Welcome to the 40th (Hybrid) Digital Avionics Systems Conference

Welcome to the 40th Digital Avionics Systems Conference (DASC)! This is our first ever hybrid DASC, where both presenters and attendees can be in-person or virtual. While this was driven by the pandemic, we feel that this is the wave of the future, where we leverage the best of both formats to provide a fantastic expertise for a wider range of participants. As technical program chair last year, I experienced firsthand the rapid response of our organizing committee to produce a high-quality virtual conference. We hope to replicate that success this year in our first hybrid conference. So let me take a moment to thank all the presenters, panelists, sponsors, and attendees for joining us in making this new format a success. I was greatly honored to be invited to lead this year's conference. My very first service opportunity came as a DASC session chair almost 20 years ago. Many things have changed since then. DASC has grown from a national to an international conference, travelling to Prague and London in recent years. For me personally, I moved from industry to academia. But one thing has not changed - the DASC community continues its rich tradition of presenting innovative research and state of the art technology in key areas of interest in aviation and space.

This year, we will meet in San Antonio, one year later than originally planned. The global COVID-19 pandemic has irrevocably changed the way we collaborate, communicate, and connect. The impacts continue to evolve in ways that we can only try to anticipate. I hope that the DASC community is faring well during these difficult times. My sincere condolences to anyone who may have lost a loved one through this pandemic.

The Organizing Committee has worked relentlessly to construct a format that captures the best of in-person experiences combined with the lessons learned from last year's virtual conference. This comes with multiple challenges, including the timing of sessions and supporting interaction between virtual and in-person attendees. To address timing, we purposefully scheduled all plenary sessions at an optimal time for all time zones. Papers were scheduled while trying to be sensitive to the time zones of any virtual presenters. To support interaction, all technical sessions will be both live in-person and live online. The session chairs will manage the question-and-answer session to allow both in-person and virtual attendees to participate. The plenaries will be livestreamed to virtual attendees.

But with challenges comes opportunities as well. By enabling people to attend virtually, we expand the number and range of attendees, thus enriching the conference experience for all. By recording all presentations, our virtual platform makes all technical sessions and plenaries available online to all attendees for four weeks after the end of the conference. The virtual platform allows attendees to continue to ask questions of the presenters after the technical session is complete, enabling extended conversations. It is our hope that this approach will provide an optimal program for all of our attendees.

Our technical program chairs, Dr. Nils Smith (Southwest Research Institute) and Dr. Terry Morris (NASA Langley Research Center) have put together an exciting technical program that covers a wide range of topics across nine technical tracks. They are supported by over 50 Session Chairs that are dedicated to providing the best forum for a robust exchange of ideas. Our conference theme this year is "Integrating Humans and Increasingly Autonomous Systems in Air Transportation". This continues our focus on application of Artificial Intelligence in aviation, and asks the question of how do we best design and apply increasingly autonomous systems working alongside humans while maintaining safety and security. Over the week of the 40th DASC, we will explore these and other essentials topics for air transportation systems through over 180 original research papers and posters.

We have two inspiring keynote speakers on Tuesday: Mr. Robert A. Pearce is the associate administrator for the NASA Aeronautics Research Mission Directorate, and Mr. Tony Gingiss is the Chief Operating Officer of Virgin Orbit and former CEO of OneWeb Satellites. They are both leaders setting the strategic direction of research areas such as autonomy, highly efficient advanced air vehicle concepts, urban air mobility, satellite launch, and space communications, to name a few of the areas where they nurture and develop transformative concepts for aviation. Tuesday continues with technical sessions and a UAS competition that includes both college and high school students. Please stop by and cheer on your favorite teams. Tuesday afternoon will cap off with Students Research Competition and Poster Sessions. Please attend to encourage the finalists as they present and answer questions on their research. In parallel, sponsors will showcase products and services, answer questions, and present opportunities for collaboration. There will be a reception for Young Professionals and Women in Engineering. Wednesday will kick off with a panel, "Integrating humans and increasingly autonomous systems in air transportation" with a range of panelists from industry, academia, and government. After the panel session, technical sessions continue through the rest of Wednesday and Thursday.

2021 IEEE/AIAA 40th Digital Avionics Systems Conference (DASC) | 978-1-6654-3420-1/21/$31.00 ©2021 IEEE | DOI: 10.1109/DASC52595.2021.9594305

Our Awards Ceremony is scheduled over lunch on Wednesday. Please join us as we present Best of Tracks, Best of Conference, and Best Student Paper awards. The Awards lunch is always a highlight of the conference, and we hope to see you there. Wednesday evening we will meet at the Briscoe Western Art Museum to learn all about the art, history, and culture of the American West while enjoying traditional barbeque.

I encourage all attendees to utilize every avenue available to commutate and interact. Be it through the traditional in-person networking we all have missed so much, or through the virtual conference platform that enables new ways to interact, we can leverage the best of both formats to communicate. We have all learned new skills on how to collaborate during the pandemic! Given that this is the first hybrid format for DASC, we are charting new territory and issues are bound to arise. Please communicate with me, the staff, or our volunteers to get the answers you need. Throughout the conference, questions, suggestions, and feedback for real-time improvement are welcome.

In these challenging times we often had to make adjustments quickly as circumstance changed, while being as thorough as possible when considering all options. My sincerest thanks to everyone who have worked tirelessly to organize and bring us to our very first hybrid conference, including the Session Chairs, Track Chairs, Technical Program Chairs, Conference Organizing Committee, Keynote Committee, and Contingency Committee. Let us also thank our sponsors who have continued to be supportive while facing their own challenges. Finally, my thanks to all of you, for your continued enthusiasm and support for our community.

Finally, on behalf of the AIAA Digital Avionics Technical Committee, IEEE Aerospace Electronics Systems Society, and Conference Organizing Committee, I would like to welcome you to the 40th DASC. I look forward to interacting with you all, and working together to make this an experience everyone will remember. I hope each of you has a week of rich, rewarding DASC experiences. Thank you for your participation.

Dr. Michael Dorneich
40th DASC General Chair
Iowa State University

Welcome Message from the Technical Program Chairs

Welcome to the 40th DASC meeting – the first “hybrid” conference meeting in its history and potentially a model for future DASC meetings. This year’s conference them is “integrating humans and increasingly autonomous systems in air transportation”. As we move to accept automation in flight systems, UAS platforms, and interaction with ground and space-based systems the need to address interaction with humans, be they pilots, controllers, passengers, or users remains of high concern. This is overlaid on top of current safety requirements, increasing security requirements, and the emergence of machine learning in design and in operations.

This year’s technical program will present 180 papers organized into nine tracks: Air Traffic Management Machine Learning & Automation, ATM Airspace and Spectrum Management, Unmanned Aircraft Systems, Communications, Navigation, and Surveillance and Information Networks, Human Factors, Space Systems & Special Topics, Cyber, Systems, and Software, and Urban Air Mobility/Advanced Air Mobility, and Integrated Modular Avionics. In addition, we have two poster sessions across the spectrum of topics and a dedicated student research session.

We would like to express our heartfelt appreciation to the track chairs, session chairs, conference staff, and volunteers for their countless hours of service to bring you this outstanding technical program. They have worked tirelessly to adapt the format while preserving the high standards of the DASC conference. Finally, we want to thank the authors for their contributions to the conference, and their continued support in sharing their excellent work with the community. On behalf of the Technical committee, welcome to the 40th DASC conference.

Terry Morris, NASA Langley

40th DASC Technical Program Chair

Nils Smith, Southwest Research Institute

40th DASC Technical Program Chair

Conference Organizing Committee

General Chair
Dr. Michael Dorneich
Iowa State University

Technical Program Co-Chair
Mr. Nils Smith
Southwest Research Institute (SWRI)

Technical Program Co-Chair
Dr. Terry Morris
NASA Langley

Finance Co-Chair
Mr. George N. Andrew
GNA Aerospace Consulting Group

Finance Co-Chair
Mr. T. Scott Atkinson
IEEE

Professional Education Chair
Dr. Krishna Sampigethaya
Embry-Riddle Aeronautical University-Prescott

Sponsors & Exhibitor Chair
Mr. Paul Kostek
IEEE AESS

Publicity Chair
Ms. Denise Ponchak
NASA Glenn Research Center

Local Arrangement Chair
Mr. Christopher E. Camargo
Southwest Research Institute

Student Research Competition Co-Chair
Dr. Giancarmine Fasano
University of Naples

Awards Lunch Chair
Aubrey T. Smith
Earthlink

Awards Chair
Mr. Chris Watkins
Gulfstream

Conference Management
Conference Catalysts, LLC

Conference Sponsors

DATC Technical Committee
AIAA Digital Avionics

IEEE

AIAA
The World's Forum for Aerospace Leadership

AESS tm

Co-Sponsor

Conference Special Event Sponsor

SwRI
SOUTHWEST RESEARCH INSTITUTE

Silver Sponsors

BOEING

NASA

Bronze Sponsors

MITRE

Mark III Systems

PRESAGIS
HMI Development

PORT SAN ANTONIO

Exhibitors

THALES

RELIABLE ROBOTICS

Great River Technology
www.greatrivertech.com

TEXAS A&M UNIVERSITY SAN ANTONIO

Media Sponsors

RTCA

40th DASC Week at a Glance

(All times US CDT; GMT-5)

US CDT	Sunday (Oct 3)	Monday (Oct 4)		Tuesday (Oct 5)		Wednesday (Oct 6)	Thursday (Oct 7)
8:00-9:00	**Tutorial** (8:00-11:00) *Tutorial 1 - Salon A Tutorial 2 - (Virtual) Salon B*	**Tutorial** (8:00-11:00) *Tutorial 1 - (Virtual) Salon A Tutorial 2 - (Virtual) Salon B*		**Opening Remarks, Keynote** (8:00-10:00) *Salon C*		**Opening Remarks, Panel** (8:00-10:00 *Salon C*	**Technical Sessions** (8:00-10:00) *Salon A, Salon B, Bowie, Bonham, Milam, Travis*
9:00-10:00							
10:00-10:30				**Morning Break** (10:00-10:30) *Foyer*		**Morning Break** (10:00-10:30) *Foyer*	**Morning Break** (10:00-10:30) *Foyer*
10:30-11:00				**Technical Sessions** (10:30-12:00) *Salon A, Salon B, Bowie, Bonham, Travis, Valero*		**Technical Sessions, Virtual Poster Session B** (10:30-12:00) *Salon A, Salon B, Bowie, Bonham, Milam, Travis, Valero*	**Technical Sessions** (10:30-12:30) *Salon A, Salon B, Bowie, Bonham, Milam, Travis, Valero*
11:00-12:00	**Tutorial** (11:30-14:30) *Tutorial 3 - Salon A*	**Tutorial** (11:30-14:30) *Tutorial 3 - (Virtual) Salon A*	**DATC Meeting** (9:00-17:00) *Boardroom*		**UAS Competition** (10:00-17:00) *Salon D*		
12:00-12:30				**Lunch** (12:00-13:00) *River Terrace*		**Awards Lunch** (12:00-14:30) *Salon C&D*	**Lunch** (12:30-13:30) *River Terrace*
12:30-13:00							
13:00-13:30				**Technical Sessions** (13:00-15:00) *Salon A, Salon B, Bowie, Bonham, Milam, Travis, Valero*			
13:30-14:00							**Technical Sessions** (13:30-15:30) *Salon A, Salon B, Bowie, Bonham, Milam, Travis, Valero*
14:00-14:30						**Afternoon Break** (14:30-15:00) *Foyer*	
14:30-15:00							
15:00-15:30	**Tutorial** (15:00-18:00) *Tutorial 4 - Salon A*	**Tutorial** (15:00-18:00) *Tutorial 4 - (Virtual) Salon A Tutorial 5 - (Virtual) Salon B*		**Afternoon Break** (15:00-15:30) *Foyer*			
15:30-16:00				**Technical Sessions** (15:30-17:30) *Salon A, Salon B, Bowie, Bonham, Milam, Travis, Valero*		**Technical Sessions** (15:30-18:00) *Salon A, Salon B, Bowie, Bonham, Milam, Travis, Valero*	
16:00-17:00							
17:00-17:30							
17:30-18:00			**Welcome Reception** (17:30-19:00) *River Terrace*	**Student & Conference Poster Session** *Foyer* **Exhibitors Reception** *Foyer* (17:30-19:30)	**YP/WIE Receptions** (17:30-19:30) *Salon D*		
18:00-19:00						**Special Event** *Briscoe Western Art Museum* (18:00-22:00)	
19:00-19:30							
19:30-20:00		**DATC Dinner** *Offsite* (19:00-21:30)					
20:00-21:00				**Organizing Committee Dinner** *Offsite* (20:00-22:00)			
21:00-21:30							
21:30-22:00							

Opening Remarks & Keynotes

Tuesday, October 5th 8:00-10:00
Salon C
Moderator: Dr. Michael Dorneich, Iowa State University

Tony Gingiss

Tony Gingiss, COO Virgin Orbit and former CEO of OneWeb Satellites. As the Virgin Orbit COO, he delivers a wealth of experience spanning 3 decades to the role given his extensive work in the aerospace industry. Before his days at OneWeb, he worked at Boeing Satellite Systems for more than 20 years. His responsibilities included general leadership, engineering, operations, with his most impressive role as the Director of Strategic Integration and National Space Communications Program.

Title: Emergence of Commercial Space – Making a Better World

We are at a pivotal moment in mankind's journey. Fire, the Wheel, and the Industrial Revolution, all changed mankind's destiny in ways inconceivable in their day. The Emergence of Commercial Space the next step making our World Better!

Robert A. Pearce

Mr. Robert A. Pearce is the associate administrator for NASA ARMD. Pearce manages the agency's aeronautics research portfolio and guides its strategic direction, including research in quiet supersonic flight over land, urban air mobility, autonomy, highly efficient advanced air vehicle concepts, electrified aircraft propulsion, advanced materials, airspace operations and safety, integration and flight demonstrations of aviation systems, and the nurturing and development of transformative concepts for aviation.

Title: The Future of Aviation

Aviation will be shaped by the need to accommodate growing demand while simultaneously reducing emissions and environmental impact. Converging technologies create new opportunities for innovation to enable aviation to serve new transportation markets and serve public needs. NASA is investing in a diverse portfolio of research and technology development to enable this exciting future.

2nd Day Panel

Topic: Integrating Humans and Increasingly Autonomous Systems in Air Transportation

Wednesday, October 6th 8:30-10:00

Salon C

Moderator: Dr. Steven D. Harbour (SwRI)

Dr. Steven D. Harbour, PhD. Principal Engineer & Scientist, Dayton Engineering Advanced Projects Lab, Avionics Division, SwRI. SME in Artificial Intelligence / Machine Learning, Human Autonomy Teaming, Neuroscience, Electrical & Computer Engineering, Avionics, UAS and Autonomous vehicles. A senior leader, defense research & engineering professional with over 25 years of experience in multiple engineering and aviation disciplines & applications. Leads and performs ongoing basic and applied research projects, including the development of third-generation spiking neural networks (SNNs) and neuromorphic applications to include Human Autonomy Teaming. He has supported the Air Force Research Laboratory Sensors Directorate at Wright-Patterson Air Force Base, Ohio, and at the Air Force Life Cycle Management Center in the ISR / SOF directorate as the Global Hawk Chief of Avionics Engineering and Modernization Programs. USAF test pilot with over 5,000 hours total flying time in F-16, F-4, AT-38, T-37, B-52, and EC-135 aircraft. Flew the MIG-29 as part of the US State Department's military to military visit program under the Nunn-Lugar Act. PhD in Neuroscience (Specializations: Artificial Intelligence & Machine Learning and Neuroergonomics), MS in Aerospace Engineering & Mathematics (Specializations: Avionics, Controls & Displays), BS in Electrical & Computer Engineering (Specializations: Robotics & Feedback Control Systems and Cognition). Dr. Harbour also teaches at the University of Dayton & Sinclair College.

Dr. Kelly Cohen, the Brian H. Rowe Endowed Chair in aerospace engineering, has been a faculty member at UC's College of Engineering and Applied Science, or CEAS, for more than 10 years and currently serves as interim head of the Department of Aerospace Engineering and Engineering Mechanics. His career is marked by achievement in the field of aerospace engineering and education, including the UC George Barbour Award for Good Faculty-Student Relations, UC Faculty Core Values Award, UC Dolly Cohen Award for Excellence in Teaching, the American Institute of Aeronautics and Astronautics Outstanding Technical Contribution Application Award, the CEAS Distinguished Researcher Award and the Greater Cincinnati Consortium of Colleges and Universities Excellence in Teaching Award, among many others.

Dr. Yulia Sandamirskaya leads the Applications Research team of the Neuromorphic Computing Lab at Intel. Her team in Munich develops spiking neuronal network-based algorithms for neuromorphic hardware to demonstrate the potential of neuromorphic computing in real-world applications, in particular in robotics. She has 15 years of research experience in the fields of neural dynamics, embodied cognition, and autonomous robotics. She led the research group “Neuromorphic Cognitive Robots” at the Institute of Neuroinformatics of the University of Zurich and ETH Zurich, Switzerland, and the “Autonomous learning” group at the Institute for Neural Computation at the Ruhr-University Bochum (RUB), Germany. She has a Diploma in physics from the Belarussian State University and a Doctoral degree in neural computation from the RUB. She was chairing EUCog—the European Society for Artificial Cognitive Systems and coordinated an EU coordination and support action NEUROTECH, facilitating development of the neuromorphic computing technology community in Europe.

Professor Chris Eliasmith is co-CEO and President of Applied Brain Research, a leading neuromorphics company. He is the co-inventor of the Neural Engineering Framework (NEF), the Nengo neural development environment, and the Semantic Pointer Architecture, all of which are dedicated to leveraging our understanding of the brain to advance AI efficiency and scale. His team has developed Spaun, the world's largest functional brain simulation. He won the prestigious 2015 NSERC Polanyi Award for this research. Chris has published two books, over 120 journal articles and patents, and holds the Canada Research Chair in Theoretical Neuroscience. He is jointly appointed in the Philosophy, Systems Design Engineering faculties, as well being cross-appointed to Computer Science. Chris has a Bacon-Erdos number of 8.

Davide Venturelli is Associate Director for Quantum Computing of the Research Institute of Advanced Computer Science at the Universities Space Research Association (USRA). He works since 2021 in the NASA Quantum AI Laboratory (QuAIL) under the NASA Academic Mission Service, invested in research projects dealing with quantum optimization applications and their implementation, in a hardware-software co-design approach. He teaches Quantum Optimization as an adjunct professor at Carnegie Mellon University. He is Principal Investigator or task lead in projects sponsored by DARPA (Optimization in NISQ Devices), NSF (Expeditions in Computing), and DOE (SQMS Ecosystem).

Student Unmanned Aerial Systems Competition

Tuesday, October 5 10:00-17:00
Salon D

High School and University Drone Competition

DASC 2021 will be hosting a student drone competition for high school students and university students. Local San Antonio high schools will be racing against each other during the morning session. Student teams will build small drones from a drone kit during an allowed time. After the time is up, the student teams will race their drones against each other. Plaques will be awarded to first, second, and third places.

A university competition will take place after the high school competition. Participants will be racing against each other via time trials. The baseline drone model recommended for this competition is the Tello Drone as seen in Figure 1. As an added bonus, rubber duckies will be placed around the course at random for a bonus computer vision object recognition task. Teams will be allowed to choose their best run out of two. Plaques and cash prizes will be awarded to first, second, and third places.

Figure 1 – Tello Drone

The drone course will be approximately 45 feet length, 20 feet width, and 10 feet tall. The entire course will be enclosed with safety netting on sides and top. There will be 4 LED lit gates which the teams will be required to fly through from the start of the course the finish of the course as outlined in Figure 2. Teams will be ranked on time to complete course. University teams will gain bonus points for number of duckies detected.

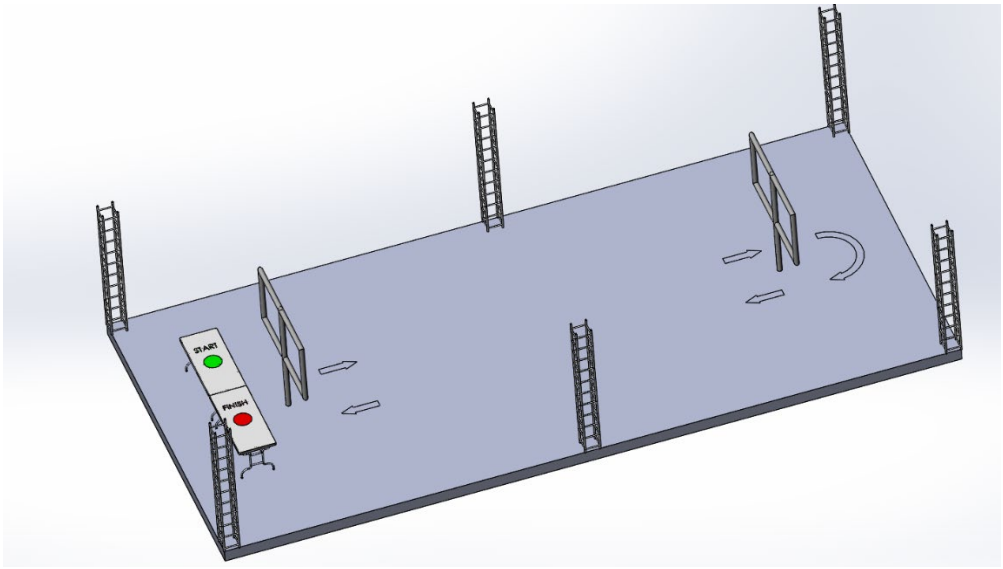


Figure 2- Drone Course Diagram with gates and start/end points.

Tutorial Schedule: Sunday, October 3

US CDT	Label	Presenter	Title	Track	Format
8:00-11:00	SM1	Tim Etherington	Modern Avionics Architectures	Avionics and Space Systems	In-Person *Salon A*
8:00-11:00	SM2	Pavel Paces	Artificial Intelligence and Relations to Avionics	Autonomy and Security I	Virtual *Salon B*
11:30-14:30	SL2	Krishna Sampigethaya	Introduction to Aviation Cyber Security		In-Person *Salon A*
15:00-18:00	SA2	Steven Harbour	Artificial Intelligence / Autonomous Systems and Human Autonomy Teaming		In-Person *Salon A*

Tutorial Schedule: Monday, October 4

US CDT	Label	Presenter	Title	Track	Format
8:00-11:00	MM1	Pavel Paces	Machine Learning in Avionics	Autonomy and Security II	Virtual *Salon A*
8:00-11:00	MM2	Giancarmine Fasano	Detect and Avoid for Unmanned Aircraft Systems	UAS	Virtual *Salon B*
11:30-14:30	ML2	Carlos Insaurralde	Intelligent Control Architecture for Autonomous Vehicles		Virtual *Salon A*
15:00-18:00	MA2	Maarten Ujit de Haag	Reliable Navigation for Unmanned Aircraft Systems		Virtual *Salon A*
15:00-18:00	MA3	Sabatini, Majid, Blasch, Fasano, Kramer	AESS Avionics Systems Panel Research and Education Perspectives (FREE tutorial!)	**FREE**	Virtual *Salon B*

Tutorial Descriptions: Sunday, October 3

Avionics and Space Systems

Modern Avionics Architectures

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

PRESENTER BIO

Timothy Etherington graduated from North Dakota State University with a Master of Science in Electrical Engineering in 1987. Tim conducts flight deck research at NASA Langley Research Center and is recently retired from Collins Aerospace as a Technical Fellow. Mr. Etherington had worked at Rockwell Collins for over thirty years with extensive experience in military and commercial flight deck design and applied human factors. He helped design the flight decks for the Canadair Regional Jet and other business and regional primary flight display systems. He led the perspective, synthetic and enhanced flight deck research at Rockwell Collins including the flight-testing completed with NASA Langley and Air Force Research labs. He holds an FAA Airline Transport Pilot certificate with a Citation Type Rating and holds commercial fixed wing and private pilot rotorcraft ratings. Mr. Etherington is co-chair for RTCA SC-213 working on standards for enhanced and synthetic vision systems.

Autonomy and Security I

Artificial Intelligence and Relations to Avionics

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 flight-path panning and recovery.

PRESENTER BIO

Dr. Pavel Paces works at Artificial Intelligence Center at Faculty of Electrical Engineering, Czech Technical University in Prague, Czech Republic. He gained MSc and Ph.D. in aerospace engineering. Currently, he leads a group developing solutions for pilot training evaluation and fatigue measurement aiming on human machine interaction, processes and procedures. He received Honeywell Innovator award in 2011, he is member of IEEE Aerospace and Electronic Systems Society and AIAA.

Introduction to Aviation Cyber Security	The cyber threat landscape of aviation is every increasing. Particularly concerning are those threats that bring novel risks that are specific to aviation and are perceived to impact public safety and well-being. This tutorial will introduce you to aviation cyber security, focusing on the aircraft being the center 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 including both manned and unmanned aircraft. 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 passenger carrying aircraft, unmanned aircraft, and their supporting systems. Using examples and case studies, you will be able to evaluate threats from vulnerabilities as well as risks from threats to these systems. 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 avionics, crew, and aircraft, air traffic control, UAS, and UTM systems. **PRESENTER BIO** Krishna Sampigethaya is currently the Chair for the Department of Cyber Intelligence and Security at the Embry-Riddle Aeronautical University in Prescott, AZ, located in the one and only College of Security and Intelligence in the US. https://prescott.erau.edu/cyber. Krishna received his Ph.D. in electrical engineering from the University of Washington (2007) and was one of the first in the world to defend a thesis on connected vehicle privacy and aviation cyber security research. He then joined The Boeing Company and was soon selected as the first Boeing Associate Technical Fellow for aviation cyber-physical security in 2012. Most recently he was an Associate Director for cyber security at the United Technologies Corporation (UTC) Research Center (2016-2018), focusing on the security of aerospace systems and commercial products. He has also been an Assistant Director for the Masters in Telecom program at the University of Maryland (2014-2015), developing new courses on software-defined networks and connected vehicles. Krishna founded the first aviation cyber security technical committee, sponsored by the SAE in 2008, and has been organizing aviation cyber security tracks at SAE as well as AIAA/IEEE conferences since then. He co-edited the first special issue on cyber-physical systems, published in the first centennial year issue of the Proceedings of the IEEE journal (2012). He has authored over 50 papers—including 3 award-winning publications (at IEEE DASC and I-CNS)—delivered over 16 keynotes, and holds over 16 US patents in aviation cyber security. His work has been recognized in the community with awards such as the American Society of Engineers of Indian Origin (ASEI) Engineer of the Year Award (2013), ASEI Corporate Engineering Excellence Award (2013), and a Best Instructor Award at UMD (2015). Most recently, he led a team of Embry-Riddle cybersecurity program students to design the first ever aviation cybersecurity competition at the DEF CON Aerospace Village in 2020.
Artificial Intelligence / Autonomous Systems and Human Autonomy Teaming	The course is designed to appeal to scientific and engineering professionals who wish to obtain and or increase knowledge in Artificial Intelligence / Autonomous Systems and Human Autonomy Teaming. Introduction to the main foundational concepts and techniques used in Artificial Intelligence (AI); including decision making, planning, machine learning, and cognition. Includes a range of real-world applications in which AI is currently used in aeronautical and aerospace systems. Presentation of theoretical concepts occurs. Systematic study of methods and research findings in the field of human perception, with an evaluation of theoretical interpretations. Provides a basis for the understanding of these perceptual capabilities as components in Artificial Intelligence in aviation/aerospace systems. The field of human-autonomy teaming (HAT) is fast becoming a significant area of research, especially in aviation. HAT is highly interdisciplinary, bringing together methodologies and techniques from robotics, artificial intelligence, human-computer interaction, cognitive psychology, neuroscience, neuroergonomics, and other fields. The topics covered will include technologies that enable human-machine interactions, the psychology of interaction between people and machines, how to design and conduct HAT studies, and real-world applications such as assistive machines. Covered are the advanced systematic study of methods and research findings in the field of human and computer perception, with an evaluation of theoretical interpretations. Algorithmic foundations of AI / ML. Additionally, introduction to Autonomous Systems will be covered. Surveys the fundamentals of autonomous aircraft system operations, from sensors, controls, and automation to safety procedures, human factors. Presentation of advanced theoretical concepts for artificial intelligence in the areas of knowledge representation and search techniques. The concept of the perceptron and neuron will be covered along with 1st, 2nd, and 3rd generation neural networks. Machine Learning is also covered: hands-on, live and in-action machine learning problems will be

solved: utilizing regression analysis, ANNs, RNNs, CNNs (Deep Learning), SNNs, RELs, SVMs, and Bayesian Belief Networks. This course presents the latest major commercial uses of UAS, and manned aircraft that will be going from 2-pilot operations to 1-pilot operations to unmanned operations.

PRESENTER BIO

Dr. Steven D. Harbour, PhD. Principal Engineer & Scientist, Dayton Engineering Advanced Projects Lab, Avionics Division, SwRI. SME in Artificial Intelligence / Machine Learning, Human Autonomy Teaming, Neuroscience, Electrical & Computer Engineering, Avionics, UAS and Autonomous vehicles. A senior leader, defense research & engineering professional with over 25 years of experience in multiple engineering and aviation disciplines & applications. Leads and performs ongoing basic and applied research projects, including the development of third-generation spiking neural networks (SNNs) and neuromorphic applications to include Human Autonomy Teaming. He has supported the Air Force Research Laboratory Sensors Directorate at Wright-Patterson Air Force Base, Ohio, and at the Air Force Life Cycle Management Center in the ISR / SOF directorate as the Global Hawk Chief of Avionics Engineering and Modernization Programs. USAF test pilot with over 5,000 hours total flying time in F-16, F-4, AT-38, T-37, B-52, and EC- 135 aircraft. Flew the MIG-29 as part of the US State Department's military to military visit program under the Nunn-Lugar Act. PhD in Neuroscience (Specializations: Artificial Intelligence & Machine Learning and Neuroergonomics), MS in Aerospace Engineering & Mathematics (Specializations: Avionics, Controls & Displays), BS in Electrical & Computer Engineering (Specializations: Robotics & Feedback Control Systems and Cognition). Dr. Harbour also teaches at the University of Dayton & Sinclair College.

Tutorial Descriptions: Monday, October 4

	Autonomy and Security II
Machine Learning in Avionics	In this course we will explore the term machine learning and define algorithms to be generally considered as machine learning. The course is built around use cases where machine learning can provide advantage in form of time and cost savings. We are going to link the use of machine learning to existing algorithms used for system diagnostics which include signal processing algorithms, feature extraction and classification methods. The tutorial will begin with Signal to Noise Ratio, variance, Standard Deviation and FFT which can be used for unsupervised, supervised and reinforcement learning where such as regression, k-nearest neighbors and other algorithms are used. The tutorial will also introduce the basics of the neural networks, their design and pros and cons with explanation why certification authorities do not accept systems using neural networks for safety critical applications. The tutorial will be concluded by a use case utilizing machine learning with data classification algorithms for automatic recurrent testing of avionics software modifications. **PRESENTER BIO** Pavel Paces is currently member of Artificial Intelligence Center and Department of Aerospace Technologies at Czech Technical University in Prague, Czech Republic. He graduated from Electrical Engineering in 2005 and got his Ph.D. in Aerospace Engineering in 2011 at the same university. Pavel has past experience with aerospace sensors development, flight simulators certification and business development.
	UAS
Detect and Avoid for Unmanned Aircraft Systems	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. PRESENTER BIO Giancarmine Fasano is Associate Professor at the University of Naples “Federico II”, where he holds courses in “Unmanned Aircraft Systems” and “Space Flight Dynamics”. His research activities in the field of aeronautics are focused on UAS, and in particular on sense and avoid and cooperative multi-UAV systems. In the space field he is mainly interested in distributed space systems and proximity operations, with emphasis on relative motion design and control. He is Member of the Avionics Systems Panel of the IEEE Aerospace and Electronic Systems Society and Associate Editor of the IEEE AESS Magazine for the UAS area of specialty. He is also Member of the AIAA Sensor Systems and Information Fusion Technical Committee and of the IAA Committee on Small Satellites. He has co-authored over 110 publications and five book chapters.
Intelligent Control Architecture for Autonomous Vehicles	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. PRESENTER BIO Dr. Carlos C. Insaurralde is a Senior Lecturer in Electronic Engineering in the Department of Engineering Design and Mathematics, University of the West of England, UK. His roles are Programme Leader BEng(Hons) Robotics and Module leader for courses from the Electronic Engineering and Robotics programmes. He received the MEng degree in Electronics from the National University of Cordoba, Argentina, in 1999, the MAst and PhD degrees in Computer Engineering (Mention “Doctor Europaeus” accredited by the European University Association) from the Universidad Complutense de Madrid, Spain, in 2005 and 2007 respectively, and the MPhil degree in Electrical Engineering from Heriot-Watt University, UK in 2014. He also received a PgCert in Learning and Teaching in Higher Education from Teesside University, UK in 2017. He is a Fellow of the Higher Education Academy (FHEA), UK and an IEEE Senior Member. Dr Insaurralde has worked in collaboration with EADS (Airbus and Eurocopter), and BAE Systems as well as in different industrial sectors (aerospace, defense, maritime, and industrial automation). He has over twenty years of hands-on experience in software engineering, including over ten years of engineering research experience in robotics and autonomous systems. He is author of over eighty international publications, including a book and five book chapters. He is also author of fifteen technical project reports. His background is in architectures of intelligent and autonomous systems, multidisciplinary development of high-integrity systems, and metric assessment of systems performance. His research interest mainly focuses on intelligent automation and autonomy, including decision-making support for Air Traffic Management (ATM).
Reliable Navigation for Unmanned Aircraft Systems	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.

PRESENTER BIO
Dr. Uijt de Haag is the Edmund K. Cheng Professor of Electrical Engineering and Computer Science and a Principal Investigator (PI) with the Avionics Engineering Center at Ohio University since 1999. He obtained his M.S.E.E. degree from Delft University in The Netherlands in 1994 and a Ph.D. in Electrical Engineering from Ohio University in Athens, Ohio in 1999. He has authored or co-authored has authored or co-authored over 140 navigation-related publications and seven book chapters.

Free Tutorial

AESS Avionics Systems Panel Research and Education Perspectives

- Part-I: Avionics Systems Research and Innovation Opportunities
- Part-II: Avionics Systems Educational Needs and Curricular Evolution

This tutorial is being presented on behalf of the IEEE Aerospace Electronic Systems Society (AESS) Avionics Systems Panel (ASP). The panel comprises experts in various areas of Avionics Engineering representing industry, academia, and the government around the globe. The tutorial forms part of efforts undertaken by the panel to propagate expertise in Avionics Systems. The tutorial is configured in two distinct segments, which in turn are interconnected as avionics (1) research and (2) education.

Part one (avionics research) elucidates the contemporary and future, industry focused, development and innovation areas in the field of Avionics Engineering. The constantly increasing density of air traffic and the growing diversity of aerospace vehicles that will occupy the air space imposes new requirements on Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) and Avionics (CNS+A) technologies. Unmanned Aerial Systems (UAS) are key drivers in the evolution of CNS+A systems. Additionally, Urban Air Mobility (UAM) is expected to add a new dimension to future aviation related technologies. The conventional ATM network and services will be expanded to include new UAS and Space Traffic Management (UTM/STM) schemes for un-segregated operations of manned and autonomous vehicles both in atmospheric flight (including low-level and urban operations) and in near-Earth space operations. In the wake of UTM/UAM come further advances in Performance-Based Operations (PBO), which will have profound impacts on aviation equipment mandates and standards, with tangible benefits in terms of airspace capacity, safety, access modalities, prioritization and overall fairness. Another key area will be the design of Human-Machine Interfaces and Interactions (HMI2) supporting trusted autonomous operations (i.e., human-autonomy teaming). All these spheres will utilize Machine Learning & Artificial Intelligence (ML/AI) algorithms to enhance the overall CNS+A systems performance and efficiency.

Likewise, certification of ML/AI in aviation and especially safety critical avionics is a major focus of current research. Proliferation of cyber-physical systems, especially for UTM/UAM operations makes cyber security a critical requirement.

The aim of Part two of this tutorial (avionics education) is to discuss practical approaches for the alignment of educational curricula with that of relevant industry needs and technological advances in the field of avionics engineering. A review of existing avionics programs will be presented, highlighting their current shortcomings vis-a-vis prevailing industry requirements and future trends covered in part one. Building on the fact that most curricula have not been updated since the late 1990s, a new and comprehensive undergraduate curriculum is proposed, clarifying the rationale of variations from current practices. Additionally, a curriculum structure suitable for graduate avionics programs is presented, with a focus on specialist skills aligned with the prevailing research and innovations areas in Avionics Engineering. The overall objective of the proposed curricula is to bridge the gaps between higher education, industry practices, government regulators, and public stakeholder needs; towards maximizing educational outcomes and preparedness of the avionics engineering workforce, and to tackle some of the most important challenges and opportunities faced by the aerospace sector globally.

PRESENTERS

- Roberto Sabatini, School of Engineering, RMIT University, Victoria, Australia
- Irfan Majid, Department of Avionics Engineering, Institute of Space Technology, Islamabad, Pakistan
- Erik Blasch, Data Analytics Portfolio, Air Force Office of Scientific Research, Arlington, VA, USA
- Giancarmine Fasano, Dept. of Industrial Engineering, University of Naples “Federico II”, Naples, ITALY
- Kathleen A Kramer, University of San Diego, San Diego, CA, USA

40th DASC Conference Tracks

Track 1: Air Traffic Management (ATM) Machine Learning & Automation Chairs

Rainer Koelle
Eurocontrol

Billy Josefsson
Sweden

Track 2: ATM – Airspace & Spectrum Management Chairs

Jason Glaneuski
DOT/Volpe Center

Bernd Korn
DLR

Track 3: Unmanned Aircraft Systems (UAS) Chairs

Yemaya Bordain
Intel

Vince Socci
LHP Software

Track 4: Communications, Navigation, and Surveillance and Information Networks (CNS) Chairs

Dr. Michael Schnell
German Aerospace Center (DLR)

Divya Chandra
DoT

Track 5: Human Factors (HF) Chairs

Scott Crawford
Raytheon

Steven Harbour
SwRI

Track 6: Space Systems & Special Topics (SSST) Chairs

Michael McLelland
SwRI

Carlos Insaurralde
University of the West of England

Track 7: Cyber, Systems, and Software (CSS) Chairs

Steve Vanderleest
Rapita Systems

Kathleen Kramer
UCSD

Track 8: Urban Air Mobility/Advanced Air Mobility (UAM/AAM) Chairs

Maria Consiglio
NASA

Michael Frye
UIW

Track 9: Integrated Modular Avionics (IMA) Chairs

Björn Annighöfer
U of Stuttgart

Mark Darnell
GE

Poster Papers Chair

Giancarmine Fasano
University of Naples

Technical Sessions: Tuesday, October 5, 10:30-12:00

	10:30	11:00	11:30
Non-Nominal Operations (Track 1) **Session Chairs: Enrico Spinielli, EUROCONTROL & Imen Dhief, Nanyang Technological University Singapore** *Salon A*	**Machine Learning-Enabled Adaptive Air Traffic Recommendation System for Disaster Evacuation** Kai Zhang, Embry Riddle Aeronautical University	**Reconnaissance Mission Flight Modeling for Strategic Planning of Manned and Unmanned Vehicle Integrated Disaster Response** Adriana Andreeva-Mori, Japan Aerospace Exploration Agency	
Communications Resiliency (Track 4) **Session Chairs: Michael Schnell, German Aerospace Center & Ann Tedford, formerly FAA** *Salon B*	**Robust UAS Communications and Loss of Link Operational Impact** Ignacio Vidal, Boeing Research & Technology Europe	**Impact of Pilot Jamming Attacks on Digital Aeronautical Data Communications** Daniel M. Mielke, German Aerospace Center	**Signal Classification for Safety Critical Aeronautical Communications for Anti-Jamming Using Artificial Intelligence** Rameez Asif, University of Bradford
Applications 1 (Track 3) **Session Chair: Yemaya Bordain, Intel Corporation** *Bowie*	**Adaptive UAV Swarm Mission Planning by Temporal Difference Learning** Shreevanth Krishnaa Gopalakrishnan, Cranfield University	**Autonomous Ground Refueling Approach for Civil Aircrafts Using Computer Vision and Robotics** Suleyman Yildirim, Cranfield University	**Multi-Head Attention Based Transformers for Vegetation Encroachment Over Powerline Corriders Using UAV** Srikanth Vemula, University of the Incarnate Word
Pilot Factors (Track 7) **Session Chair: Tim Etherington, NASA** *Bonham*	**An Objective Human Fatigue Monitoring Solution for Fatigue Risk Management or Reduced Crew Operations** Sylvain Hourlier, Thales AVS France SAS	**Design and Validation of a Pilot Stress Monitoring System Based on a Deep Convolutional Neural Network Model** Jaime Meneses, Airbus Defence and Space	**Hypoxia Resistance Comparing Between Physically Trained Pilots and Non-Trained Population** Jan Boril, University of Defence
Optimizing ATM (Track 2) **Session Chairs: Chiemi Heil, US DOT & Kevin Capiot, DLR** *Travis*	**Towards Greener Air Traffic Management Reducing Emissions by Applying the Lowest Impact of Deviation Principle** Michael Finke, German Aerospace Center	**A Unified Collision Risk Model for Unmanned Aircraft Systems** Suraj Bijjahalli, Royal Melbourne Institute of Technology	**A Scenario Optimization Approach for Air Traffic Flow Management with Sector Capacity Uncertainty** Abdelghani Fadil, Beihang University
AI and Multicore (Track 6) **Session Chairs: Martin Halle, TUHH Institut Flugzeug-Systemtechnik & Jeffrey VanDorp, GE Aviation** *Valero*	**Incremental Assurance of Multicore Integrated Modular Avionics (IMA)** Steven VanderLeest, Rapita Systems, Inc.	**Using Neural Networks to Identify Wired Peripherals Connected to Integrated Modular Avionics Hardware** Bastian Luettig, University of Stuttgart	**TFCluster: An Efficient Algorithm to Mine Maximal Differential Function-Resource Biclusters for Single Pilot Operations Safety Analysis** Yue Luo, Shanghai Jiao Tong University

Technical Sessions: Tuesday, October 5, 13:00-15:00

	13:00	13:30	14:00	14:30
Aircraft & Aerial Vehicle Applications (Track 1) **Session Chairs: Xavier Olive, ONERA & Jean Boucquey, EUROCONTROL** *Salon A*	**Certification Approach for Physics Informed Machine Learning and its Application in Landing Gear Life Assessment** Haroun El Mir, Cranfield University	**Flight Data Driven System Identification Using Neural Networks for Landing Safety Assessment** Hyunki Lee, Georgia Institute of Technology	**A Multi-Criteria Clustering Method for UAS Traffic Management and Urban Air Mobility** Nichakorn Pongsakornsathien, Royal Melbourne Institute of Technology	**Reinforcement Learning-Based Flow Management Techniques for Urban Air Mobility and Dense Low-Altitude Air Traffic Operations** Yibing Xie, Royal Melbourne Institute of Technology
Surveillance (Track 4) **Session Chair: Divya Chandra, USDOT Volpe Center** *Salon B*	**OpenSky Report 2021: Insights on ADS-B Mandate and Fleet Deployment in Times of Crisis** Junzi Sun, Delft University of Technology / OpenSky	**Intrusion Detection in Automatic Dependent Surveillance-Broadcast (ADS-B) with Machine Learning** Suleman Khan, Linkoping University	**Drone Model Identification by Convolutional Neural Network from Video Stream** Mariusz Wisniewski, Cranfield University	
Detect and Avoid, Conflict Detection & Resolution 1 (Track 3) **Session Chairs: Evan Dill, NASA & Vince Socci, IEEE** *Bonham*	**Antenna Pattern Aware UAV Trajectory Planning Using Artificial Potential Field** Mohamad Hani Sulieman, Syracuse University	**Detect and Avoid Considerations for Safe sUAS Operations in Urban Environments** Victor Celdran Martinez and Bilkan Ince, Cranfield University	**Detect and Avoid of Weather Phenomena On-Board UAV: Increasing Detection Capabilities by Information Fusion** Adrian Dudek, Bundeswehr University Munich	
Autonomy, High Performance Computing, & 4DT in UAM (Track 8) **Session Chair: Srikanth Vemula, UIW** *Bowie*	**SIRIUS: Simulation Infrastructure for Research on Interoperating Unmanned Systems** Swee Balachandran, National Institute of Aerospace	**A High-Performance Computing Process for Urban Air Mobility Simulations** Thanakorn Khamvilai, Georgia Institute of Technology	**A Modular Experimental Flight Management and 4D Trajectory Generation System for Unmanned Multicopter, Urban Air Mobility Vehicles and Other VTOL Vehicles** Fabian Morscheck, German Aerospace Center	
AI Application (Track 9) **Session Chairs: Michael Koets, SwRI & Michael Epperly, SwRI** *Milam*	**Curating Datasets for Visual Runway Detection** Joakim Lindén, Saab AB	**Toward Certification of Machine-Learning Systems for Low Criticality Airborne Applications** Konstantin Dmitriev, Technical University of Munich	**Framework Prototype to Test Decision Support System for Avionics Analytics** Carlos C. Insaurralde, Bristol Robotics Laboratory	
Avionics Systems (Track 5) **Session Chairs: Uma Ferrell, Mitre & Tim Stelkens-Kobsch, German Aerospace Center (DLR)** *Travis*	**A Secure Broadcast Service for LDACS with an Application to Secure GBAS** Nils Mäurer, German Aerospace Center	**Inflation and Deflation of Aircraft's Tire with Intelligent Tire Pressure Regulation System** Masoud Mirzaee, Islamic Azad University	**Intelligent Health and Mission Management for Multicopter UAS Integrity Assurance** Kavindu Ranasinghe, Royal Melbourne Institute of Technology	
Flow Management (Track 1) **Session Chairs: Valentin Polishchuk, Linköping University & Chris Brinton, Mosaic ATM** *Valero*	**Predict ATFCM Weather Regulations Using a Time-Distributed Recurrent Neural Network** Sergi Mas-Pujol, Universitat Politècnica de Catalunya	**A Privacy-Preserving Marketplace for Air Traffic Flow Management Slot Configuration** Christoph Schuetz, Johannes Kepler University Linz	**A 4D-Trajectory Planning Method Based on Hybrid Optimization Strategy for Demand and Capacity Balancing** Yutong Chen, Cranfield University/ Nanjing University of Aeronautics and Astronautics	**Multi-Agent Deep Reinforcement Learning for Solving Large-Scale Air Traffic Flow Management Problem: A Time-Step Sequential Decision Approach** Yan Xu, Cranfield University

Technical Sessions: Tuesday, October 5, 15:30-17:30

	15:30	16:00	16:30	17:00
Airport Surface Operations (Track 1) **Session Chairs: Yoon Jung, NASA & Luis Delgado, Westminster University** *Salon A*	**Off-Block Time Prediction Using Operators' Prediction History** Ryota Mori, Electronic Navigation Research Institute	**An Aggregate Dynamic Traffic Assignment Model for Generating Multi-Path Standardized Taxi Routes at Airport** Fengjie Liang, Nanjing University of Aeronautics and Astronautics	**Agent-Based Simulation for Aircraft Stand Operations to Predict Ground Time Using Machine Learning** Mingchuan Luo, Dresden University of Technology	**Predicting Runway Configurations and Arrival and Departure Rates at Airports: Comparing the Accuracy of Multiple Machine Learning Models** Ramakrishna Raju, KBR Inc.
Operations & Path Planning 1 (Track 3) **Session Chair: Yemaya Bordain, Intel Corporation** *Salon B*	**Comparing Path Loss Prediction Methods for Low Altitude UAS Flights** Frederick Wieland, Mosaic ATM, Inc.	**Computation of a Database of Trajectories and Primitives for Decision-Based Contingency Management of UAVs Over Congested Areas** Markus Ortlieb, Technical University of Munich	**Identification and Characterization of Traffic Flow Patterns for UTM Application** Abdulrahman Alharbi, Cranfield University	
Displays & HMI (Track 7) **Session Chair: Todd Lovell, Raytheon Intelligence & Space** *Bonham*	**Light Weight Eye Visor for Commercial Pilot Use: Human Factors Assessment of Novel Functionalities** César Álvarez, Airbus Defence and Space	**Human Machine Interface Design to Support Safety Risk Monitoring of Autonomous Small Unmanned Aircraft Systems – Results from a Mock-Up Evaluation** Max Friedrich, German Aerospace Center	**Evaluation of an AoI Mapping and Analysis Tool for the Identification of Visual Scan Pattern** Lothar Meyer, LFV	**Development of a Survey Instrument to Measure Display Compellingness** Michael Dorneich, Iowa State University
Flight Tests & Simulation Evaluations of UAM/AAM Concepts (Track 8) **Session Chair: Michael Frye, UIW** *Bowie*	**Assessing Human-Automation Role Challenges for Urban Air Mobility (UAM) Operations** Lakshmi Vempati, MITRE Corporation	**Preliminary Evaluation of National Campaign Scenarios for Urban Air Mobility** Nicholas Craven, Spencer Monheim, and Savvy Verma, NASA Ames Research Center/ Millennium Engineering & Integration Co.	**A Machine Learning Based GNSS Performance Prediction for Urban Air Mobility Using Environment Recognition** Oguz Kagan Isik, Cranfield University	
Navigation & Network (Track 9) **Session Chairs: Maarten Uijt de Haag, TU-Berlin & Giancarmine Fasano, University of Naples Federico II** *Milam*	**Generation of Emergency Trajectories Based on Aircraft Trajectory Prediction** Raúl Sáez, Universitat Politècnica de Catalunya	**Automatic Ground Collision Avoidance System Trajectory Prediction and Control for General Aviation** Zack Kirkendoll, University of Tulsa		
Model-Based Development & Requirements (Track 5) **Session Chairs: Todd Kilbourne, Mosaic ATM & Corinna Schmitt, Universität der Bundeswehr München, Research Institute** *Travis*	**Open Source Domain-Specific Model Interface and Tool Frameworks for a Digital Avionics Systems Development Process** Bjoern Annighoefer, University of Stuttgart	**Integrating Safety Into MBSE Processes with Formal Methods** Alexander Ahlbrecht, German Aerospace Center	**Levels of Requirements, Robustness, Unicorns, and Other Semi-Mythical Creatures in the Requirements Engineering Bestiary: Why "Types" of Software Requirements Are Often Misleading** Matt Jaffe, Embry–Riddle Aeronautical University	**Incorporation of Autonomous Model Analytics for Avionic System Design Into Standard Framework for Integrated Engineering** Carlos C. Insaurralde, Bristol Robotics Laboratory
Human Operator Support (Track 1) **Session Chairs: Chris Brinton, Mosaic ATM & Magnus Bang, Linköping University** *Valero*	**A Machine Learning Application for Predicting and Alerting Missed Approaches for Airport Management** Chih-Sheng Chou, MITRE Corporation	**Automated Interpretation of Air Traffic Control Communication: the Journey from Spoken Words to a Deeper Understanding of the Meaning** Matthias Kleinert, German Aerospace Center	**A Multi-Agent Reinforcement Learning Approach for Conflict Resolution in Dense Traffic Scenarios** Jiajian Lai, Beihang University	

Technical Sessions: Wednesday, October 6, 10:30-12:00

	10:30	11:00	11:30	12:00
System-wide Challenges & Change (Track 1) **Session Chairs: Imen Dhief, Nanyang Technological University Singapore & Hanbong Lee, NASA** *Salon A*	**Transitioning from Legacy Air Traffic Management to Airspace Management Through Secure, Cloud-Native Automation Solutions** Adrian Solomon, Thales	**Assessing the Global COVID-19 Impact on Air Transport with Open Data** Rainer Koelle, European Organisation for the Safety of Air Navigation		
Future Communications (Track 4) **Session Chair: Daniel Mielke, German Aerospace Center** *Salon B*	**Deep Clipping Based Interference Mitigation Technique for LDACS** Miziya K, Birla Institute of Technology & Science Pilani	**Novel Filterbank Multicarrier Waveform for L-Band Digital Aeronautical Communications: Initial Field Test Results** David Matolak, University of South Carolina	**SDN Augmented Network Management for Future Avionics Communications Network** Muhammad Ali, University of Bradford	**Aircraft to Operations Communication Analysis and Architecture for the Future Aviation Environment** Huw Whitworth, Cranfield University
Operations & Path Planning 2 (Track 3) **Session Chair: Vince Socci, IEEE** *Milam*	**Initial Exploration of STEReO (Scalable Traffic Management for Emergency Response Operations) System User Requirements for Safe Integration of Small UAS** Lynne Martin, NASA Ames Research Center	**Protected Online Path Planning for UAVs Over Congested Areas Within Convex Regions of Obstacle-Free Space** Markus Ortlieb, Technical University of Munich	**Enhancing the Security of Unmanned Aerial Systems Using Digital-Twin Technology and Intrusion Detection** Benjamin Fraser, Cranfield University	
Human Factors - Special Topics (Track 7) **Session Chair: Jan Boril, University of Defence** *Bonham*	**Study Existing Personal Electronic Devices (PED) Policies and Provide an Automatic Solution to Switch on Airplane Mode In-Flight** Pushpendra Singh Sengar, International Institute of Information Technology Hyderabad	**A User-Centered Cabin Design Approach to Investigate Peoples Preferences on the Interior Design of Future Air Taxis** Maria Stolz, German Aerospace Center	**Common Cause Failure Analysis for Aviation Safety Assessment Models** Sara Nikdel, George Mason University	
CNS, DFR, & Traffic Deconfliction (Track 8) **Session Chairs: Maria Consiglio, NASA & Sweewarman Balachandran, National Institute of Aerospace** *Bowie*	**Informing New Concepts for UAS and Autonomous System Safety Management Using Disaster Management and First Responder Scenarios** Kaleb Gould, Flight Safety Foundation	**Safe Planning and Deconfliction for Multiple UAVs in High Density Low Altitude Urban Environments** Flavia Causa, University of Naples Federico II		
Spectrum Allocation & Performance Monitoring (Track 2) **Session Chairs: Alexander Kuenz, DLR & Chiemi Heil, US DOT** *Travis*	**Dynamic Spectrum Allocation in Urban Air Transportation System via Deep Reinforcement Learning** Ruixuan Han, University of Louisville	**Joint Spectrum Access and Power Control in Air-Air Communications - A Deep Reinforcement Learning Based Approach** Zhe Wang, University of Louisville	**Building Back Better – Democratization of Performance Monitoring with Open Data** Rainer Koelle, European Organisation for the Safety of Air Navigation	
Real-time Networks (Track 6) **Session Chairs: Bastian Luettig, University of Stuttgart & Todd Schavey, GE Aviation** *Valero*	**Do We Really Need TSN in Next-Generation Helicopters? Insights from a Case-Study** Nicolas Navet, University of Luxembourg / Cognifyer	**Performance Evaluation of the Efficient Precise Time Synchronization Protocol for the Redundant Ring Topology Network** Pusik Park, Korea Electronics Technology Institute & Korea Aerospace University	**Analysis of Synchronization in Distributed Avionics Systems Based on Time-Triggered Ethernet** Nahman Tariq, Cranfield University	

Technical Sessions: Wednesday, October 6, 15:30-18:00

	15:30	16:00	16:30	17:00	17:30
Arrival and Departure Management (Track 1) **Session Chairs: Luis Delgado, Westminster University & Yoon Jung, NASA** *Salon A*	**Autocorrelation Effects in Air Traffic Management Performance Data** James DeArmon, MITRE Corporation	**A Machine Learning Approach for the Prediction of Top of Descent** Benjamin Zhi Yong Tan, Nanyang Technological University	**Trajectory Pattern Identification for Arrivals in Vectored Airspace** Chuhao Deng, Purdue University	**Capacity Finder: A Machine Learning-Based Decision Support Tool for Integrated Metroplex Departure Traffic Management** Ryan Laroza, ATAC Corporation	
Onboard Communications (Track 4) **Session Chair: Nils Mäurer, German Aerospace Center** *Salon B*	**Gatekeeper: A Reliable Reconfiguration Protocol for Real-Time Ethernet Systems** Brendan Luksik, University of Pittsburgh	**Can We Replace Physical Wiring with Free-Space Optical Transmission Systems?** Nicholas Dukeman, Embry–Riddle Aeronautical University	**Aircraft DC Networks Characterization and Adaptive Stage Design for PLC Use** Abdelmoumin Allioua, Technical University Darmstadt	**Architectural Considerations for Low Latency ARINC 818 Video Concentrators** Tim Keller, Great River Technology	**Internet Protocol Suite for Safety Services: Validation with Next Generation Avionics** Michal Skorepa, Honeywell
Modeling & Simulation (Track 3) **Session Chair: Yemaya Bordain, Intel Corporation** *Bonham*	**Modelling Assured Navigation of sUAS Swarms in Urban Environments** Maarten Uijt de Haag, Technische Universität Berlin	**Skyway Simulator: an Integrated ATM/UTM Simulator for Autonomous Operations** Guillermo Frontera, Boeing Research & Technology Europe	**Understanding the Implications of the Future Unmanned Air Traffic Growth** Cristina Barrado, Universitat Politècnica de Catalunya		
Safety Assurance & Contingency Management (Track 8) **Session Chair: Michael Frye, UIW** *Bowie*	**An Approach for Identifying IASMS Services, Functions, and Capabilities from Data Sources** Paul Krois, Crown Consulting, Inc.	**Assured Contingency Landing Management for Advanced Air Mobility** Joseph Kim, University of Michigan	**Assuring Human and Artificial Intelligence Are Appropriately Informed in Aviation Systems** Alfred Anderegg, MITRE Corporation		
Safety (Track 9) **Session Chair: Carlos Varela, CS.RPI** *Milam*	**Overarching Properties as Means of Compliance: An Industrial Case Study** Zamira Daw, Raytheon Technologies Research Center	**Development of an Automatic Ground Collision Avoidance System for a General Aviation Aircraft** Tim Neidhardt, Technical University of Munich	**A Qualification Effort Assessment Framework for Development Processes of Safety-Critical System Functions** Darbaz Nawzad Darwesh, University of Stuttgart		
AI & Algorithms (Track 5) **Session Chairs: Chris Watkins, Gulfstream Aerospace Corporation & Martin Halle, TUHH Institut für Flugzeug-Systemtechnik** *Travis*	**Deep Neural Network Approach to Estimate Early Worst-Case Execution Time** Vikash Kumar, Indian Institute of Science	**Classification for Avionics Capabilities Enabled by Artificial Intelligence** Bjoern Annighoefer, University of Stuttgart	**Diagnosing System-Level Cascading Failure Using Machine Learning for Aviation System** Luning Li, Cranfield University	**Wildfire Emergency Response Hazard Extraction and Analysis of Trends (HEAT) Through Natural Language Processing and Time Series** Sequoia Andrade, HX5 LLC.	**An Overview of Cyber-Physical Systems' Hardware Architecture Concerning Machine Learning** Denis Loubach, Aeronautics Institute of Technology – ITA
Self-adaptive and Wireless Avionics (Track 6) **Session Chairs: Denis Loubach, Aeronautics Institute of Technology - ITA & Mark Darnell, GE Aviation** *Valero*	**Requirements and Concept for a Self-Organizing Plug&Fly Avionics Platform** Bjoern Annighoefer, University of Stuttgart	**A Safety Process for Self-Adaptive Safety-Critical Plug&Fly Avionics** Matthias Brunner, University of Stuttgart	**A Localizable Wireless Communication Node with Remote Powering for Onboard Operations** Thomas Multerer, Airbus Central Research and Technology		

Technical Sessions: Thursday, October 7, 8:00-10:00

	8:00	8:30	9:00	9:30
Autonomy Concepts & Applications (Track 1) **Session Chairs: Sameer Alam, Nanyang Technological University Singapore & Martin Christiansson, LFV** *Salon A*	**Verification of Image-Based Neural Network Controllers Using Generative Models** Sydney Katz, Stanford University	**Automated Aircraft Stall Recovery Using Reinforcement Learning and Supervised Learning Techniques** Dheerendra Singh Tomar, University of Malta	**Vehicle Automation Framework: Toward Autonomy** Sérgio Penna, Instituto Nacional de Pesquisas Espaciais	
Navigation (Track 4) **Session Chair: Mitchell Narins, Strategic Synergies LLC** *Salon B*	**Enhancing Detection Performance Through Sensor Model-Based Trajectory Optimization for UAVs** Markus Zwick, Bundeswehr University Munich	**Hardware in the Loop Simulation of Helicopter Pins Procedures Using GLS Avionics and an SBAS to GLS Converter** Thomas Dautermann, German Aerospace Center	**Extending Enhanced Visual Operations to Urban Air Mobility: Requirements and Approaches** Paolo Veneruso, University of Naples Federico II	
Detect and Avoid, Conflict Detection & Resolution 2 (Track 3) **Session Chairs: Emmanuel Letsu-Dake, Honeywell & Vince Socci, IEEE** *Bowie*	**Detecting Cables and Power Lines in Small-UAS (Unmanned Aircraft Systems) Images Through Deep Learning** Arnaldo Alves Viana Junior, Universidade de São Paulo	**Improved Sensing Strategies for Low Altitude Non Cooperative Sense and Avoid** Federica Vitiello, University of Naples Federico II	**Investigation of DAA System Effectiveness with a Pilot Decision Model and Realistic Sensor Performance Limits** Hak-Tae Lee, Inha University	**Aircraft Proximity: Towards Systematic Test Strategies via the Apollonian Proximity Circle Paradigm** Brendan Williams, Boeing Research & Technology
Automation & Teaming (Track 7) **Session Chair: Steven Harbour, Southwest Research Institute** *Bonham*	**We Need to Talk About This - Assessing Information Needs for Collaboration in a Sectorless Working Environment** Anne Papenfuß, German Aerospace Center	**Human-Automation Interaction for Assisting Novices to Emulate Experts by Inferring Task Objective Functions** Sooyung Byeon, Purdue University	**Evaluating Human Perception of Autonomous System Teammate-Likeness** Güliz Tokadli, Iowa State University	
SE Development (Track 9) **Session Chairs: Randy Rose, SwRI & Michael Epperly, SwRI** *Milam*	**Be Lean – How to Fit a Model-Based System Architecture Development Process Based on ARP4754 Into an Agile Environment** Daniel Dollinger, Technical University of Munich	**A Framework for Simulation and Formal Verification of Redundant Flight Control Systems with Components Subject to Partially Synchronous Timing Effects** Valentin Marvakov, Technical University of Munich	**Towards Formalization of a Data Model for Operational Risk Assessment** Vidhya Tekken Valapil, GE Research	**Seamless Integration of Component Fault Trees with MathWorks System Composer and Simulink** Julian Rhein, Technical University of Munich
Cybersecurity (Track 5) **Session Chairs: Paul Meng, GE Global Research & Umut Durak, Technische Universität Clausthal** *Travis*	**ATMChain: Blockchain-Based Solution to Security Problems in Air Traffic Management** Xin Lu, Civil Aviation University of China	**Cybersecurity for Flight Deck Data Exchange** Willard True, Honeywell Aerospace	**An Architecture Centric Approach to Safety and Security Assurance** John Hudak, Software Engineering Institute	**Group Key Distribution Procedures for the L-Band Digital Aeronautical Communications System (LDACS)** Thomas Ewert, German Aerospace Center

Technical Sessions: Thursday, October 7, 10:30-12:30

	10:30	11:00	11:30	12:00
Demand Capacity Balance (Track 1) **Session Chairs: Magnus Bang, Linköping University & Sameer Alam, Nanyang Technological University Singapore** *Salon A*	**Demand and Capacity Balancing Technology Based on Multi-Agent Reinforcement Learning** Yutong Chen, Cranfield University/ Nanjing University of Aeronautics and Astronautics	**Considering Airport Planners' Preferences and Imbalanced Datasets When Predicting Flight Delays and Cancellations** Mike Zoutendijk, Delft University of Technology	**An Airspace Capacity Estimation Model Based on Spatio-Temporal Graph Convolutional Networks Considering Weather Impact** Jiatong Chen, Beihang University	**Propagation of Airport Capacity Improvements to the Air Transport Network** Daniel Lubig, Dresden University of Technology
Applying Neural Networks to Navigation (Track 4) **Session Chair: Thomas Dautermann, German Aerospace Center** *Salon B*	**Recurrent Neural Network Based Sensor Fusion Algorithm for Alternative Position, Navigation and Timing** Byoung-Ju Jeon, Cranfield University	**Determining Impact of Navigation Errors on Mission Capabilities** Kathleen Kramer, University of San Diego	**Adopting Neural Networks in GNSS-IMU integration: A Preliminary Study** Yujin Shin, Hongik University	**Applying Novel Adaptive Activation Function Theory for Launch Acceptability Region Estimation with Neural Networks in Constrained Hardware Environments: Performance Comparison** Atakan Filgöz, Roketsan Missiles Inc.
Applications 2 (Track 3) **Session Chairs: Mahyar Malekpour, NASA & Yemaya Bordain, Intel Corporation** *Bonham*	**City-ATM – Safe Drone Operations in Dense Traffic** Alexander Kuenz, German Aerospace Center	**Evaluating the Use of Unmanned Aircraft Systems to Autonomously Download Ground-Based Sensor Data** Zane Mountcastle, Mission Mule LLC	**Identifying Needs and Requirements for an Integrated Crisis Traffic Management (iCTM) Concept for Unmanned Aircraft Systems Supporting First Responses in Crisis Situations** Joonas Lieb, German Aerospace Center	**Integration of a UAV-Lidar System for Remote Sensing of CO2 Concentrations in Smart Agriculture** Thomas Fahey, Royal Melbourne Institute of Technology
ETVOL Aircraft & Vertiport Operations (Track 8) **Session Chair: Anuja Verma, Mitre & Savita Verma, NASA** *Bowie*	**Initial Feasibility Study of Multi-Rotor eVTOL Aircraft for Cross-Border Urban Air Mobility Between Singapore and Neighbouring Countries** Kailun Tan, Air Traffic Management Research Institute, Nanyang Technological University	**Scenarios for the Use of eVTOLs Using Multiagent Systems with Netlogo: Comparison of Parameters and the Impact on UAM** Felipe Desiglo Ferrare, Universidade de São Paulo	**eVTOL Fleet Selection Method for Vertiport Networks** Jasenka Rakas, Jeffrey Jeung, Duston So, and Valeria Chupina, University of California, Berkeley	
Algorithms, ML/DL, Automation, Autonomy (Track 3) **Session Chairs: Natasha Neogi, NASA & Joseph Kim, University of Michigan** *Milam*	**Unintended Behavior in Learning-Enabled Systems: Detecting the Unknown Unknowns** Darren Cofer, Collins Aerospace	**A Framework for Evaluating the Role of Autonomy for UAS Operations** Anuja Verma, MITRE Corporation	**A New Approach to Complex Dynamic Geofencing for Unmanned Aerial Vehicles** Vihangi Vagal, Royal Holloway, University of London	**Framework of Level-of-Autonomy-Based Concept of Operations: UAS Capabilities** Bizhao Pang, Nanyang Technological University
Safe & Secure Technologies (Track 5) **Session Chairs: Michael Durling, GE Research & Huafeng Yu, The Boeing Company** *Travis*	**Certification Considerations for Adaptive Stress Testing of Airborne Software** Michael Durling, GE Research	**Integrating Multi-/Many-Cores in Avionics: Open Issues and Future Concepts** Anika Christmann, Technische Universität Braunschweig	**Proving the Correctness of Multicopter Rotor Fault Detection and Identification Software** Ankita Bhaumik, Rensselaer Polytechnic Institute	**DO-178C Certification of General-Purpose GPU Software: Review of Existing Methods and Future Directions** Leonidas Kosmidis, Barcelona Supercomputing Center (BSC) & Universitat Politècnica de Catalunya
Trajectory Modelling & Optimization (Track 1) **Session Chairs: Martin Christiansson, LFV & Xavier Olive, ONERA** *Valero*	**Data-Driven Methodology for Uncertainty Quantification of Aircraft Trajectory Predictions** Andrés Muñoz Hernández, Boeing Deutschland GmbH	**Modeling Relative Trajectory Costs for Airborne Trajectory Reroutes Using Trajectory Option Sets** Kevin-Christian Garzon Galindo, San Jose State University Research Foundation/NASA Ames Research Center	**A Performance Learning Method for Aircraft Trajectory Modeling** Yuejingyan Wang, Beihang University	

Technical Sessions: Thursday, October 7, 13:30-15:30

	13:30	14:00	14:30	15:00
Explainable AI (Track 1) **Session Chairs: Jean Boucquey, EUROCONTROL & Valentin Polishchuk, Linköping University** *Salon A*	**SEDA: A Self-Explaining Decision Architecture Implemented Using Deep Learning for On-Board Command and Control** Alexander Stringer, United States Air Force	**Data-Driven Runway Occupancy Time Prediction Using Decision Trees** Zhi Jun Lim, Nanyang Technological University	**An Explainable Artificial Intelligence (xAI) Framework for Improving Trust in Automated ATM Tools** Carolina Sanchez Hernandez, Cranfield University	**Explainable AI in Aerospace for Enhanced System Performance** Sujitra Sutthithatip, Cranfield University
Modelling & Measuring Safety (Track 1) **Session Chairs: Hanbong Lee, NASA & Enrico Spinielli, EUROCONTROL** *Salon B*	**Identifying Emerging Safety Threats Through Topic Modeling in the Aviation Safety Reporting System: A COVID-19 Study** Misty Davies, NASA Ames Research Center	**Risk Metrics to Measure Safety Performance of the National Airspace System: Implementation Using Machine Learning** Firdu Bati, Federal Aviation Administration	**Application of Trajectory Clustering for Aircraft Conflict Detection** Sasha Madar, Georgia Institute of Technology	
Surveillance & Situational Awareness (Track 3) **Session Chairs: Mahyar Malekpour, NASA & Yemaya Bordain, Intel Corporation** *Bonham*	**Counter a Drone and the Performance Analysis of Deep Reinforcement Learning Method and Human Pilot** Ender Çetin, Universitat Politècnica de Catalunya	**Impact of Communications Quality of Service (QoS) on Remote ID as an Unmanned Aircraft (UA) Coordination Mechanism** Robert Raheb, Noblis, Inc.	**Mixed Initiative Balance of Human-Swarm Teaming in Surveillance via Reinforcement Learning** Chengtao Xu, Embry–Riddle Aeronautical University	**Real-Time Drone Surveillance System for Violent Crowd Behavior Unmanned Aircraft System (UAS) – Human Autonomy Teaming (HAT)** Todd Simpson, Sinclair College
Capacity Management & Traffic Coordination (Track 8) **Session Chair: Maria Consiglio, NASA** *Bowie*	**Comparing the Performance of Traffic Coordination Methods for Advanced Aerial Mobility** Ítalo Romani de Oliveira, Boeing Research & Technology	**An RRT* Based Method for Dynamic Mission Balancing for Urban Air Mobility Under Uncertain Operational Conditions** Junlin Lou, Cranfield University	**Emergent Autonomy – A Step Toward Assurance** Andrew Lacher, Noblis, Inc.	
Next-Gen Space Systems (Track 9) **Session Chairs: John Stone, SwRI & Patrick Phelan, SwRI** *Milam*	**Comparative Study of Ethernet Technologies for Next-Generation Satellite On-Board Networks** Pierre-Julien Chaine, Airbus Defence and Space	**Spectrum Sensing of Cognitive Radio for CubeSat Swarm Network** Chengtao Xu, Embry–Riddle Aeronautical University	**Lunadrone: Experimental UAS Designed for Lunar Operations** John Kramer, Sinclair College	
Flow Management & Airport Operations (Track 2) **Session Chairs: Dylan Hasson, U.S. DOT & Chiemi Heil, US DOT** *Travis*	**A Moment-Based Distributionally Robust Optimization Model for Air Traffic Flow Management** Bin Hao, Beihang University	**Evaluation of Controller Position Takeover in Team-Based Flight Centric ATM** Kevin Capiot, German Aerospace Center	**Analysis of Delay Recovery in Chinese Airports Network** Daozhong Feng, Beihang University	
Systems & Development (Track 6) **Session Chairs: Darbaz Darwesh, University of Stuttgart & Shana Fliginger, Eaton** *Valero*	**Avionics Next-Gen Engineering Tools (AvioNET): Experiences with Highly Automised and Digital Processes for Avionics Platform Development** Martin Halle, Hamburg University of Technology	**Enabling the Automated Generation of the Failure and Redundancy Management for Distributed and Integrated Fly-by-Wire Avionics** Thorben Hoffmann, University of Stuttgart	**Toward a Cloud-Based Flight Management System** Todd Kilbourne, Mosaic ATM, Inc.	

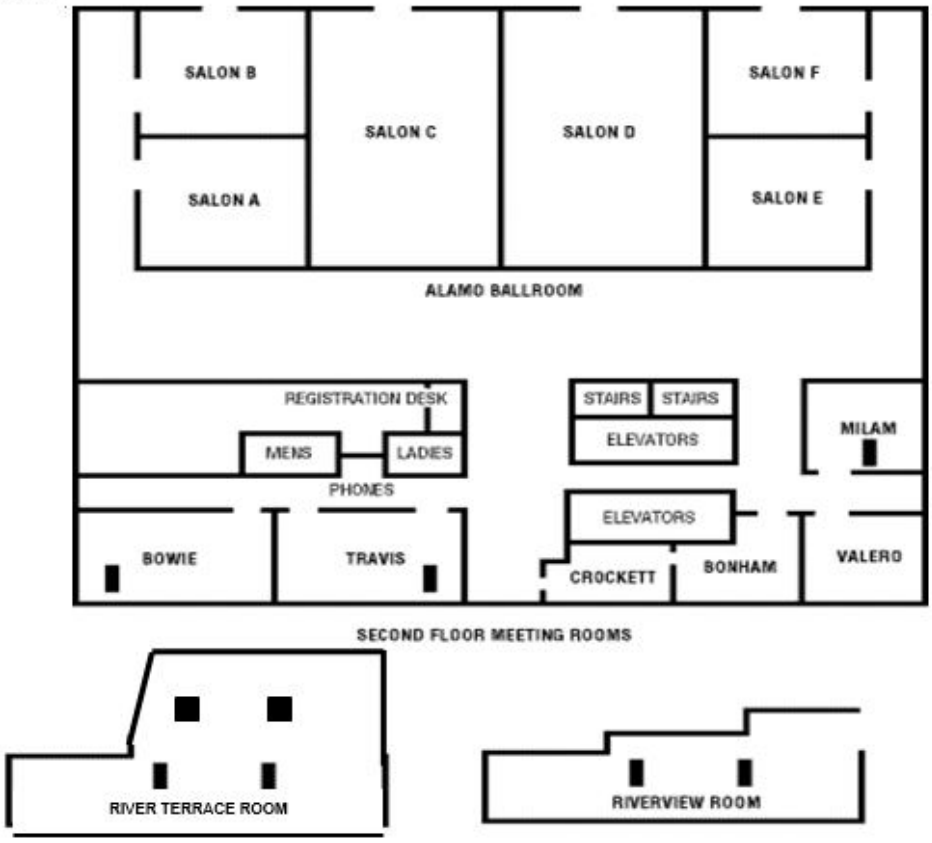
Poster Sessions

Poster A *Tuesday, October 5, 17:30-19:30* *Foyer* **Session Chair: Omar Garcia Crespillo, DLR**	**Poster B** *Wednesday, October 6, 10:30-12:00* *Virtual* **Session Chair: Dongsong Zeng, MITRE**
Test Bench for Regenerative Braking UAVs to Maximize Efficiency Jan Leuchter, University of Defence	**Research on UAV Route Optimization in Complex Terrains** Lihua Zhu, Nanjing University of Science and Technology
A Testbed for Performance Analysis of Algorithms for Engineless Taxiing with Autonomous Tow Trucks Stefano Zaninotto, University of Malta	**The Factor Graph Information Fusion Algorithm with Time-Varying Noise Estimate for All-Source Navigation System** Yuyang Ge, Shanghai Jiao Tong University
Low-Cost System Architecture Solutions for Small Unmanned Aircraft Traffic Management Dean La Monica, Air Force Institute of Technology	**Research on Security Gateway of System Wide Information Management** Yue Yin, Civil Aviation University of China
Indoor Autonomous Powerline Inspection Model Tristan Brouwer, University of the Incarnate Word	**A Collaborative Trajectory Management Framework in Case of Single Pilot Operation Disability: Considering the Overall Safety of Air Traffic System** Pavel Paces, Czech Technical University in Prague
Artificially Intelligent Assistance for Pilot Performance Assessment Pavel Paces, Czech Technical University in Prague	**Taxi-Out Time Prediction at a Busy Airport Using Random Forest Algorithm** Jihoon Kim, Korea Aerospace University
	Integrated Frameworks of Unsupervised, Supervised and Reinforcement Learning for Solving Air Traffic Flow Management Problem Yan Xu, Cranfield University
	Streamlining the Airborne Systems Certification Mohamad Ibrahim, Clausthal University of Technology
	Trust of Airspace Configuration Transition Concerning the Fluctuation of Air Traffic Chengtao Xu, Embry–Riddle Aeronautical University
	Going SPO: Hierarchical Task Analysis of Pilot Flying and Pilot Monitoring in Two-Crew Operations Min Li, Shanghai Jiao Tong University

Map of Marriott Riverwalk Hotel Conference Space

San Antonio Marriott Riverwalk
889 East Market Street
San Antonio, Texas 78205 USA

MARRIOTT
SAN ANTONIO
RIVERWALK



COVID-19 Policies and Recommendations

In response to the current COVID-19 pandemic, DASC 2021 has officially moved to a hybrid conference format, where attendees can be either virtual or in-person. For our in-person attendees, we are excited to host a strong in-person experience while implementing protocols that promote awareness and protection. The conference has in place the following procedures and policies.

Mask Wearing and Physical Distancing

Based on CDC guidelines, we ask attendees to wear masks during the conference. Presenters can decide to wear masks or not. The venue will be set up to provide a minimum of 6 feet of distance between presenters and audience. The rooms will be set up to promote social distancing.

Hotel Policies and Practice

DASC will work closely with the hotel to promote recommended best practices related to venue cleaning, food handling, and social distancing. Marriot San Antonio Riverwalk will follow all local Texas and San Antonio ordinances including all employees required to wear masks. Hand sanitizer stations are placed throughout all public areas and meeting space areas of the hotel. There are signs throughout the hotel encouraging mask wearing, however, the hotel will not be policing guests to wear masks.

Food Services

Hotel employees will serve food to all attendees buffet style to limit the amount of surfaces touched. The awards Luncheon will be a plated meal. Grab-and-go meals will be individually wrapped for the attendee.

Health

We ask attendees perform a self-check each morning to assess if they are feeling ill or displaying COVID like symptoms. If you are not feeling well, we ask that you remain in your hotel room and attend the conference virtually. It is not possible to do contact tracing; however, if we become aware of a positive case of COVID, the on-site attendees will be informed either during or following the conference as soon as we know of any such incidence.

Pre-Meeting Guidance

Attendees should closely monitor all travel alerts issued by the U.S. Department of Homeland Security. Attendees are encouraged to monitor the CDC website for additional information. Attendees should check their individual airlines for specific cancellation / refund policies. DASC will not be responsible for any airline cancellation or change fees should you be unable to either attend for any reason or have any problem returning home after the meeting. All attendees should check themselves for symptoms before starting travel.

Attendees agree to annual meeting terms and conditions, to abide by all posted safety guidelines, and to release DASC from risks associated with attending the DASC conference.

We are excited to host you in-person and are committed to doing so safely. We will continue to keep you informed about our plans to ensure you feel welcome joining us with clear expectations for your 2021 DASC experience.

Thank you for supporting DASC!