An Improved SVM Model for Flight Delay Prediction Weinan Wu ***Beihang University***
UTM-2: UTM TCL3 Evaluations **Session Chair: Victor Carreno** **San Marino**	Flight Demonstration of Unmanned Aircraft System (UAS) Traffic Management (UTM) at Technical Capability Level 3 Arwa S Aweiss ***NASA Ames Research Center***	UAS Traffic Management (UTM) Technical Capability Level 3 (TCL3) Flight Demonstration: Concept Tests and Results Jeffrey Homola ***NASA Ames Research Center***	Effectiveness of Redundant Communications Systems in Maintaining Operational Control of Small Unmanned Aircraft Jaewoo Jung ***NASA Ames Research Center***	
CNS-2: Surveillance - AI and Machine Learning **Session Chair: Shoichi Hanatani** **Capri**	Surface Location Ambiguous Analysis and Suppression Algorithm Research based on multilateration Fengxun Gong ***Civil Aviation University of China***	Gaussian Mixture PHD Filter with State-Dependent Jump Markov System Models Dohyeung Kim ***Purdue University - West Lafayette***	Traffic-aware Dynamic Controller Placement using AI techniques in SDN-based aeronautical networks Doanh Kim Luong ***University of Bradford***	
UAS-2: DAA in Terminal Area **Session Chair: Eric Theunissen** **Riviera**	Applications of Conflict Probes for Detect and Avoid Systems Timothy Grebe ***General Atomics - Aeronautical Systems***	Terminal Area Considerations for UAS Detect and Avoid Keith D Hoffler ***Adaptive Aerospace Group***	Analysis of Alerting Criteria and DAA Sensor Requirements in Terminal Area Hyeonwoong Lee ***Inha University & Aerospace Control & System Lab***	Safety Assessment Process for UAS Ground-Based Detect And Avoid Chris Wargo ***Mosaic ATM, Inc.***
IMA-2: Certification and Safety **Session Chair: Laurence H Mutuel** **Portofino**	Potential Hazardous Elements Mining for Task Synthesis Safety Analysis in IMA System Miao Wang ***Shanghai Jiao Tong University***	Sim: A Contract-Based Programming Language for Safety-Critical Software Tuur Benoit ***Siemens Industry Software***	Self-Healing Data Streams Using Multiple Models of Analytical Redundancy Shigeru Imai ***Rensselaer Polytechnic Institute***	Challenges of certification and integration of new hardware into legacy avionics architectures Andreas Zeitler ***Airbus Defence & Space***
ST-2: A/C Systems **Session Chair: Hanbong Lee** **Marseilles**	Overview of Electrical Backup Power Supply Systems for Air Navigation Facilities based on the Energy Storage Technology Jan Leuchter ***University of Defence***	ARINC 818 Revision 3 Paul Grunwald ***Great River Technology***	Emerging COTS-Based Computing Platforms in Avionics Need a New Assurance Concept Håkan Forsberg ***Mälardalen University***	A Conceptual Intelligent aircraft system Joe Yin ***Aviage Systems***
CSS-2: Safety/Security Critical System Design and Verification **Session Chair: Nils Mäurer** **Las Palmas**	Architectural and Behavioral Analysis for Cyber Security Kit Siu ***GE Research***	Requirements-based Automated Test Generation for Safety Critical Software Meng Li ***General Electric Research***	Design Optimization of Time-Triggered Ethernet based on Routing and Scheduling Strategy Zhong Zheng ***Beihang University***	Safe and Secure Data Fusion - Use of MILS Multicore Architecture to Reduce Cyber Threats Patrick Huyck ***Green Hills Software***
ATM-9: Performance & Risk Assessment 2 **Session Chair: Paul Diffenderfer** **Marbella**	World-Wide Air Traffic: Generic Operations for Busy Airports Alexander Kuenz ***German Aerospace Center (DLR)***	Learning Terminal Airspace Traffic Models from Flight Tracks and Procedures Soyeon Jung ***Stanford University***	Towards Precise Performance Measurements in Live Air Traffic Validation Exercises Michael Finke ***German Aerospace Center (DLR)***	A Supernetwork Model for ATM System Reliability Analysis Kaiquan Cai ***Beihang University***

Technical Sessions

Wednesday, September 11, 10:30 AM – 12:00 PM

	10:30	11:00	11:30
ATM-3: Trajectory Management 1 **Session Chair: Hilton Bateman** **Sorrento**	4D Trajectory Based Operations - Speed Control Interoperability Michael R. Jackson ***Honeywell Aerospace Advanced Technology***	Generating Realistic Reroutes to Assess Traffic Impact of Blocked Airspaces Amal Srivastava ***MITRE***	Deep Learning Techniques for Improving Estimations of Key Parameters for Efficient Flight Planning Mevlüt Uzun ***Istanbul Technical University & ITU Aerospace Research Center***
UTM-3: Formal Methods and Collision Avoidance for sUAS **Session Chair: Paul C Wood** **San Marino**	Integration and Flight Test of Small UAS Detect and Avoid on A Miniaturized Avionics Platform Liling Ren ***GE Global Research***	A Learning-Based Guidance Selection Mechanism for a Formally Verified Sense and Avoid Algorithm Swee Balachandran ***National Institute of Aerospace***	
CNS-3: Communications - Cognitive Radios and Software Defined Networks **Session Chair: Dongsong Zeng** **Capri**	Seamless handover in SDN-Based Future Avionics Networks with Network Coding and LISP Mobility Protocol Doanh Kim Luong ***University of Bradford***	Spectrum and Operational Efficiency Optimization Using Airborne Communication Network Capacity Modeling for Cognitive Radios Joe Zambrano ***LASSENA Labs, École de Technologie Supérieure***	Learning Based Spectrum Hole Detection for Cognitive Radio Communication Zhengjia Xu ***Cranfield University***
UAS-3: Autonomy **Session Chair: Keith D Hoffler** **Riviera**	Realizing the Promise of Artificial Intelligence for Unmanned Aircraft Systems through Behavior Bounded Assurance Prakash Sarathy ***Northrop Grumman Aerospace Systems***	An Improved Firefly Algorithm used to Location Selection of Distribution Center for Logistics UAV Xinfei Li ***Nanijng University of Aeronautics and Astronautics***	
IMA-3: IMA Modelling and Design 1 **Session Chair: Martin Halle** **Portofino**	Integrated Modular Avionics System Design Based on Formal Dynamic Organization Miao Wang ***Shanghai Jiao Tong University***	Cyber security concerns regarding federated, partly IMA and full IMA implementations Serdar Uzumcu ***HAVELSAN***	Avionics Architecture Design for a Future Generation Fighter Aircraft Zeynep Seda Mor ***Istanbul Technical University & Turkish Aerospace Industries***
ST-3: Computation Hardware **Session Chair: Gano B Chatterji** **Marseilles**	Empirical Bounds of Multicore Cache Interference for Real-Time Schedulability Analysis Srini Srinivasan ***nHansa Inc***	Micro-Architectural support for High Availability of NoC based MP-SoC Ritika Singh ***Indian Institute of Science***	FPGA-Based Real Time Wide Band Radar Waveform Simulator Gokhan Kara ***Scientific and Technological Research Council of Turkey (Tubitak)***
HF-1: ATM/UTM **Session Chair: Lynda J Kramer** **Las Palmas**	Bad Weather Highlighting: Advanced Visualization of Severe Weather and Support in Air Traffic Control Displays Oliver Ohneiser ***German Aerospace Center (DLR)***	Investigation of communications involved in near-term UAM operations Jillian Keeler ***NASA Ames Research Center***	Human-in-the-loop AI: Requirements on future (unified) air traffic management systems Jonas Lundberg ***Linköping University***
ATM-10: UAM and GA **Session Chair: Robert Geister** **Marbella**	Learning an Urban Air Mobility Encounter Model from Expert Preferences Sydney M Katz ***Stanford University, USA***	Measured Impact of ADS-B In Applications on General Aviation and Air Taxi Accident Rates Daneil W Howell ***Regulus Group, LLC, USA***	Evaluation of Using Mobile Devices to Streamline General Aviation Instrument Flight Rules Operations Paul Diffenderfer ***The MITRE Corporation***

Technical Sessions

Wednesday, September 11, 1:00 PM – 3:00 PM

	1:00	1:30	2:00	2:30
ATM-4: Trajectory Management 2 **Session Chair: Paul Diffenderfer** **Sorrento**	Improving Climb Performance Prediction in Air Traffic Control with Machine Learning and Full Flight Simulator Verification Matthias Poppe ***DFS Deutsche Flugsicherung GmbH***	En-route arrival time prediction via locally weighted linear regression and interpolation HongAh Chai ***Korea Aerospace University***	Real-time Short-Term Trajectory Prediction Based on GRU Neural Network Ping Han ***Civil Aviation University of China***	Simulating Fleet Noise for Notional UAM Vehicles and Operations in New York Patricia Glaab ***NASA Langley Research Center***
UTM-4: UTM Technologies for Safety **Session Chair: Jeffrey Homola and Ngaire Underhill** **San Marino**	Safe2Ditch Steer-to-Clear Development and Flight Testing Bryan J Petty ***Analytical Mechanics Associates***	Fail-Safe, Fail-Secure Experiments for Small UAS and UAM Traffic in Urban Airspace Sam B. Siewert ***Embry Riddle Aeronautical University & University of Colorado Boulder***	Simulation of real-time routing for UAS Traffic Management with Communication and Airspace Safety Considerations Ziyi Zhao ***Syracuse University***	Integrated Routing and Charging Scheduling for Autonomous Electric Aerial Vehicle System Jun Chen ***San Diego State University***
CNS-4: Future Communications **Session Chair: Brent Phillips** **Capri**	L-band Digital Aeronautical Communications System (LDACS) - Technical Validations in SESAR2020 Christoph Rihacek ***Frequentis AG***	Potential Future Aviation Communication Technologies M. Cenk Erturk ***University of South Carolina***	Towards Modern Air-to-Air Communications: the LDACS A2A Mode Miguel Angel ***German Aerospace Center (DLR)***	Re-envisioning Air/Ground Communications for Aviation Dongsong Zeng ***MITRE***
UAS-4: CNS for UAS 1 **Session Chair: Daniel M. Mielke** **Riviera**	Research on Flight Management of Unmanned Civil Freight Aircraft Hongyu Li ***Shanghai Jiao Tong University***	Evaluation of RADAR Altimeter-Aided GPS for Precision Approach using Flight Test Data Andrew Videmsek ***Ohio University***	Light Sport Aircraft Auto-Land System Jan Vlk ***Brno University of Technology***	On-Board System Concept for Drones in the European U-space Robert Geister ***German Aerospace Center (DLR)***
IMA-4: IMA Networks **Session Chairs: Björn Annighöfer & Todd Lovell** **Portofino**	Improving End-To-End Delay Analysis for TT and RC Traffic of TTEthernet in DIMA Systems Xuan Zhou ***Beihang University***	A SDN-based Traffic Bandwidth Allocation Method for Time Sensitive Networking in Avionics Ershuai Li ***Beihang University***	Bandwidth Management in Avionic Networks based on SDN Paradigm and ML Techniques Fouad Benamrane, ***University of Bradford***	A Topology-based Decomposition Approach for Time-Triggered Message Scheduling in Network-on-chip Yafei Shi ***Beihang University***
CSS-3: Secure Communication **Session Chairs: Rainer Koelle & Martin Strohmeier** **Marseilles**	Evaluation of the LDACS Cybersecurity Implementation Nils Mäurer ***German Aerospace Center (DLR)***	Using distributed ledger technology to mitigate challenges with flight information exchange Ramakrishna Raju ***KBRWyle***	When Air Traffic Management Meets Blockchain Technology: a Blockchain-based concept for securing the sharing of Flight Data Marina Dehez Clementi ***Macquarie University & ISAE Supaero***	An AI based Approach to Secure SDN Enabled Future Avionics Communications Network Against DDoS Attacks Muhammad Ali ***University of Bradford***
HF-2: Flight Deck Design **Session Chair: Stephen Whitlow** **Las Palmas**	Virtual cockpit instruments displayed on head-worn displays - Capabilities for future cockpit design Johannes M Ernst ***German Aerospace Center (DLR)***	Multi-Touch Touch Screens on the Flight Deck: The Impact of Display Location, Display Inclination Angle and Gesture Type on Pilot Performance Sonia Dodd ***Honeywell Aerospace***	An assistance system for pilot at landing approach Tatsuo Minohara ***Chiba University of Commerce***	A Method of Civil Aircraft Cockpit Integrated Alert Information Modeling and Evaluation Based on MBSE Zhengjie Cheng ***Shanghai Jiao Tong University & School of Aeronautics and Astronautics***
ATM-11: Performance & Risk Assessment 3 **Session Chair: Max Friedrich** **Marbella**	Analyzing Airspace Data with RACE Peter Mehlitz ***SGT Inc. / NASA Ames Research Center***	Application of Machine Learning for Aviation Safety Risk Metric Firdu Bati ***FAA & University of Maryland University College***	Analysis of Accrued Delay During and Across Flights Christopher Chin ***SGT, Inc. at NASA Ames Research Center***	Optimal Aircraft Metering during Space Launches Rachael E Tompa ***Stanford University***

Technical Sessions

Wednesday, September 11, 3:30 PM – 5:30 PM

	3:30	4:00	4:30	5:00
ATM-5: Trajectory Management 3 **Session Chair: Rany Azzi** **Sorrento**	Cognitive Work Analysis of the Sectorless ATM Concept with the Introduction of Teams Kevin Capiot ***Delft University of Technology & German Aerospace Center (DLR)***	Study on Aircraft Generalized conflict resolution and Trajectory Optimization with Multiple Constraint in Complex Airspace Environment Gang Xiao ***Shanghai Jiao Tong University***	China Initial 4D Flight Trial Evaluation Daozhong Feng ***Beihang University***	
UTM-5: Risk, Safety, and Collision Avoidance Approaches **Session Chair: Cesar Munoz** **San Marino**	ACAS sXu: Robust Decentralized Collision Avoidance for Small Unmanned Aircraft Systems Luis E Alvarez ***MIT Lincoln Laboratory***	Probabilistic Determination of Maximum Safe Altitudes for Unmanned Traffic Management Aaron McFadyen ***Queensland University of Technology***	Ground Risk Assessment Service Provider (GRASP) Development Effort as a Supplemental Data Service Provider (SDSP) for Urban Unmanned Aircraft System (UAS) Operations Ersin Ancel ***NASA Langley Research Center***	Urban air mobility and manned eVTOLs: safety implications Jasenka Rakas ***University of California Berkeley***
CNS-5: Communications and Navigation **Session Chair: Maarten Uijt de Haag** **Capri**	Real-Time Testing of GNSS Based Curved and Continuous Descending Approach for General Aviation Aircraft Umberto Ciniglio ***Italian Aerospace Research Centre***	Enabling Air-to-Air Wideband Channel Measurements between Small Unmanned Aerial Vehicles with Optical Fibers Dennis Becker ***German Aerospace Center (DLR)***	Comparison of BS-MAC and C-MAC for WAIC Yuanjun Zuo ***Beihang University***	
UAS-5: CNS for UAS 2 **Session Chair: Anuja Verma** **Riviera**	Circumventing the Random Access Channel: New Concepts for Accessing a Command & Control Link for Unmanned Aircraft Daniel M. Mielke ***German Aerospace Center (DLR)***	Adaptive UAS Route Planner Based Upon Evidence Accrual Kathleen A Kramer ***University of San Diego***	Cost-Effective NLOS Detection for Privacy Invasion Attacks by Consumer Drones Yifan Tian ***Embry-Riddle Aeronautical University***	
IMA-5: IMA Modelling and Design 2 **Session Chairs: Mark L Darnell & Joachim Hochwarth** **Portofino**	Design space exploration of avionics architectures for Future Launcher Evolutions Martin Halle ***Hamburg University of Technology & TUHH/FST***	Challenges and Ways Forward for Avionics Platforms and their Development in 2019 Björn Annighöfer ***University of Stuttgart***	Semi-automated deployment of a High-lift system on IMA using the Selective Middleware Darbaz Nawzad Darwesh ***University of Stuttgart***	System Effects Test Example for Atmospheric Radiation Environment Laura Dominik ***Honeywell***
CSS-4: Safety Assurance and Dependability **Session Chair: James Lopez** **Marseilles**	Using Quantifier Elimination to Enhance the Safety Assurance of Deep Neural Networks Hao Ren ***Honeywell International Inc***	Fault Assessment of Safety-Critical Applications on Reconfigurable Multi-Core Architecture Thanakorn Khamvilai ***Georgia Institute of Technology***	A Set of Requirements for Certification of Airborne Military Software Johnny Marques ***Brazilian Aeronautics Institute of Technology, Brazil***	Collaborative Model Connectivity for Avionics Systems Design Carlos C. Insaurralde ***Bristol Robotics Laboratory & University of the West of England***
HF-3: Human/Autonomy Teaming **Session Chair: Jan Boril** **Las Palmas**	A Novel Human Machine Interface to Support Supervision and Guidance of Multiple Highly Automated Unmanned Aircraft Max Friedrich ***German Aerospace Center (DLR)***	Simulation Platform for Reduced Crew Operations - A Case Study Helge Lenz ***German Aerospace Center (DLR)***	Interaction Paradigms: from Human-Human Teaming to Human-Autonomy Teaming Güliz Tokadlı ***Iowa State University***	The Evaluation of a Playbook Interface for Human-Autonomy Teaming in Single Pilot Operations Güliz Tokadlı ***Iowa State University***
ATM-12: Information Management **Session Chair: Rainer Koelle** **Marbella**	Usage of machine learning algorithms for Flexible Use of Airspace Serdar Uzumcu ***HAVELSAN***	Future space traffic integration by AFUAS SWIMming Frank Morlang ***German Aerospace Center (DLR)***	Doorway to the United States: An Exploration of Customs and Border Protection Data Philippe Monmousseau ***French National School of Civil Aviation & Georgia Institute of Technology***	

Technical Sessions

Thursday, September 12, 8:00 AM – 10:00 AM

	8:00	8:30	9:00	9:30
ATM-6: Airport Operations 1 **Session Chair: Alexander Kuenz** **Sorrento**	Modeling Deicing Operations in Departure Scheduling using Fast Time Simulation Zhifan Zhu ***Stinger Ghaffarian Technologies Inc. at NASA Ames Res Ctr***	Fast-Time Simulation for Evaluating the Impact of Estimated Flight Ready Time Uncertainty on Surface Metering Hanbong Lee ***NASA Ames Research Center***	Simulation-Based Deep Reinforcement Learning Applied to Airport Surface Movement Planning Alex Tien ***The MITRE Corporation***	A Tactical Scheduler for Surface Metering under Minimum Departure Interval Restrictions Yeonju Eun ***Korea Aerospace Research Institute***
UTM-6: sUAS Traffic Management and Deconfliction **Session Chair: Swee Balachandran** **San Marino**	Air Traffic Deconfliction Using Sum Coloring Raúl Sáez ***Technical University of Catalonia***	Improving UAV Trafic Management Using Fog Computing Massood Towhidnejad ***Embry-Riddle Aeronautical University***	Path Planning for Critical ATM/UTM Areas Scott H James ***Noblis***	An Improved Far-Field Small Unmanned Aerial System Optical Detection Algorithm Chester V Dolph ***NASA***
CNS-6: Communications - Air Traffic Management (ATM) **Session Chair: Dongsong Zeng** **Capri**	Analysis of Wireless Connectivity Applications at Airport Surface Shahid Ayub ***Cranfield University***	Joint Positioning-Communications System Design and Experimental Demonstration Andrew Herschfelt ***Arizona State University***	Managing aircraft mobility in a context of the ATN/IPS network Alexandre Hoang ***French Civil Aviation University & Collins Aerospace***	An Air Traffic Management Data Traffic Pattern for Aeronautical Communication System Evaluations Thomas Gräupl ***German Aerospace Center (DLR)***
UAS-6: Regulation and Standardization **Session Chair: Kevin Niewoehner** **Riviera**	SORA Application to Large RPAS Flight Plans Tyler D Miles ***General Atomics Aeronautical Systems Inc.***	Application of US Detect and Avoid Standards in European Airspace Timothy Grebe ***General Atomics - Aeronautical Systems***	An Evaluation of Airport Traffic Airspace Use by Terminal Airspace Class Ngaire Underhill ***MIT Lincoln Laboratory***	
ST-4: Navigation Technology & Flight Testing **Session Chair: Jaewoo Jung** **Portofino**	Application of AI in the NAS: The Rationale for AI-enhanced Airspace Management Ronald L Stroup ***Federal Aviation Administration***	Geospatial Object Detection using Machine Learning-Aviation Case Study Durga Prasad Dhulipudi ***Honeywell & International Institute of Information Technology Hyderabad***	Comparison of Flight-Planning Algorithms in View of Certification Requirements Pavel Paces ***Czech Technical University in Prague***	Cognitive Decision Support System for Avionics Analytics Carlos C. Insaurralde ***Bristol Robotics Laboratory & University of the West of England***
CSS-5: Security Concepts and Solutions for UAS/UTM/UAM **Session Chair: Matthias Schaefer** **Marseilles**	Performance evaluation of a new secure routing protocol for UAV Ad hoc Network Jean Aime Maxa ***ENAC & Airbus***	Security Challenges of Vehicle Recovery for Urban Air Mobility Contexts Jean Aime Maxa ***ENAC & Airbus***	Detection of Clone Attacks in Swarms of Autonomous Aircraft Systems - Position Paper – Damien Sauveron ***University of Limoges***	Cyber Awareness Trends in Avionics Erik Blasch ***Air Force Research Lab***
HF-4: Information Awareness and Understanding **Session Chair: Sonia Dodd** **Las Palmas**	Intelligent Modules and Advanced Displays to Support Pilot Airplane System State Awareness Stephen Whitlow ***Honeywell Aerospace Advanced Technology***	Increasing Pilot's Understanding of Future Automation State - An Evaluation of an Automation State and Trajectory Prediction System Tim Etherington ***Rockwell Collins & NASA Langley Research Center***	Information Overload in Tactical Aircraft Ales Svoboda ***Czech Air Force***	Flight Deck Human Factors Issues in Vertical and Lateral Deviations during North Atlantic Flight Operations Divya Chandra ***USDOT Volpe Center***
ATM-13: Terminal Operations 1 **Session Chair: Hilton Bateman** **Marbella**	Analyzing Required Time of Arrival Performance to Low Altitude Meter Fixes Michael D McPartland ***MIT Lincoln Laboratory***	Policy Optimization in Automated Point Merge Trajectory Planning: An Artificial Intelligence-based Approach Man Liang ***University of South Australia***	Arrival Scheduling Algorithm in Terminal Airspace Soyeun Kim ***Korea Aerospace Research Institute***	Evaluation of Flight Efficiency for Stockholm Arlanda Airport Arrivals Anastasia Lemetti ***Linköping University***

Technical Sessions

Thursday, September 12, 10:30 AM – 12:30 PM

	10:30	11:00	11:30	12:00
ATM-7: Airport Operations 2 **Session Chair: James Kuchar** **Sorrento**	Integrated Application of the Collaborative Trajectory Options Program Philip Smith ***The Ohio State University***	Assessment of Segmented Standard Taxi Route Procedure to Integrate Remotely Piloted Aircraft Systems at Civil Airports using Fast-Time Simulation Nikolai Okuniek ***German Aerospace Center (DLR)***	An algorithm to determine airport runway usage/configuration based on aircraft trajectories Raúl Torres ***Universidad de Valladolid***	
UTM-7: UAM Concepts and Technologies **Session Chairs: Raúl Sáez Garcia** **San Marino**	Promoting Autonomy Design and Operations in Aviation Stephen Cook ***Northrop Grumman Corporation***	Urban Area Unmanned Aerial Systems Sensor Capabilities for Ensuring Ground Hazards Safety Xavier Bouyssounouse ***NASA Ames Research Center***	City-ATM - Demonstration of Traffic Management in Urban Airspace in case of bridge inspection Stefan Kern ***German Aerospace Center (DLR)***	
CNS-7: Navigation **Session Chair: Ronald L Stroup** **Capri**	Enabling LPV for GLS equipped aircraft using an airborne SBAS to GBAS converter Thomas Dautermann ***German Aerospace Center (DLR)***	A Multimode Visual-Inertial Navigation Method for Fixed-wing Aircraft Approach and Landing in GPS-denied and Low Visibility Environments Xiaogang Song ***School of Computer Scicence and Engineering, Xi'an University of Technology***	A Fast ILS Electromagnetic Covering Analysis Method for New Obstacles Impact at Expanded Airport Qianqian Wang ***Nanjing University of Aeronautics and Astronautics***	Comparison of Simple DME/DME Positioning Method and Augmentation Using Extended Kalman Filtering, Unscented Kalman Filtering and Particle Filtering Petr Makula ***University of Defence***
UAS-7: sUAS DAA **Session Chair: Luis E Alvarez** **Riviera**	A Multiple Hypothesis Tracking Approach to Collision Detection for Unmanned Aerial Vehicles Francesco d'Apolito ***AIT Austrian Institute of Technology GmbH***	Electro-Optical Sensor Selection based on Flight Test for Detect-and-Avoid in Phase Two UAS Jaehyun Lee ***Korea Advanced Institute of Science and Technology***	Experimental assessment of vision-based sensing for small UAS sense and avoid Roberto Opromolla ***University of Naples Federico II***	Drone Navigation and Avoidance of Obstacles Through Deep Reinforcement Learning Ender Çetin ***Universitat Politècnica de Catalunya, BarcelonaTech***
ST-5: Air Transport System Management **Session Chair: Jeffrey Homola** **Portofino**	A Comparative Study of Two Complex Ontologies in Air Traffic Management Eduard Gringinger ***Frequentis AG***	An adaptive MILS Architecture for Resilient Remote Tower Communication Services Wolfgang Kampichler ***Frequentis AG***	Runway Excursions: Bearing Strength Measurement Concerns Ludek Cicmanec ***University of Defense Brno***	A Model for Spectrum Valuation Susan Hanson ***The MITRE Corporation***
HF-5: Information Modeling **Session Chair: Güliz Tokadlı** **Las Palmas**	Human-Centered Design of a Rotorcraft Cockpit System for Offshore Standard Approach Procedures (OSAP) Emmanuel Letsu-Dake ***Honeywell Aerospace***	Image-derived ground visibility for aviation (Pilot Study) Daniela Kratchounova ***Federal Aviation Administration & Civil Aerospace Medical Institute***	Detecting Hazardously Misleading Information on Safety-Critical Displays Bing Wang ***N/A***	Usability Evaluation of Indicators of Energy-Related Problems in Commercial Airline Flight Decks Emory T Evans Jr ***NASA***
ATM-14: Terminal Operations 2 **Session Chair: Amal Srivastava** **Marbella**	Closely Spaced Parallel Operations (CSPO) Dependent Departures: Concept and Initial Assessments Ralf H Mayer ***The MITRE Corporation***	Safety Study of Closely Spaced Parallel Operations Utilizing Paired Approach Rany Azzi ***Federal Aviation Administration***	Measuring Operational Air Navigation System Performance in the 21 st Century Rainer Koelle ***Eurocontrol, Performance Review Unit***	

DASC 39

Digital Avionics Systems Conference

San Antonio, Texas, USA – September 2020

CALL FOR PAPERS

IMPORTANT DATES

Submission Deadlines

March 6, 2020
Abstract Submission

March 27, 2020
Notification of Acceptance

May 22, 2020
Full Paper Submission
(If Editorial Review is Requested)

July 17, 2020
Final Paper Submission Deadline

Conference Dates

September 2020
Tutorials

September 2020
Conference

The 39th Digital Avionics Systems Conference (DASC) promises to continue its rich tradition as the preeminent R&D Conference in the field of digital avionics offered.

In addition to the increasingly diverse background of attendees and relevant technical topics discussed, the conference offers a conducive environment for educational and recreational opportunities for everyone to explore. We are positive that you will have a memorable and educational experience at the 39th DASC.

CONFERENCE THEME

Certifiable and Secure Artificial Intelligence in Safety-Critical Air Transportation Systems.

The application of Artificial Intelligence (AI) in aviation will have an unprecedented transformational impact. However, despite advances in robust, high performance AI with new capabilities, application to safety-critical air transportation systems presents unique challenges. Associated risks, challenges and certification requirements of aeronautical systems implementing AI-technologies need to be well understood and addressed. The 39th DASC will explore critical-to-quality essentials for AI systems in safety-critical air transportation systems. Conference participants are invited to submit cutting edge research papers and exchange diverse perspectives on application of certifiable and secure AI in the air transport system considering the safety-criticality of the domain. Original research on technical challenges, gaps and approaches to enhance traditional ATM, UTM, CNS, IMA, space systems, software and human factors are also invited.

Areas of emphasis will include:

- Explainable artificial intelligence for decision-making.
- AI use cases, concepts and technology enablers for air transport systems.
- Validation, verification and certification.
- Adaptive, integrated secure networks – use of deep learning in cyber security.
- Safety assurance and human factors.
- Integration of autonomous vehicles into the airspace.
- AI-driven Cognitive assistants, Digital Copilots and Robotic Copilot to reduce workload, augment performance and improve safety.
- Multi-modal interaction including speech recognition and synthesis for cockpit and Air Traffic Management.

Other Topics

The 39th DASC will continue to offer opportunities to publish and present on a wide range of topics of interest to the avionics technology community (see next page).

Papers, Panels, Education and Workshops

The Technical and Professional Education Programs will incorporate technical research papers and relevant tutorials from international Researchers, Innovators, Engineers, Users, and Designers. Plenary panel discussions and keynote presentations by Leaders in Industry, Government and Academia will discuss topics that are shaping international developments.

Please check our website for periodic updates: **http://www.dasconline.org**.

DATC AIAA Digital Avionics Technical Committee

IEEE Advancing Technology for Humanity

AESS

Co-sponsor AIAA The World's Forum for Aerospace Leadership

TECHNICAL PROGRAM

Air Traffic Management (ATM) Machine Learning & Automation

Application of AI and machine learning to leverage distributed knowledgebase, fusion of sensor data from multiple airborne and ground systems to address ATM challenges; predictive automation aids to reduce controller and pilot workload.

ATM – Airspace & Spectrum management

Automation and cognitive radios to support dynamic sectors and mitigate escalating spectrum demand; Traffic flow management; spacing, sequencing, and scheduling; command and control technologies for future ATM; separation management; unmanned aircraft system traffic management (UTM) inspired air traffic management for new entrants; simulation and modeling needs.

Unmanned Aircraft Systems (UAS)

Issues, challenges, and opportunities arising from emerging drone and autonomy technology developments; UAS system design, applications, and mission optimization. Of significant interest are concepts for integrating UAS into both controlled and uncontrolled airspace.

Communications, Navigation, and Surveillance and Information Networks (CNS)

Role of machine learning and AI in navigation, and surveillance; distributed knowledgebase enabled by broadband communications; on-board and ground-based CNS systems for all vehicles and services. Emerging fields include: surface wireless networks; air/ground datalink; satellite-based CNS; optical communications; global navigation satellite systems (GNSS); alternative positioning navigation and timing (APNT); performance-based navigation; and, surveillance systems for ATM and collision avoidance; self-forming / healing networks; quality of service (QoS) driven software defined networks.

Cyber, Systems, and Software (CSS) Impact of "Connected"

Design, testing, verification and validation, and certification of large complex aviation systems with multiple design assurance levels; avionics cyber security; cyber-physical security threat assessment and mitigation development; airborne network security and risk; software assurance versus regular security patches. Multiple Independent Levels of security safety (MILS); physical and virtual system firewalls; AI-based deep packet inspection; data security for shared data buses; operating system security; virtual versus physical domain separation.

Integrated Modular Avionics (IMA)

System resources and performance allocation, configuration, integration, verification and certification processes and tools; model-based system engineering; scalability; inter-partition interference on multicore processors; assessing system demand and resource availability; mitigation of common mode failures; system maintenance; wired and wireless communication; health monitoring; optimization techniques; architectures including open interface standards; operating systems; ARINC-653; alternate API solutions, communication standards, use of Commercial-Off-The-Shelf (COTS) technologies; modularity vs. scalability.

Human Factors (HF)

Developing AI behavior that is unambiguous or predictable to human operators and demonstration that such systems meet their intended function in all foreseeable operating conditions. Issues on human interaction with automation such as mode awareness, trust in automation, roles and responsibilities, flight deck displays and controls, and decision support tools; assessment and modeling of human performance; and methods for avoiding the presentation of hazardously misleading information.

Special Topics (ST)

Includes topics that do not fit the above areas or are recently emerging from new technical innovations, such as but not limited to: emerging systems architectures; safety-critical avionics; mission planning, and operations; risk management methods; computer aided design; space systems.

PROFESSIONAL EDUCATION

DASC will offer two days of Professional Education sessions spanning relevant engineering disciplines. These tutorials will be presented by educators and practicing professionals who are recognized experts in their field.

Examples of possible topics include:

- Basic & Advanced Avionics Systems; Integrated Modular Avionics
- Surveillance & Collision Avoidance; Synthetic Vision; Sensing Modalities
- Navigation Systems Including Technologies and Performance Based Navigation
- Communications Systems and Networks
- Systems Engineering; Program Management
- Software Development & Test Certification (DO-178)
- Environmental Qualification (DO-160)
- System Safety
- Cyber Security
- Autonomy & Application of Modern Techniques to Autonomous Systems

All professional education sessions will offer Continuing Education Units (CEUs) through the IEEE. For more information, contact our Tutorial Chair.

SPONSORS AND EXHIBITS

This year's conference will feature exhibits and product demonstrations by representatives of key avionics-related industries and institutions. To have your organization represented in our exhibit hall, please contact our Sponsors and Exhibits Chair via the conference website.

For inquiries regarding paper submissions, please contact:

Hannah Doyal
Conference Catalysts, LLC.
hdoyal@conferencecatalysts.com

ICNS CONFERENCE 2020

CALL FOR TECHNICAL PAPERS & PRESENTATIONS

iCNS Horizons – intelligent CNS for Evolutionary and Innovative Air Transportation

CONFERENCE DATES

21-23 April 2020

CONFERENCE VENUE

Westin Washington Dulles Hotel
Herndon, Virginia, USA

IMPORTANT DATES

- **Abstract submission**
  3 January 2020
- **Notification of Acceptance**
  13 January 2020
- **Final Papers due**
  14 February 2020

ORGANIZERS

- **Conference General Chair**
  Dr Gregory Woo, U.S. DOT Volpe Center
- **Technical Program Co-Chairs**
  Ms Sherry Yang, The Boeing Company
  Mr Mike Olive, Honeywell
- **Plenary Program Co-Chairs**
  Mr Brent Phillips, FAA
  Dr Nikos Fistas, Eurocontrol
- **Workshop Co-Chairs**
  Dr Lance Sherry, George Mason University
  Ms Denise Ponchak, NASA
- **Sponsors and Exhibits Chair**
  Mr Mark Darnell, GE Aviation
- **Finance Chair**
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- **Registration Chair**
  Mr Herb Tax, AIAA
- **Communications Chair**
  Mr Rafael Apaza, NASA
- **Technical Publications Editor**
  Mr Tony Rossetti, ARL Intl
- **ICNS Executive Committee Chair**
  Mr Robert Kerczewski, NASA (retired)

The Integrated Communications Navigation and Surveillance (ICNS) Conference is the premier international aviation conference addressing technology and policy advances in CNS research, development and implementation programs, and policies related to CNS/ATM capabilities and applications. ICNS is a not-for-profit event, jointly organized by the American Institute of Aeronautics and Astronautics (AIAA) Digital Avionics Technical Committee (DATC) and the Institute of Electrical and Electronics Engineers (IEEE) Aerospace and Electronic Systems Society (AESS), with active support from government and industry. The ICNS Conference assembles leaders from government, industry, and academia as well as senior technical experts to address important policy issues and discuss the future directions.

The ICNS Conference provides an excellent framework for networking during breaks and evening social events, creating ample opportunity for an enhanced, efficient, and informal exchange of views among policy makers and researchers.

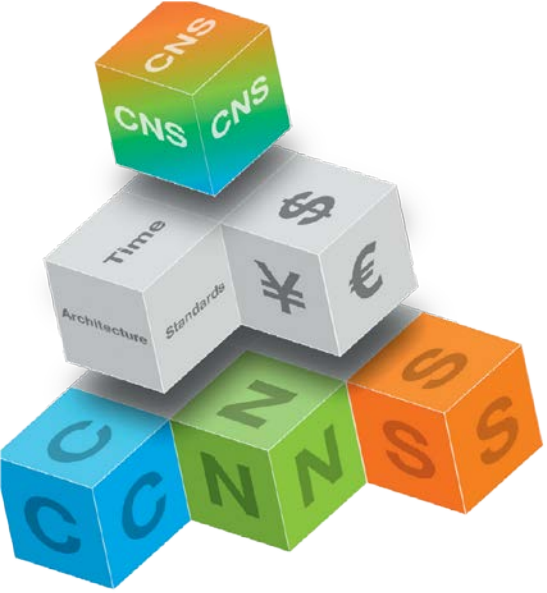
The 2020 ICNS Conference theme "iCNS Horizons: intelligent CNS for Evolutionary and Innovative Air Transportation" will focus on the impact of intelligent CNS technologies and concepts on both the future of air transportation systems and the evolution of our current systems as new innovations and new technologies emerge. The conference will consider applications of Artificial Intelligence (AI), Machine Learning (ML), Decision Support Systems (DSS), and other potentially applicable advanced technologies in meeting the CNS needs of our increasingly complex air traffic management and aviation operating environments.

AI, ML, and sophisticated DSS technologies are rapidly emerging as intelligent strategies for management roles in complex systems and operations environments. These technologies can support intelligent CNS capabilities for 4D Trajectory Based Operations (TBO), the increased automation requirements of future flight, global coordination of flight operation and air traffic management strategies, as well as the rapidly emerging UAS and Urban Air Mobility (UAM) operations environments. The 2020 Conference will address these intelligent CNS concepts and the spectrum on which they all depend as well as the challenges of transitioning from current CNS infrastructure to advanced future technologies.

The 2020 ICNS Conference will be a three day event with morning plenary sessions addressing a hot topic of global relevance. Distinguished invited speakers will set the stage for the policy, economic, operational and technology aspects of the plenary. The afternoons will provide a wide variety of parallel technical discussions with selected papers and presentations on various intelligent CNS themes.

The conference provides an understanding of all major CNS/ATM programs and addresses the transition between our Integrated CNS systems of today to the intelligent CNS systems of tomorrow by examining implementation strategies, standards development, research, ICNS technologies, and opportunities for intelligent communications, navigation, and surveillance infrastructure deployment.

Go to https://i-cns.org for more information



20th Integrated Communication Navigations and Surveillance Conference

21-23 April 2020

Westin Washington Dulles Hotel
Herndon, Virginia, USA

Visit us at: i-cns.org

Plenary Sessions and Interactive Workshop

Plenary and Workshop topics will be defined at a later stage. Topics will likely include global air navigation, use of Artificial Intelligence, Machine Learning, and Decision Support Systems in CNS applications as well as future complex or highly automated aviation operating environments.

Afternoon Technical Sessions

Papers and presentations are solicited for the technical sessions, addressing the key topical areas listed below:

- Intelligence-based drivers for CNS Evolution and Innovation
- Transitioning to the future with artificial Intelligence and machine learning applications for CNS/ATM
- UAS Traffic Management (UTM)
- Accommodating Urban Air Mobility (UAM)
- Integration of UAV, RPAS, and Space Transportation Into the Airspace
- Emerging Aviation Systems
- Data and Voice Communications Systems
- Surveillance Systems & Situation Awareness
- Navigation Systems & APNT
- CNS Integration, Consolidation and Miniaturization
- Cybersecurity
- Commercial, Military, and Consumer UAS
- Air Traffic Management (ATM) and Supporting Technologies
- Performance-based CNS/ATM
- Airport & Airspace Optimization/Operations
- Support for Civil Military Interoperability
- Impact of Climate Change and Aviation Weather on Aviation and CNS Performance
- Changing Economic Impact on Users and Purchasers of CNS Equipment
- CNS Spectrum Considerations and Issue Management

Sponsors and Exhibits

ICNS 2020 invites industry sponsors, exhibits, and product demonstrations by representatives of CNS-related industries and organizations. Participating as an exhibitor in the conference allows close-up interaction with customers and key policy decision makers to help move your research and products closer to daily operations. For more information, please contact the 2020 Sponsors and Exhibits Chair Mark Darnell, sponsor.exhibits.chair@i-cns.org.

Best Paper Competition - Student and Professional

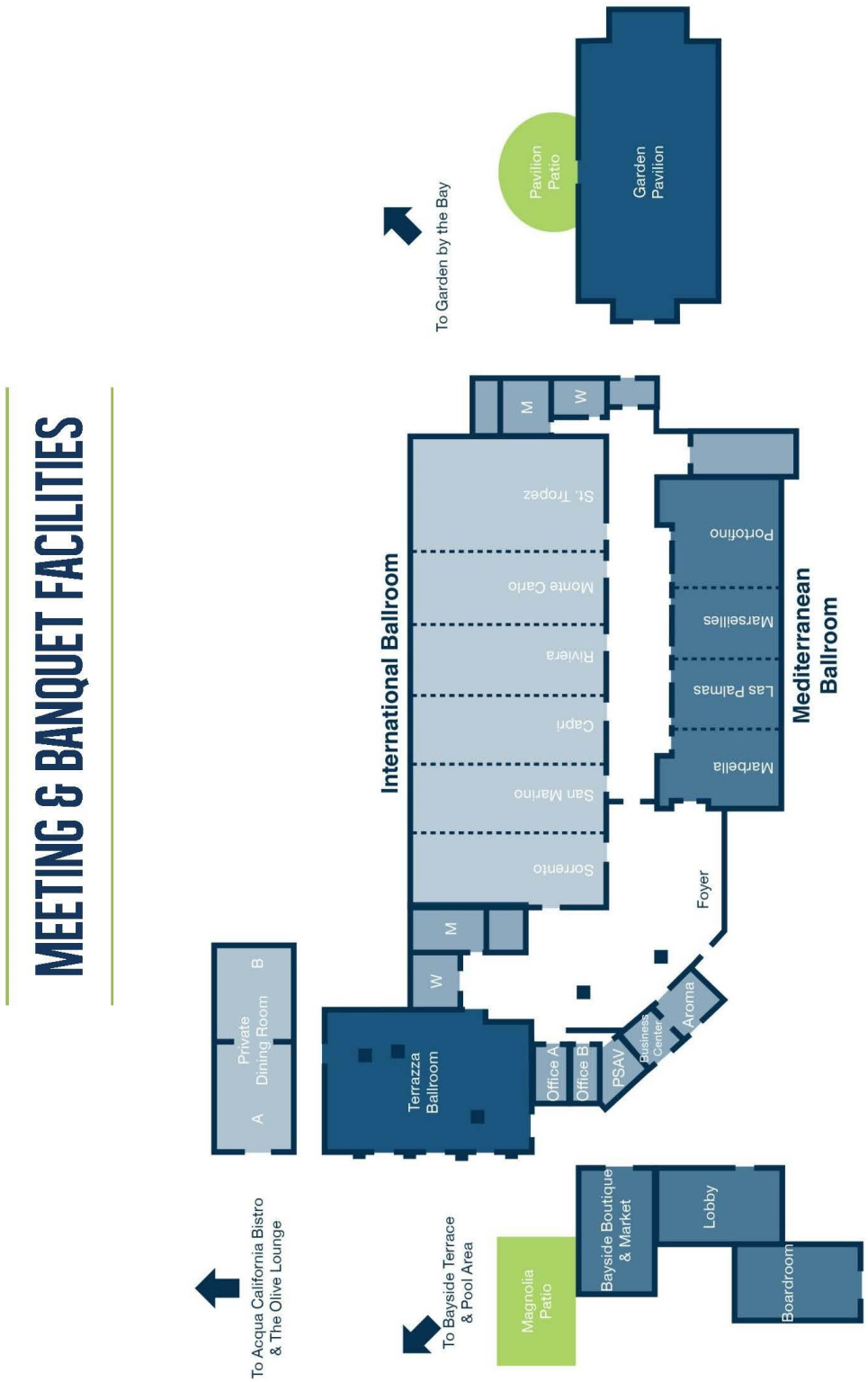
The 2020 ICNS Conference is sponsoring student and professional Best Paper competitions. Active students and professionals within two years of graduation are eligible for ICNS Student Best Paper awards. Those not eligible for Best Student Paper awards are eligible for Best Professional Paper awards.

Abstract Submission

Authors are invited to submit abstracts by 3 January 2020, addressing one or more of the key topical areas listed above or having a critical relevance to the above aeronautical CNS topics. Abstracts should clearly define the goal of the work, its tasks, methods or results (anticipated or completed) as well as the potential benefits or applications of the work. Abstracts need to be clear and concise, with at least 250 words and no more than 750 words. The abstract submission details will be provided in the ICNS webpages at i-cns.org.

Goto https://i-cns.org for more details and contact information on ICNS 2020

Venue Map


MEETING & BANQUET FACILITIES
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A
B
Terrazza Ballroom
Office A
Office B
PSAV
Business Center
Aroma
To Acqua California Bistro & The Olive Lounge
To Bayside Terrace & Pool Area
Magnolia Patio
Bayside Boutique & Market
Lobby
Boardroom

Notes