

Aerospace Systems and Technology Conference

Technical Session Schedule

As of 11/05/2018 07:40 pm

Monday, November 5

Power Systems - Commercial Power Systems

Session Code: ASTC302

Room Private Room 32

Session Time: 1:30 p.m.

This session shall include papers related to commercial aircraft and unmanned vehicles electrical power generation, power management/power distribution, control & protection corona and arc fault detection, power conversion/conditioning, energy storage – batteries/ultracapacitors, and other related issues. New commercial aircraft are considering the use of variable frequency power and the power requirements are going to be much more for a More Electric Airplane.

Organizers - Jon Fifield, Astronics - Luminescent Systems Inc.; Travis E. Michalak, US Air Force Research Laboratory; Mario R. Rinaldi, UTC Aerospace; Sean Field, Naval Air Systems Command; Michael Melnyk, US Department Of The Navy; Doug Harmon, NAVAIR; Christopher Severns, Boeing Co

Chairpersons - Christopher Severns, Boeing Co

Time	Paper No.	Title
1:30 p.m.	2018-01-1938 ORAL ONLY	Electrical Energy Storage Technologies for Hybrid Electric Aircraft Iain Robert George Fleming; Catherine E. Jones, Patrick Norman, Graeme Burt, University of Strathclyde
2:00 p.m.	2018-01-1934	DC Arc Fault Detection Methods in MEA Distribution Systems Jeffy Thomas, Rory Telford, Puran Rakhra, Patrick Norman, Graeme Burt, University of Strathclyde
2:30 p.m.		BREAK
3:00 p.m.	2018-01-1935	Towards Dual and Three-Channel Electrical Architecture Design for More-Electric Engines Qiyang Zhang, Michal Szttykiel, Patrick Norman, Graeme Burt, University of Strathclyde
3:30 p.m.	2018-01-1937	Modulation Limit Based Control Strategy for More Electric Aircraft Generator System Seang Shen Yeoh, Mohamed Rashed, Serhiy Bozhko, University of Nottingham
4:00 p.m.	2018-01-1936	Dynamic Stability Analysis of High-Speed Traction Drive CVT for Aircraft Power Generation Kippei Matsuda, Tatsuhiko Goi, Kenichiro Tanaka, Hideyuki Imai, Kawasaki Heavy Industries, Ltd.; Hirohisa Tanaka, Yasukazu Sato, Yokohama National University

The papers in this session are available in SAE Technical Paper Collection, COLL-TP-00618 and SUB-TP-00013, an individually. To purchase visit collections.sae.org

Tuesday, November 6

Opening Plenary & Keynote Speakers

Session Code: ASTC1

Room Commonwealth Suite

Session Time: 9:00 a.m.

Time	Paper No.	Title
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- 9:00 a.m.** **ORAL ONLY** **Emerging Trends in the Electrification of Aerospace – A Perspective from Rolls-Royce**
- The presentation considers the backdrop to the acceleration of electrical capability in aerospace in recent years, and examines two separate continuing trends – the evolution of mature aerospace markets and their requirement for increasing electrical capability; and the disruptive effect of new markets, enabled by emerging technology and embraced by a wider range of new organisations. How these two trends affect the market, what opportunities they enable, what issues they create, and how the market reacts are all areas for further examination. From Rolls-Royce’s propulsion system perspective, the presentation also considers key emerging technology and looks at the broader ecosystem which is enabling and accelerating change.*
- Robert Watson, Rolls-Royce*
- 9:30 a.m.** **ORAL ONLY** **Meet the Opening Plenary**
- Michael Winter, Pratt & Whitney; Robert Watson, Rolls-Royce; Ajay Misra, NASA John Glenn Research Center; Robert Loveday, GE Aviation*

Tuesday, November 6

Littlewood Lecture

Session Code: **ASTC1900**

Room Commonwealth Suite

Session Time: **11:30 a.m.**

Organizers - *Robert L. Ireland, Airlines for America; Pascal Joly, Airbus; Nicol Lachimia, James Sherman, SAE International*

Time	Paper No.	Title
11:30 a.m.	2018-01-1925	Highly Efficient Civil Aviation, Now via Operations - AAR and Challenges <i>R K Nangia</i>

Tuesday, November 6

(Part 1 of 3) Electric Aircraft

Session Code: **ASTC2100**

Room Commonwealth Suite

Session Time: **2:30 p.m.**

The next generation of aircraft will be Electric Aircraft and in various configurations that were considered improbable, if not impossible. The new aircraft will result in higher performance, added capability, and in a more reliable platform for both personal and public transportation. The demonstrations by NASA and various traditional manufacturers, and new companies, are being used to define the next generation of airplanes. The next generation of more integrated systems, such as integrated propulsion, power, and control, is well underway and yielding positive results.

Organizers - *Richard Ambrose, Airbus; Ravi Rajamani, drR2 Consulting; Pascal Thalin, SAE EASG Chair; Patrick Norman, Univ of Strathclyde*

Time	Paper No.	Title
12:30 p.m.		LUNCH BREAK
2:30 p.m.	ORAL ONLY	SAE Hybrid Propulsion Committee Overview <i>David Alexander, SAE International; Richard Ambrose, Airbus</i>

- 3:00 p.m.** **ORAL ONLY** **Connecting Communities - How Electric Aircraft will Enable the New Demand-Driven World**
Electric and Hybrid Electric Propulsion are going to be part of our lives. Over the years, the technologies used to produce thrust have changed and the number of passengers transported by air each year has reached 4 billion. Air traffic will double in the next 15 years. Faced with these new challenges, Airbus is researching technologies which further improve the sustainability of our products and strives to develop next generation technologies to reduce our carbon footprint by 50% in 2050 compared to 2005. Our teams are working on several new propulsion architectures; among them, hybrid electric propulsion.
Richard Ambroise, Airbus
- 3:30 p.m.** **ORAL ONLY** **The Future of Flight: Electric and Digital**
Zoltan Koltai, Siemens Corp.

Tuesday, November 6

Avionics Systems - Aircraft Information and Communication Networks

Session Code: **ASTC402**

Room Connaught Suite A

Session Time: **1:30 p.m.**

The aim of this session is to present the latest developments in aircraft networks and provide information on network standards, physical layers, avionics applications and the role of network infrastructure in system design

Organizers - *Serge A. Bruillot, Dassault Aviation; Mark Lawrence Darnell, GE Aviation; Marc Gatti, Thales Avionics; Ralf God, Hamburg University of Technology; Mirko Jakovljevic, TTTech. Computertechnik AG*

Chairpersons - *Serge Bruillot, Dassault Aviation*

Time	Paper No.	Title
1:30 p.m.	ORAL ONLY	Ethernet Networks for Advanced Integrated Systems <i>Mirko Jakovljevic, TTTech. Computertechnik AG</i>
2:00 p.m.	ORAL ONLY	20 Years of TTP Databus: History and Applications <i>Mirko Jakovljevic, TTTech. Computertechnik AG</i>

Tuesday, November 6

(Part 1 of 2) Avionics SW/HW Certification: DO-178 and DO-254

Session Code: **ASTC403**

Room Connaught Suite A

Session Time: **3:00 p.m.**

The avionics industry has been working to the DO-254 & DO-178 standard for FPGAs, ASICs, PLDs and Hardware designs for systems, avionics LRUs and IMA hardware applications. There are many areas of this standard which are in flux due to the complexities of the technology as well as the changes in the certification policies in commercial and military programs. This session will discuss several areas of current dialog and concern within the certification community as it relates to this standard.

Organizers - *Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics; Tammy M. Reeve, Patmos Engineering Services Inc.*

Chairpersons - *Tammy Reeve, Patmos Engineering Services Inc*

Time	Paper No.	Title
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3:00 p.m.	ORAL ONLY	Avionics Equipment Product Policy: Challenges and Complexities in the Current Certification Process
		<p>Since years Airbus helicopters is engaged in design process based on definition and integration of a company product policy. Product shall be understood as an equipment, Application SW, Concept HMI,.. Main reason is to simplify and shorten the path of aircraft development, de-scope product development to Aircraft development, keep a harmonized family concept on all fleet.
</p> <p>On the other hand, certification process based on Top down approach starting from Aircraft function down to Hardware item or SW item are not really adapted in this industrial methodology. To fix the issue, Airbus helicopters is proposing an alternative methods fitting with industrial constraint and certification requirements defined in CS 27/29 1309.
</p> <p>The presentation will be composed of 3 parts
 Concept of product policy within AH
 Difficulties to integrate a product policy in a certification process
 How to stream line product policy integration in a certification process
 Frederic Faubladier; Louis FABRE, Airbus Helicopters</p>
3:30 p.m.	ORAL ONLY	Feedback of a Use Case on a Real Time On-board Many Core Implementation
		<p>This presentation is depicting the activities conducted by engineers and PhD Student, of the Software expertise team of the embedded computer department of Airbus Helicopters design Office, as part of the differents research projects* and the perspectives of manycore computers for the development of light avionic computers. This presentation will first report on experiments made to port existing software into on-board real-time computations, using a manycore processor.</p>
 <p>There are two main problems to be addressed: </p>
 1. The management of the flow of inputs from sensors;</p>
 2. The projection of existing system/software architecture on to the processors of on cluster.</p>
 <p>The presentation will conclude on the foreseen perspectives of using manycore processors to develop a light avionic computer identifying:</p>
 1. The driving factors of the choice</p>
 2. The key aspects to be studied</p>
 <i>*Part of this work was supported by the CAPACITES research project, supported by the French authorities through the â€œInvestissements dâ€™Avenirâ€™ program.</i>
 Louis Fabre; Frederic Faubladier, Airbus Helicopters</p>
4:00 p.m.	ORAL ONLY	Satisfying the Timing Requirements of CAST-32A using COTS OS and Tools
		Olivier Charrier, Wind River; Guillem Bernat, Rapita Systems Ltd.

4:30 p.m.

ORAL ONLY

Safety Critical COTS Hardware, Fact or Fiction?

This presentation will discuss the changes in the COTS industry to support systems with DO-254/ED-80 and DO-178C/ED-12C requirements including a revolutionary change from providing hardware to providing complete COTS designs as Intellectual Property (IP) solutions. The presentation will also touch on some of the concerns with certifying with COTS Circuit Board Assemblies.

</p>

Commercial-Off-The Shelf (COTS) hardware modules have become a staple of modern embedded systems saving integrators time and money over traditional custom-built systems. This is serving the mil/aero industry well since the change from mil-spec started 20 years ago. Now mil/aero requirements are evolving to include DO-254/ED-80 safety requirements for hardware and the COTS industry is in lock-step providing safety certifiable hardware solutions continuing to enable system integrators to provide cost effective solutions. This is leading to COTS designs that could provide advantages to system integrators supplying commercial, civil or military safety critical avionics platforms.

Gregory Sikkens, Core Avionics and Industrial Inc.

Tuesday, November 6

Power Systems - Aircraft Power Management & Distribution

Session Code: ASTC300

Room Private Room 32

Session Time: 2:30 p.m.

This session shall include papers related to military manned aircraft and air vehicle electrical power management and distribution (relays, circuit breakers, SSPCs), control & protection, arc fault protection, power conversion (AC/DC, DC/DC/ AC/AC) and power conditioning. AC (fixed & variable frequency) and DC (28 VDC and 270 VDC) systems are planned for discussion.

Organizers - Jon Fifield, Astronics - Luminescent Systems Inc.; Travis E. Michalak, US Air Force Research Laboratory; Mario R. Rinaldi, UTC Aerospace; Sean Field, Naval Air Systems Command; Patrick Norman, Univ of Strathclyde

Chairpersons - Patrick Norman, Univ. of Strathclyde

Time	Paper No.	Title
2:30 p.m.	2018-01-1930	Power Dissipation Optimization for Solid State Power Control Modules in the Aircraft Secondary Power Distribution System <i>Neno Novakovic, Milorad Manojlovic, UTC Aerospace Systems</i>
3:00 p.m.	2018-01-1931	Definitions of Test Conditions for High Voltage Aerospace Systems Using the IAGOS Atmospheric Dataset <i>Hasti Haghighi, Ian Cotton, Richard Gardner, University of Manchester; Bastien Sauvage, Universit� de Toulouse</i>
3:30 p.m.	2018-01-1927	Transient Stability Analysis of DC Solid State Power Controller (SSPC) for More Electric Aircraft <i>Jeevan Adhikari, Tao Yang, Mohamed Rashed, Serhiy Bozhko, University of Nottingham; JiaWei Zhang; Patrick W. Wheeler, University of Nottingham</i>
4:00 p.m.	2018-01-1932	Power Quality Test Data Analysis for Aircraft Subsystem <i>Shobha Ramanjani, UTC Aerospace Systems</i>

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Wednesday, November 7

(Part 2 of 3) Electric Aircraft

Session Code: ASTC2100

Room Commonwealth Suite

Session Time: ALL DAY

The next generation of aircraft will be Electric Aircraft and in various configurations that were considered improbable, if not impossible. The new aircraft will result in higher performance, added capability, and in a more reliable platform for both personal and public transportation. The demonstrations by NASA and various traditional manufacturers, and new companies, are being used to define the next generation of airplanes. The next generation of more integrated systems, such as integrated propulsion, power, and control, is well underway and yielding positive results.

Organizers - Ravi Rajamani, drR2 Consulting; Pascal Thalin, SAE EASG Chair; Patrick Norman, Univ of Strathclyde

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	Welcome & Introductions Ravi Rajamani, drR2 Consulting
9:10 a.m.	ORAL ONLY	Electrical Propulsion – “ Onwards and Upwards Around 100 electrically propelled aircraft programmes are now in development. In this presentation Robert Thomson will survey the landscape of the different development programmes, outline the progress made against the barriers to electrical propulsion, and describe the environmental pressures that may accelerate adoption of electrical propulsion. He will also assess the implications for existing and new suppliers to the aerospace industry, including the forthcoming jostle for supremacy between aircraft OEMs, engine companies, and electrical systems suppliers. Robert W. Thomson, Roland Berger Strategy Consultants
9:50 a.m.	ORAL ONLY	Technology Status and Path Forward for Electrified Aircraft There is growing interest in development of electrified aircraft for commercial aviation. The initial introduction of commercial electrified aircraft is expected to be for urban air mobility with three to four passenger and thin haul sector with up to ten passengers. With time the application space for electrified aircraft will be expanded to commuter and regional aircraft. The ultimate goal is to have electric propulsion for 737 class aircraft. Commercial introduction of various aircraft will be a strong function of availability of technology. This presentation will review the current status of various technologies related to the electrified aircraft. Various electrified aircraft configurations that are possible with today’s state of technology will be highlighted. Path forward for development of technologies related to future generation of electrified aircraft will be discussed. The presentation will identify key technical barriers for the expansion of electrified aircraft concept to multiple aviation sectors. Ajay Misra, NASA John Glenn Research Center
10:30 a.m.		BREAK

- 11:30 a.m. ORAL ONLY Transformative Vertical Flight WG-4 Public Services**
- <p>Over the past few years a community of aerospace professionals that includes technical, regulatory, and business elements have been exploring the potential for new forms of air transportation systems. Their focus has been on systems that embody combinations of on-demand, distributed electric propulsion, and vertiport capabilities. This community has been pursuing their interest through a series of Transformative Vertical Flight (TVF) workshops and working groups coordinated by NASA.</p>*
- <p>The “Public Services Working Group” is responsible for defining activities in appropriate timeframes that would lead to the creation of a national capability for TVF enabled search and rescue, law enforcement, medical transport, emergency/humanitarian response, and military operations. </p>*
- <p>The TVF enabled public services capabilities present excellent opportunities to significantly transform and enhance our ability to help people and save lives. The working group has identified many viable applications as well as the vehicle and system capabilities needed for these short range vertical lift missions. Public services sector could lead the early deployment of TVF vehicles and systems, not only to apply the unique capabilities for public good but also be able to generate good will and positively influence public acceptance of Transformative Vertical Flight system.</p>*
- Johnny T. Doo, International Vehicle Research*
- 12:00 p.m. 2018-01-1926— ORAL ONLY Fully Electric Regional Airliner Feasibility and Design Study**
- <p>The paper presents a design study for a fully electric regional airliner with a high wing, envisaged to enter service in 2035. The work reported includes the conceptual, preliminary and some detailed design of a 70 passenger twin propeller-driven vehicle, with a 46 passenger short take-off and landing capability also investigated. The design mission is to carry 70 passengers 300 nm with a take-off mass of 27 tonnes and at a cruise Mach number of 0.65.</p>*
- <p>The power and propulsion system is reported in some detail. A step change in today’s battery technology is envisioned to be required to make such a pure-electric regional airliner feasible. Lithium-Air is a candidate cell chemistry and system sizing aspires to achieve a 900 Wh / kg battery energy density. Operational aspects have been studied and reported. Thermal management design is progressed, in particular considering the electrical power systems requirements and the two 4 MW motors driving the two propellers. Flight path performance is studied in detail and reference made to ACARE Flight Path 2050 targets, including for noise.</p>*
- <p>In terms of aircraft structures, particular attention is paid to the wing design, considering the wing no longer needs to serve as a kerosene storage vessel. Structural design and systems integration is investigated, including using a detailed CAD model implemented in CATIA software.</p>*
- <p>Certification in the context of Part 25 is given full consideration, with modifications and means of compliance to enable a pure-electric airliner proposed. This is approached by considering in some respects the battery and electrical power distribution system to be equivalent to the kerosene aircraft’s fuel system, while for the electric motor, the engine regulations are used in part as being analogous. Lessons learned and key challenges ahead to enable a fully electric airliner are reported. </p>*
- Craig Peter Lawson, Howard Smith PhD, Cranfield University*
- 12:30 p.m. LUNCH BREAK**
- 1:30 p.m. ORAL ONLY Aircraft Electrification**
- Michael Duell, BAE Systems*

2:00 p.m.	ORAL ONLY	<p>The Electric Aircraft Paradigm</p> <p><i>An overview of the goals, challenges, and stakes for various applications of the Electric Aircraft will be presented. With regard to systems and propulsion, a specific focus will be made on enabling technologies and architectures for more-electric and all-electric aircraft. Standardization requirements behind this paradigm shift will also be addressed.</i></p> <p><i>Pascal Thalin, SAE EASG Chair</i></p>
2:30 p.m.	ORAL ONLY	<p>Integration of New and Conventional Aerospace Systems for Next-Generation Aircraft</p> <p><i>The aircraft industry's push towards the concept of more-electric aircraft (MEA) has been driven by the demand to optimize aircraft performance, decrease operating and maintenance costs and reduce gas emissions. Recent technological advances in the field of power electronics, fault-tolerant architecture, electro-hydrostatic actuators, flight control systems, high density electric motors, power generation and conversion systems have ushered the era of the MEA. Adoption of the MEA concept is seen as critical enabler for the aircraft industry to unlock significant improvements in terms of aircraft weight, fuel consumption, total life cycle costs, maintainability and aircraft reliability. This trend is accelerating, as aircraft OEMs collaborate with their suppliers to design new systems and implement new electrical-intensive architectures. However, adaptation of innovative technologies inherently comes with substantial risks in certification. A compromised strategic approach would follow an integration of conventional and new technologies within the development of a new type of aircraft in order to exploit technology maturity of existing conventional system whilst pushing the industry's limit through innovative solutions.</i></p> <p><i>Seyed Mohseni, Samad Aerospace</i></p>
3:30 p.m.	ORAL ONLY	<p>A Study on the More Electric Architecture for Aircraft and Propulsion (MEAAP) Concept</p> <p><i>Naoki Seki, IHI Corporation</i></p>
4:00 p.m.	2018-01-1933	<p>Energetic, Environmental and Range Estimation of Hybrid and All-Electric Transformation of an Existing Light Utility Commuter Aircraft</p> <p><i>Michele Trancossi, Sheffield Hallam University; Jose Pascoa, Universidade Da Beira Interior</i></p>

Wednesday, November 7

Avionics Systems - Artificial Intelligence

Session Code: ASTC414

Room Connaught Suite A

Session Time: 9:00 a.m.

Everyone know and use Artificial Intelligence every days, using Google, Amazon, iPhone with SIRI, etc. but if this use is a common practice in the consumer domain, it is not the case for the domains where safety is Key.

What we propose to address in this section is the use of AI within the domains where safety is key and to analyze how we can use this technology and to do what : helping driver or pilot, in what circumstances and how to validate and qualify it facing certification authorities.

Organizers - Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics

Chairpersons - Marc Gatti, Thales

Time	Paper No.	Title
9:30 a.m.	ORAL ONLY	<p>AI in the Cockpit.... Again, Really ?</p> <p><i>Sylvain Hourlier, Thales Avionics</i></p>

10:00 a.m. **ORAL ONLY** **Development Assurance of Machine Learning Systems**
Joshua Gould Fadaie, Boeing Research and Technology; Paula olivio, Embraer; John Strasburger, Federal Aviation Administration; George Romanski, FAA; Marc Gatti, Thales Avionics; Matthew Carrico, Rockwell Collins; David A. Redman, Aerospace Vehicle Systems Institute

Wednesday, November 7

(Part 2 of 2) Avionics SW/HW Certification: DO-178 and DO-254

Session Code: **ASTC403**

Room Connaught Suite A

Session Time: **11:00 a.m.**

The avionics industry has been working to the DO-254 & DO-178 standard for FPGAs, ASICs, PLDs and Hardware designs for systems, avionics LRUs and IMA hardware applications. There are many areas of this standard which are in flux due to the complexities of the technology as well as the changes in the certification policies in commercial and military programs. This session will discuss several areas of current dialog and concern within the certification community as it relates to this standard.

Organizers - *Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics; Tammy M. Reeve, Patmos Engineering Services Inc.*

Chairpersons - *Tammy Reeve, Patmos Engineering Services Inc*

Time	Paper No.	Title
10:30 a.m.		BREAK
11:00 a.m.	ORAL ONLY	DO-254 and DO-178 Transition Criteria: What is it and Why it is Important? <i>Tammy M. Reeve, Patmos Engineering Services Inc.</i>
11:30 a.m.	2018-01-1939	A Structured Assurance Case for Commercial Off-The-Shelf (COTS) Airborne Electronic Hardware (AEH) <i>Guy-Andre Berthon, Thales Avionics</i>
2:30 p.m.		BREAK

Wednesday, November 7

Avionics Systems - System Testing and Simulation

Session Code: **ASTC412**

Room Connaught Suite A

Session Time: **1:30 p.m.**

This session focuses on advanced methods and tools used for complex systems V&V including certification aspects. Focus should be geared to a (multi-) system integration approach and applications.

Organizers - *Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics; Andreas Himmler, dSPACE GmbH; Yves Marcet, Airbus*

Chairpersons - *Andreas Himmler, dSPACE GmbH*

Time	Paper No.	Title
1:30 p.m.	ORAL ONLY	Cyclic Simulation Data Exchange in Hybrid Test Systems <i>Lars Stockmann, Sven Laux, Andreas Himmler, dSPACE GmbH</i>

2:00 p.m.	2018-01-1947	<p>Novel Framework Approach for Model-Based Process Integration from Requirements to Verification Demonstrated on a Complex, Cyber-Physical Aircraft System</p> <p><i>Marcel Gottschall, Bastian Binder, ESI ITI GmbH; Soeren Reglitz, dSPACE GmbH; Hajer Saada, Luis Diogo Couto, Fabio Cremona, Gilberto Burgio, United Technologies Research Center</i></p>
2:30 p.m.		BREAK
3:00 p.m.	2018-01-1948	<p>A Methodology for Formal Requirements Validation and Automatic Test Generation and Application to Aerospace Systems</p> <p><i>Orlando Ferrante, United Technologies Research Center; Eelco Scholte, UTC Aerospace Systems; Simone Rollini, United Technologies Research Center; Rob North, UTC Aerospace Systems; Luca Manica, Valerio Senni, United Technologies Research Center</i></p>
3:30 p.m.	2018-01-1949	<p>ED-247 (VISTAS) Gateway for Hybrid Test Systems</p> <p><i>Yannick Hildenbrand, dSPACE France SARL</i></p>

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Wednesday, November 7

Avionics Systems - Integrated Architectures and IMA

Session Code: ASTC408

Room Connaught Suite B

Session Time: 8:30 a.m.

The aim of this session is to present the latest development in aircraft avionics advanced system architectures and Integrated Modular Avionics, and provide information about Avionics Platforms including associated standards and surrounding development environments, looking at corresponding trends and challenges.

Organizers - Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics; Mirko Jakovljevic, TTTech. Computertechnik AG; Alex Wilson, Wind River

Chairpersons - Marc Gatti, Thales Avionics; Alex Wilson, Wind River

Time	Paper No.	Title
8:30 a.m.	ORAL ONLY	<p>Multicore Processors: How to Implement Multi-DAL Level Application with Security Stakes</p> <p><i>Marc Gatti, Thales AVS France</i></p>
9:00 a.m.	2018-01-1943	<p>Model-Based Systems Engineering Methodology for Implementing Networked Aircraft Control System on Integrated Modular Avionics – “ Environmental Control System Case Study</p> <p><i>Prince George Mathew, Susan Liscouet-Hanke, Concordia University Montreal; Yann Le Masson, Bombardier Aerospace</i></p>
9:30 a.m.	ORAL ONLY	<p>Update on Using Multicore Processors for Safety Critical Avionics</p> <p><i>Alex Wilson, Wind River</i></p>
10:00 a.m.	2018-01-1946 ORAL ONLY	<p>Modular SWaP-Optimized On-Board Computer For Radiation-Tolerant Applications</p> <p><i>Mirko Jakovljevic, TTTech. Computertechnik AG; Jacques Gatard</i></p>
10:30 a.m.		BREAK
11:00 a.m.	2018-01-1945 ORAL ONLY	<p>Advanced System Architectures with Modular On-Board Computer</p> <p><i>Mirko Jakovljevic, TTTech. Computertechnik AG</i></p>

11:30 a.m.	2018-01-1944	Lessons Learned in Inter-Organization Virtual Integration Tyler Smith, Rand Whillock, Robert Edman, Bruce Lewis, Steve Vestal, Adventium Labs
12:00 p.m.	2018-01-1942	An Integrated Approach to Model Based Engineering with SysML, AADL and FACE Wang Zhe, AVIC Digital Corporation Ltd.; Jerome Hugues, Jean-Charles Chaudemar, ISAE SUPAERO, Université de Toulouse; Thierry LeSergent, ANSYS
12:30 p.m.		LUNCH BREAK

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Wednesday, November 7

Avionics Systems - RTOS and Software Platforms

Session Code: ASTC410

Room Connaught Suite B

Session Time: 1:30 p.m.

The aim of this session is to present RTOS and execution platforms (including frameworks) for embedded avionics software including ARINC653 ones.

The middleware used for Data Transfer and platform management is also addressed in this session

Organizers - Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics; Alex Wilson, Wind River

Time	Paper No.	Title
1:30 p.m.	ORAL ONLY	Formal, Architecture-Driven Assurance for Cyber Security with AADL and Trusted Build Michael W. Whalen, University of Minnesota

Wednesday, November 7

(Part 1 of 2) Aerospace Systems and Operations - Aerospace Systems Modeling and Simulation

Session Code: ASTC100

Room Private Room 32

Session Time: ALL DAY

The future of the Aerospace Operations requires the development of new technologies and concepts, and the capability to integrate complex systems to satisfy the needs of future aerospace operations. Presentations are solicited in Aerospace Modeling and Simulation. These sessions will provide a forum for international discussion and information on leading-edge research and developments associated with new insights of future concept elements and new technologies in aerospace operations.

Organizers - Luis Rabelo, University of Central Florida; Ebad Jahangir, United Technologies Research Center; Jorge Bardina, NASA Ames Research Center; Travis E. Michalak, US Air Force Research Laboratory; Jonathan Liscouet, Bombardier; Susan Liscouet-Hanke, Concordia University Montreal

Chairpersons - Susan Liscouet-Hanke, Concordia University Montreal

Time	Paper No.	Title
8:30 a.m.	2018-01-1918	Analysis of the Effects of Modeling Depth and Parameter Uncertainties on the System Behavior of a Multifunctional High Lift Actuation System Andreas Schäfer, Michael Schmid, German Aerospace Center (DLR)

9:00 a.m.	2018-01-1915	The Distributed Simulation of Intelligent Terrain Exploration <i>David Anekstein, Jacob Cornett, Marc Guerrero, Cory Williamson, Systems & Technology Research</i>
9:30 a.m.	2018-01-1914 ORAL ONLY	Medical Data System High Level View for Deep Space Gateway <i>Jorge Bardina, NASA Ames Research Center</i>
10:00 a.m.	2018-01-1963	Simulation Optimization of the NASA Mars Fuel In-Situ Resource Utilization and Its Infrastructure <i>Ashley Vezina, Lindsey Coutts, Emily Cohen, David Burns, University of Central Florida</i>

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Wednesday, November 7

(Part 2 of 2) Aerospace Systems and Operations - Aerospace Systems Modeling and Simulation

Session Code: ASTC100

Room Private Room 32

Session Time: 11:00 a.m.

The future of the Aerospace Operations requires the development of new technologies and concepts, and the capability to integrate complex systems to satisfy the needs of future aerospace operations. Presentations are solicited in Aerospace Modeling and Simulation. These sessions will provide a forum for international discussion and information on leading-edge research and developments associated with new insights of future concept elements and new technologies in aerospace operations.

Organizers - *Jorge Bardina, NASA Ames Research Center; Travis E. Michalak, US Air Force Research Laboratory; Luis Rabelo, University of Central Florida; Jonathan Liscouet, Bombardier; Susan Liscouet-Hanke, Concordia University Montreal; Ebad Jahangir, United Technologies Research Center*

Chairpersons - *Ebad Jahangir, United Technologies Research Center*

Time	Paper No.	Title
11:00 a.m.	ORAL ONLY	Thermal Modelling of Future Engine and Airframe Integrated Thermal Concepts <i>David Judt, Cranfield University; David Bosak, Meggitt PLC; Craig Lawson, Stevan Van Heerden, Cranfield University</i>
11:30 a.m.	2018-01-1910	Multi-level Modeling Methodology for Aircraft Thermal Architecture Design <i>Florian Sanchez, Susan Liscouet-Hanke, Concordia University Montreal; Yanik Boutin, Sebastien Beaulac, Stephane Dufresne, Bombardier Aerospace</i>
12:30 p.m.		LUNCH BREAK
1:30 p.m.	2018-01-1916	Reliability Case Analysis of an Autonomous Air Cooling System (AACS) for Aerospace Applications <i>Chung Man Fong, Patrick Norman, University of Strathclyde; Naoki Seki, IHI Corporation</i>
2:00 p.m.	2018-01-1917	The Fault-Augmented Approach for the Systematic Simulation of Fault Behavior in Multi-Domain Systems in Aerospace <i>Artem Kolesnikov, Maxim Andreev, Andreas Abel, ESI ITI GmbH</i>

The papers in this session are available in SAE Technical Paper Collection, COLL-TP-00618 and SUB-TP-00013, an individually. To purchase visit collections.sae.org

Wednesday, November 7

(Part 1 of 2) Aviation Cyber Security

Session Code: ASTC2400

Room Private Room 33

Session Time: 9:00 a.m.

Cyber Security is critical for quality, reliability, safety, and security of the entire aviation ecosystems. This includes CyberPhysical, Industrial Control Systems, IoT, Platform Information Technology (PIT) and embedded systems. This symposia address issues of Cyber Security for Aircraft, Airline, Airport and Air Traffic Control from experts in government, industry, and academia as well as White Hat professionals. Emphasis will be on vulnerabilities and challenges in security of the aviation ecosystem.

<p>For Additional Cyber Content in this session room</p>

Organizers - Marc LeDuc, SAE International; Hartmut Hintze, Airbus Operations GmbH; Ralf God, Hamburg University of Technology; Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc

Chairpersons - Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc; Ralf God, Hamburg University of Technology; Hartmut Hintze, Airbus Operations GmbH

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	Welcome & Introductions Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc.
9:10 a.m.	ORAL ONLY	Industrial Security in Light of Digital Transformation Kevin Jones, Airbus
9:50 a.m.	ORAL ONLY	Cyber security in Aviation Sean Sullivan, Boeing
10:30 a.m.		BREAK
11:00 a.m.	Panel	Panel Session #1: Aircraft Cyber Security <i>This session brings together experts from government, industry, and academia to discuss new cyber security concerns and developments related to commercial aircraft. Topics include emerging regulations, technology, and gaps.</i> Moderators - Judith Ritchie, SAE International Panelists - Nathalie Feyt, Thales Avionics; Davide Martini, EASA Europa; Michel Messerschmidt, Airbus; Patrick Morrissey, Rockwell Collins; Sean Sullivan, Boeing;
12:30 p.m.		LUNCH BREAK
1:30 p.m.	ORAL ONLY	Cyber and Digital Trends in the Aerospace Sector Seamus Galvin, Head of Innovation at BSI (British Standards Institution) Cyber Security and Information Resilience, takes a look at the current cyber landscape in the Aerospace industry and where it will be heading over the next few years. He will be covering the cyber security implications of having a connected passenger experience, in-flight connectivity and the value of aircraft data. <i>The digital environment offers a huge variety of opportunities for growth in the aerospace sector, but also introduces new risks for organizations to consider. Seamus will be using his years of experience to highlight these risks and also show the steps that can be considered to keep an organization strong and resilient in a digital world.</i> Seamus Galvin, BSI Group

2:00 p.m. ORAL ONLY SAE International Cyber Security Initiatives
 Collaboration between government, industry and academia is vital to address vulnerabilities unique to the security of Cyber Physical Systems (CPS) architecture that includes software, firmware and hardware. We need to look at the problem holistically and address all areas of concern with a perspective towards resilience to cover those vulnerabilities. Standardisation is needed to codify the Cyber Physical Systems Security framework and to provide requirements and guidance for implementation. SAE International has issued a call to action for a collaborative effort to address the current gaps in Cyber Physical Systems Security and enable industry compliance in addressing those gaps through industry standard work.

Judith Ritchie, SAE International

3:00 p.m. ORAL ONLY For Additional Cyber Content:
[Click to view Cyber Content from ASTC405](https://www.sae.org/servlets/techSession?EVT_NAME=ASTC405&GROUP_CD=TSESS&SCHED_NUM=270205&tab=sessionDetails&REQUEST_TYPE=SESSION_DETAILS)

ORAL ONLY Meet the 11:00 AM Panel Participants

Judith Ritchie, SAE International; Sean Sullivan, Boeing; Davide Martini, EASA Europa; Patrick Morrissey, Rockwell Collins; Nathalie Feyt, Thales Avionics; Michel Messerschmidt, Airbus

Wednesday, November 7

Avionics Systems - Cyber-Security

Session Code: ASTC405

Room Private Room 33

Session Time: 3:00 p.m.

Cyber security means to mitigate and manage risk induced by the digitization of aviation. During implementation and operations, cyber security is relevant to all digitally interacting elements. Key topics to address are information security, system security, security engineering, resilience, cyber physical systems, networks, risk analysis methods and management, digitally supported production, supply chain topics, digital operations, regulations and rule-making, methods and tools.

[For Additional Cyber Content and Aircraft Cyber Security Panel](https://www.sae.org/servlets/techSession?EVT_NAME=ASTC2400&GROUP_CD=TSESS&SCHED_NUM=279678&tab=sessionDetails&REQUEST_TYPE=SESSION_DETAILS)

[For Additional Cyber Panels](https://www.sae.org/servlets/techSession?EVT_NAME=ASTC2400&GROUP_CD=TSESS&SCHED_NUM=273707&tab=sessionDetails&REQUEST_TYPE=SESSION_DETAILS)

Organizers - Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics; Ralf God, Hamburg University of Technology; Krishna Sampigethaya, United Technologies Research Center; Hartmut Hintze, Airbus Operations GmbH; Alex Wilson, Wind River

Chairpersons - Ralf God, Hamburg University of Technology; Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc

Time	Paper No.	Title
3:00 p.m.	ORAL ONLY	One Standard to Secure Them All? Michel Messerschmidt, Airbus
3:30 p.m.	ORAL ONLY	How to Protect USB Ports from "USB Kill" Threats Phil Hoy, Bourns, Ltd.

- 4:00 p.m. 2018-01-1940 **Cyber Security Enhancements for a Safety-Critical Avionics Platform**
ORAL ONLY Arlen Baker, Paul Parkinson, Wind River Systems
- 4:30 p.m. 2018-01-1941 **Anomaly Based Intrusion Detection for an Avionic Embedded System**
Alienor Damien, Thales AVS & LAAS-CNRS; Marc Fumey, Thales AVS;
Eric Alata, LAAS-CNRS, Université de Toulouse, CNRS, INSA; Mohamed
KaËnliche, LAAS-CNRS, Université de Toulouse, CNRS; Vincent
Nicomette, LAAS-CNRS, Université de Toulouse, CNRS, INSA

Wednesday, November 7

(Part 1 of 2) Digital Design and Manufacturing

Session Code: **ASTC2300**

Room Private Room 38

Session Time: **ALL DAY**

Industry 4.0 and the many components of this initiative, such as IIoT, Digital Thread/Twin, Additive Manufacturing and AR/VR, will be discussed in detail to provide greater understanding of the technologies and their uses. Government, industry, and academia need to collaborate to assure that these technologies achieve their fullest potential for all stakeholders. This session will provide the participants an understanding of the current and future state of this technology as it is related to aerospace and defense.

Organizers - Paul Robert Davies, Boeing Co.; Thomas Krueger, Airbus Operations SAS; Remy Mathieu-daude, Airbus SAS; Lorrie J. Sivich, Boeing Research & Technology

Chairpersons - Remy Mathieu-daude, Airbus SAS; Thomas Krueger, Airbus Operations SAS

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	Welcome and Introductions Thomas Krueger, Airbus Operations SAS
9:10 a.m.	ORAL ONLY	Additive Manufacturing â€œ Next Generation AMnx Mazim Nazukin, Roland Berger
9:50 a.m.	ORAL ONLY	Deriving Value from Digitalization in â€œManualâ€™ Processes Digitalisation is surrounded by significant amount perceived â€œhypeâ€™ at the moment, but the fundamental question that is raised in many more manual processes, is how to extract and realise actual value. To answer this, there is a need to focus on the short, medium and long term. This session will focus on one process of aircraft assembly and how digitalization is already changing the baseline way of working. David Harra, Airbus UK
10:30 a.m.		BREAK
11:30 a.m.	ORAL ONLY	How to Manage Outcome Based Business Models The â€œAs a Serviceâ€™ delivery model is growing across many sectors. At its heart is understanding the customers desired outcomes, and transfer of risk to the prime supplier who, intentionally or not, becomes dependent on a network of sub component suppliers across an extended supply chain. Peter Maloney, Inaventure
12:00 p.m.	ORAL ONLY	The Aerospace Factory of the Future Anes Hodzic; Michelangelo Russo, Airbus France
12:30 p.m.		LUNCH BREAK

1:30 p.m.	ORAL ONLY	<p>THOR (Testing High-Tech Objectives in Reality)</p> <p><i>The THOR (Testing High-Tech Objectives in Reality) program has been established to cope with the ever-increasing need for faster development cycles, which is triggered by international competition. However, testing new and unconventional approaches in a very early development phase under conditions as realistic as possible has been a blind spot so far. THOR enables the identification of more risky but high pay-off approaches at an early stage and allows for early strategic decisions.</i></p> <p><i>In the present example, the potential of 3D printing for an airworthy subscale aircraft measuring approx. 4x4 m in size was demonstrated in order to:</i></p> <ul style="list-style-type: none"> â€¢ Identify the E2E potential of 3D printing within the context of Industry 4.0 â€¢ Provide a blueprint for an expendable flight test bed for risky ideas â€¢ Inspire unconventional approaches that are in early development and testing phases and allow them to fail early. <p><i>Detlev Konigorski, Airbus</i></p>
2:00 p.m.	ORAL ONLY	<p>From Atoms to Aircraft</p> <p><i>From the way airplanes look to the way they are powered to the very elements that make up their structures, scientists and engineers are significantly reinventing how airplanes are built and how they work. New high-performance materials, components and processes are fundamental to the performance increase of existing aircraft programs but also to the technology-leap, which influences the way of how future aircrafts and engines will be build.</i></p> <p><i>Enrico Scharlock, Dassault Systemes</i></p>
2:30 p.m.		BREAK
3:30 p.m.	ORAL ONLY	<p>Open Discussion: Integration of Digital Manufacturing Technologies</p> <p><i>IIoT, Additive Mfg, Digital Thread/Twin, AR/VR/MR - these are not just buzz words. They are technologies that are revolutionizing manufacturing through digitization. This is an open discussion session to talk about implementation requirements - sensors, connectivity, security, model-based systems engineering, artificial intelligence, human factors, workforce development, and supply chain management.</i></p> <p><i>Lorrie J. Sivich, Boeing Co.; Enrico Scharlock, Dassault Systemes; Thomas Krueger, Airbus Operations SAS</i></p>

Wednesday, November 7

Unmanned Aerial Systems - Aerodynamics

Session Code: ASTC500

Room Private Room 41

Session Time: 9:30 a.m.

Although UAS aerodynamics is similar to that of manned aircraft, some design requirements are unique for micro, small, and high altitude, long-endurance vehicles. This session discusses critical aspects of aerodynamics for fixed and rotary wing UAS along with lighter-than-air unmanned technologies.

Organizers - Patrick H. Browning, West Virginia University; Yin M. Chen, US Army ARDEC; Richard Garcia, Southwest Research Institute; Ebad Jahangir, United Technologies Research Center

Chairpersons - Patrick Browning, West Virginia University

Time	Paper No.	Title
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9:30 a.m.	ORAL ONLY	Welcome & Introductions <i>Richard Garcia, Southwest Research Institute</i>
9:45 a.m.	ORAL ONLY	Acceptable risk – “ Where You Stand Depends on Where You Sit <i>Andy Thurling, NUAIR Alliance</i>
10:30 a.m.		BREAK
11:00 a.m.	2018-01-1954	Safety Analysis of an Airship Which Loses Lifting Gas from the Hull <i>Michele Trancossi, Sheffield Hallam University; Jose Pascoa, Universidade Da Beira Interior; Giuseppe Cannistraro, Universita degli Studi di Messina</i>
11:30 a.m.	2018-01-1955	Numerical and Experimental Second Law Analysis of a Low Thickness High Chamber Wing Profile <i>Michele Trancossi, Sheffield Hallam University; Shivesh Sharma, Henri Coanda Labs LLC</i>
12:00 p.m.	2018-01-1953	Nearfield Analysis of Low Speed Flow over a Dielectric Barrier Discharge Device for Enhancement of Small UAV Aerodynamics <i>Patrick H. Browning, West Virginia University</i>

The papers in this session are available in SAE Technical Paper Collection, COLL-TP-00618 and SUB-TP-00013, an individually. To purchase visit collections.sae.org

Wednesday, November 7

Unmanned Aerial Systems - Systems Integration

Session Code: ASTC511

Room Private Room 41

Session Time: 1:30 p.m.

This session discusses aspects of UAS system integration, from mission planning to multi-aircraft and payload control, post-mission analysis and dissemination. UAS operators can discuss complete and intuitive aspects of systems operation, versatile payload installation, and control throughout every mission phase, from launch to recovery. Hardware, software, logistics, and design aspects of UAS that might be generalized to be interoperable with other operations are of interest.

Organizers - Susan Liscouet-Hanke, Concordia University Montreal; Patrick H. Browning, West Virginia University; Ebad Jahangir, United Technologies Research Center; Richard Garcia, Southwest Research Institute; Jonathan Liscouet, Bombardier

Chairpersons - Susan Liscouet-Hanke, Concordia University Montreal

Time	Paper No.	Title
1:30 p.m.	2018-01-1964	Multi-Layer Framework for Synthesis and Evaluation of Heterogeneous System-of-Systems Composed of Manned and Unmanned Vehicles <i>Jeffrey R. Peters, Ebad Jahangir, Amit Surana, Zohaib Mian, United Technologies Research Center</i>

Thursday, November 8

(Part 3 of 3) Electric Aircraft

Session Code: ASTC2100

Room Commonwealth Suite

Session Time: ALL DAY

The next generation of aircraft will be Electric Aircraft and in various configurations that were considered improbable, if not impossible. The new aircraft will result in higher performance, added capability, and in a more reliable platform for both personal and public transportation. The demonstrations by NASA and various traditional manufacturers, and new companies, are being used to define the next generation of airplanes. The next generation of more integrated systems, such as integrated propulsion, power, and control, is well underway and yielding positive results.

Organizers - Ravi Rajamani, drR2 Consulting; Pascal Thalin, SAE EASG Chair; Patrick Norman, University of Strathclyde

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	Welcome & Introductions Ravi Rajamani, drR2 Consulting
9:10 a.m.	ORAL ONLY	Connecting Communities - How Electric Aircraft Will Enable the New Demand-Driven World Roei Ganzarski, MagniX
9:50 a.m.	ORAL ONLY	The Path To High Performance Electric Aircraft Kevin Noertker, Ampaire
10:30 a.m.		BREAK
11:00 a.m.	ORAL ONLY	Hybrid-Electric Aircrafts: System Architecture and Control Challenges Tibor Debreceni, Siemens
11:30 a.m.	ORAL ONLY	Diagnostics and Prognostics for the Electric Aircraft Ravi Rajamani, drR2 Consulting
12:00 p.m.	ORAL ONLY	Real-Time Health Monitoring of Power Electronics Using IVHM Sureshkumar Perinpanayagam, IVHM Centre Cranfield University
1:30 p.m.	ORAL ONLY	Expert Panel Discussion: When Will We See Commercial Electric Aircraft? Moderators - Ravi Rajamani, drR2 Consulting Panelists - Patrick Ceretti, Pratt & Whitney Canada; Johnny T. Doo, International Vehicle Research; Sven Taubert, Lufthansa Technik AG; Pascal Thalin; Michael Winter, Pratt & Whitney;
	ORAL ONLY	Meet the Participants: "When Will We See Commercial Electric Aircraft?" Expert Panel Ravi Rajamani, drR2 Consulting; Johnny T. Doo, International Vehicle Research; Pascal Thalin; Sven Taubert, Lufthansa Technik AG; Patrick Ceretti, Pratt & Whitney Canada

Thursday, November 8

Connected Aircraft

Session Code: ASTC2000

Room Connaught Suite B

Session Time: 8:30 a.m.

Organizers - James Sherman, SAE International

Time	Paper No.	Title
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- 9:00 a.m.** **ORAL ONLY** **Aviation Security and Connectivity**
- The threat of cyber attacks on Aviation creates real and perceived concerns for all of us. This discussion will center on how the aviation system is different from most other Information Technology data systems. The airplane and ground architecture used by aviation communications and operations has become highly sophisticated, providing greater functionality and enhanced airplane safety. As connected airplanes become the norm, public concern about cyber attacks will increase. In this presentation, real and perceived threats to airplanes and the aviation system will be discussed, as well as the general countermeasures that keep the aviation system and air travel the safest form of mass transport in history.*
- Sean Sullivan, Boeing
- 9:30 a.m.** **ORAL ONLY** **Design Considerations for Cockpit Touch Display Systems**
- This presentation focuses on some key design considerations for airplane cockpit touch display systems. Topics include architecture, ergonomics, safety, Pilot feedback, system latency, user interface design, safety, and others. Key standards and guidelines for cockpit touch display systems are also presented."*
- Daniel Fitzgerald, Rockwell Collins Display Systems
- 10:00 a.m.** **ORAL ONLY** **Advancements in Sonic Boom Displays**
- Using a NASA developed algorithm, sonic boom prediction, Mach cut-off, and sound pressure levels are calculated for current and modified flights plans. The algorithm information is transformed into georeferenced objects, presented on navigation and guidance displays integrated with synthetic vision. Pilots can determine whether the flightplan avoids the generation of a sonic boom in noise-sensitive areas. Presentation discusses real-time flight guidance, inflight planning and providing pilots with a decision space to modify their flight plan to reduce their sonic boom, avoid noise-sensitive areas, or inhibit their sonic boom from reaching the ground all together.*
- Laura M. Smith-Velazquez, Rockwell Collins
- 10:30 a.m.** **BREAK**
- 11:30 a.m.** **ORAL ONLY** **Satcom System Data and Aircraft-Based Weather Observations for Improved Operations**
- Aircraft have significant amounts of data originating from both native aircraft systems and purpose-built sensors. Having real-time access to such data can be challenging but also presents operators with significant opportunities. Various satellite connectivity solutions and sensors can together enable unique and beneficial capabilities that allow airlines to leverage the data coming off of their aircraft in real-time to maximize the efficiency, safety, and situational awareness of their fleet. This discussion will focus on the valuable combinations of satcom and weather data systems that help enable such operational situational awareness at today's airlines.*
- Jeffrey Rex, Panasonic Avionics Corp.

2:00 p.m.

ORAL ONLY

The HMI Challenges of Increased Data

As more data becomes available to pilots and operators the challenge it is no longer the lack of information to make a decision but finding and deciding what information to use. New approaches for presenting and interacting with this information are required to be created as traditional approaches could mean a computer screen will be solid block of pixels with users hunting for the data required or having to navigate through hundreds of pages and menus . Upcoming users have become accustomed to touch screen mobile devices and have expectations of this approach but is this the best way ? New technology such as wide area displays (WAD) and multitouch gestures provide ability to change the way information is presented and manipulated but are they suitable for all aircraft needs and what are the alternatives ? This presentation looks at areas that need to be considered when developing display systems to support the increased information presentation and use available technology effectively. It also considers the details and process of developing systems to match the type of user and situation

Matthew Jackson, Presagis Inc.

2:30 p.m.

ORAL ONLY

SESAR and NextGen – Taking a Flight Deck Human Factors Perspective

Through projects such as NextGen and SESAR significant efforts are being made to modernise our air transportation systems with the goals of increasing their safety, efficiency, capacity, predictability and resilience. Achievement of these goals innovation both in operational concepts, such as the introduction of Trajectory-Based Operations(TBO) and System Wide Information Management (SWIM), and in the technology of supporting systems such as Automatic Dependent Surveillance - Broadcast (ADS-B) and the underpinning SWIM infrastructure. As a consequence, far reaching changes are being made to air traffic management systems and operational concepts. However, consideration also needs to be given as to how such changes transform the pilot’s task of flying an aircraft in such a transformed environment, and how that impacts on the design of flight decks to support their task. The purpose of this presentation is to provide an overview of the human factors work that is being carried out by Coventry University to address this question as part of the Open Flight Deck project, co-funded by Innovate UK with support from the UK’s Aerospace Technology Institute. The presentation will provide an outline of the approach that is being taken and some of the issues that have been identified in the early stages of the work.

John Huddleston, Coventry University

Thursday, November 8

Avionics Systems - Aircraft Displays, Instruments and Instrumentation

Session Code: ASTC400

Room Connaught Suite B

Session Time: 11:00 a.m.

This session focuses on all aspects of display technology and visualization in real-time avionics applications and flight simulation. This includes advanced screen technologies, ruggedization methods, embedded display graphics software, tools for visualization and modeling, and open display architectures.

Organizers - Serge A. Bruillot, Dassault Aviation; Marc Gatti, Thales Avionics

Time

Paper No.

Title

11:00 a.m. ORAL ONLY **Towards a Universal Large Interactive display**

Loïc Bécouarn, Thales; Philippe Coni, Thales Avionics; Florent Mennechet, THALES AVS; Thierry Ferreira, Thales Aerospace

11:30 a.m. ORAL ONLY **Avionic Video Systems: From Situation Awareness to Flight Guidance.**

Gwenael Raguenes, Frederic Faubladiet, Airbus Helicopters

Thursday, November 8

Aerospace Systems and Operations - Systems Engineering

Session Code: ASTC104

Room Private Room 32

Session Time: 8:30 a.m.

The future of Aerospace Systems and Operations require the efficient development and execution of interdisciplinary processes based on stakeholder's needs throughout the life cycle of the system. System analysis, design and development, implementation and transition with reliability and safety are needed to satisfy the needs of future aerospace operations. These sessions will explore systems engineering in aerospace systems and operations, active and proposed safety initiatives for the aerospace industry and will provide a forum for international discussion and information on leading-edge research and developments associated with best practices, novel approaches for safety, validation and verification, and reliability of system engineering in aerospace systems and operations.

Organizers - *Susan Liscouet-Hanke, Concordia University Montreal; Luis Rabelo, Univ. of Central Florida; Joel Boelke, United Technologies Corp.; Jorge Bardina, NASA Ames Research Center; Jonathan Liscouet, Bombardier*

Chairpersons - *Ebad Jahangir, United Technologies Research Center*

Time	Paper No.	Title
8:30 a.m.	2018-01-1922	Feedback on Application of MBSE to an Avionics Subsystem <i>Raphael Faudou, Samares-Engineering; Shaofan Zhu, Jian Tang, COMAC; Jean-Marie Gauthier, Samares-Engineering</i>
9:00 a.m.	ORAL ONLY	A Model-Based Systems Engineering Approach for the Development of Test Means for Flight Control Systems <i>Hasti Jahanara, Susan Liscouet-Hanke, Concordia University Montreal; Jean-Louis Bauduin, Thales Canada Inc.</i>
9:30 a.m.	2018-01-1923	Development of the Multi-Resolution Modeling Environment through Aircraft Scenarios <i>Jaeho Kim, Kyungeun Lee, Mario Marin, Gene Lee, Luis Rabelo, University of Central Florida</i>
10:00 a.m.	2018-01-1921 ORAL ONLY	Practical Application of MBSE in the Development of Future High Integrity Aircraft Electronic Systems <i>Steven David Angus Fletcher, Frazer-Nash Consultancy, Ltd.</i>

The papers in this session are available in SAE Technical Paper Collection, COLL-TP-00618, and also individually. To purchase visit collections.sae.org

Thursday, November 8

(Part 2 of 2) Aviation Cyber Security

Session Code: ASTC2400

Room Private Room 33

Session Time: ALL DAY

Cyber Security is critical for quality, reliability, safety, and security of the entire aviation ecosystems. This includes CyberPhysical, Industrial Control Systems, IoT, Platform Information Technology (PIT) and embedded systems. This symposia address issues of Cyber Security for Aircraft, Airline, Airport and Air Traffic Control from experts in government, industry, and academia as well as White Hat professionals. Emphasis will be on vulnerabilities and challenges in security of the aviation ecosystem.

<p>For Additional Cyber Content in this session room</p>

Organizers - Marc LeDuc, SAE International; Ralf God, Hamburg University of Technology; Hartmut Hintze, Airbus Operations GmbH; Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc

Chairpersons - Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc; Ralf God, Hamburg University of Technology; Hartmut Hintze, Airbus Operations GmbH

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	Welcome & Introductions Ralf God, Hamburg University of Technology
9:10 a.m.	ORAL ONLY	Cybersecurity in Aviation – EASA View on the Present and on Future Scenarios Davide Martini, EASA Europa
9:50 a.m.	ORAL ONLY	Offence and Defence in the Cyber-Security of Aviation Infrastructures Christopher Johnson, University of Glasgow
10:30 a.m.		BREAK
11:00 a.m.	Panel	Panel Session #2 - Airline and Airport IT Security and Critical Infrastructures <i>This session brings together experts from government, industry, and academia to discuss new cyber security concerns and developments related to airlines and airports. Topics include recent developments towards preparing crew and infrastructure at airport for IT security requirements.</i> Moderators - Ralf God, Hamburg University of Technology Panelists - Christopher Johnson, University of Glasgow; Stefan Pickl, University of Federal Armed Forces; Sven Taubert, Lufthansa Technik AG;
12:30 p.m.		LUNCH BREAK
1:30 p.m.	Panel	Panel Session #3 - Air Traffic Control System Cyber Security <i>This session brings together experts from government, industry, and academia to discuss new cyber security concerns and developments related to communications, navigation, and surveillance systems of the aircraft as well as air traffic management systems. Topics include research and development as well as standardization activities in ADS-B, GPS, and NextGen and SESAR.</i> Moderators - Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc. Panelists - Martin Hawley, Winsland, Ltd.; Ivan Martinovic, Oxford University; Matt Shreeve, Helios;
2:30 p.m.		BREAK

- 3:00 p.m. Panel Panel Session #4 - Drones and Their Security**
This session brings together experts from government, industry, and academia to discuss new cyber security and privacy concerns and developments related to unmanned aircraft and their civilian uses.
Moderators - Courtney E. Howard, SAE International
Panelists - Mike Gadd, Altitude Angles; Richard Garcia, Southwest Research Institute; Ivan Martinovic, Oxford University; Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc.; Paul Theron, Cranfield University; Andy Thurling, NUAIR Alliance;
- ORAL ONLY Meet the 11:00 AM Panel Participants**
Ralf God, Hamburg University of Technology; Sven Taubert, Lufthansa Technik AG; Christopher Johnson, University of Glasgow; Stefan Pickl, University of Federal Armed Forces
- ORAL ONLY Meet the 1:30 PM Panel Participants**
Matt Shreeve, Helios; Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc.; Ivan Martinovic, Oxford University; Martin Hawley, Winsland, Ltd.
- ORAL ONLY Meet the 3:00 PM Panel Participants**
Andy Thurling, NUAIR Alliance; Ivan Martinovic, Oxford University; Paul Theron, Cranfield University; Mike Gadd, Altitude Angles; Krishna Sampigethaya, Embry-Riddle Aeronautical University Inc.; Richard Garcia, Southwest Research Institute; Courtney E. Howard, SAE International

Thursday, November 8

(Part 2 of 2) Digital Design and Manufacturing

Session Code: ASTC2300

Room Private Room 38

Session Time: ALL DAY

Industry 4.0 and the many components of this initiative, such as IIoT, Digital Thread/Twin, Additive Manufacturing and AR/VR, will be discussed in detail to provide greater understanding of the technologies and their uses. Government, industry, and academia need to collaborate to assure that these technologies achieve their fullest potential for all stakeholders. This session will provide the participants an understanding of the current and future state of this technology as it is related to aerospace and defense.

Organizers - Yvan Gilles Baudin, Airbus France; Paul Robert Davies, Boeing Co.; Thomas Krueger, Airbus Operations SAS; Remy Mathieu-daude, Airbus SAS; Lorrie J. Sivich, Boeing Research & Technology

Chairpersons - Lorrie Sivich, Boeing Co

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	Welcome & Introductions <i>Lorrie J. Sivich, Boeing Co.</i>
9:15 a.m.	ORAL ONLY	Future Factory Today <i>The competitive situation and the continuously increasing production rates fuel the need of the A&D Industry to transform existing and aged as well as new factories towards digital factories, implementing innovative technologies like automation, AR, IOT and analytics.</i> <i>Enrico Scharlock, Dassault Systemes</i>

9:45 a.m.	ORAL ONLY	<p><i>The State of Industrial Augmented Reality</i></p> <p><i>This presentation will help set the stage for the second day of the event, as we cover topics related to the Digital Thread, and AR/VR/MR. The presenter will explore the benefits of implementing AR in various use cases, and technical maturity of AR as it applies to Industrial Applications. We will discuss the technical, policy and procedural gaps that remain as large enterprises attempt to implement AR at scale, and where the industry is today in bridging these gaps. Finally, an example real life manufacturing use case will be presented using currently available technology.</i></p> <p><i>Paul Robert Davies, Boeing Co.</i></p>
10:15 a.m.		BREAK
10:45 a.m.	2018-01-1929	<p><i>Improving Manufacturing Efficiencies through Industry 4.0 Technologies in Aerospace</i></p> <p><i>Sastry Veluri, Ravi Kumar, Ramji Vasudevan, Ravi Prakash Gorur, Enose Nampuraja, Mahesh Shankaraiah, Simha Tanjore, Shama Rao, Infosys Ltd.</i></p>
11:15 a.m.	ORAL ONLY	<p><i>The Digital Twin in Aviation – “ Between Reality and Vision</i></p> <p><i>Katharina SchÄpfner, SAP AG</i></p>
11:45 a.m.	ORAL ONLY	<p><i>Aerospace 4.0 – “ Enabling Supply Chain Adoption of Digital Capabilities</i></p> <p><i><p>We all know that the 4th Industrial Revolution is taking shape in many sectors, and with Aerospace being one of the most complex and important high-value manufacturing sectors for the UK, 4IR will become increasingly important. As we enter an age in which products and machines are connected across the internet, using technologies that are developing at an ever increasing rate and ever decreasing cost, companies of all sizes will need to define and execute their own individual digitalisation journeys. </p></i></p> <p><i><p>Larger companies at the tops of supply chains are already experimenting with and adopting digital capabilities, and getting their thinking around the fact that technology alone will not guarantee success in the digital age. If the entire industry is to improve its productivity and competitiveness, the whole supply chain will need to adopt digital solutions. There exist as many risks as opportunities, and as many barriers as there are solutions; coupled with the hyperbole surrounding many aspects of 4IR, adoption presents a particular challenge for supply chain companies. Through Aerospace 4.0, ADS is aiming to cut through the hype, and seeking to provide practical insights, including through a case studies, of how aerospace supply chain companies can undergo digital transformations.</p></i></p> <p><i>Sameer Savani, ADS Group</i></p>
12:15 p.m.	2018-01-1928	<p><i>Challenges of Digital Twin in High Value Manufacturing</i></p> <p><i>Sumit Singh, Essam Shehab, Cranfield University; Nigel Higgins, Kevin Fowler, Airbus Operations Ltd.; Tetsuo Tomiyama, Cranfield University; Chris Fowler, Airbus Operations Ltd.</i></p>
12:45 p.m.		LUNCH BREAK
1:30 p.m.	ORAL ONLY	<p><i>The Role of Augmented Reality with a 4IR Future</i></p> <p><i>Michael Lewis, The AMRC with Boeing</i></p>
2:00 p.m.	ORAL ONLY	<p><i>How Automation and Augmented Reality Meets Industry Expectations?</i></p> <p><i>Xavier Laville, Airbus; Maria Garcia, Cesa</i></p>
2:30 p.m.		BREAK

3:00 p.m. **ORAL ONLY** **AVATAR Project: Assembly Line Simulation with Virtual Operators**
3D and Virtual Reality serious game playing manufacturing scenario of an assembly line with virtual operator team.

Christian Berthelie, Airbus Operations SAS

4:00 p.m. **Panel**

Panel Session #4 - AR/VR/MR

Moderators - Lorrie J. Sivich, Boeing Co.

Panelists - Christian Berthelie, Airbus Operations SAS; Michael Lewis, The AMRC with Boeing; Enrico Scharlock, Dassault Systemes;

ORAL ONLY

Meet the 4:00 PM Panel Participants

Lorrie J. Sivich, Boeing Co.; Michael Lewis, The AMRC with Boeing; Christian Berthelie, Airbus Operations SAS; Enrico Scharlock, Dassault Systemes

The papers in this session are available in SAE Technical Paper Collection, COLL-TP-00618, and also individually. To purchase visit collections.sae.org

Thursday, November 8

Unmanned Aerial Systems - UAS Manufacturing

Session Code: **ASTC504**

Room Private Room 41

Session Time: **9:45 a.m.**

This session discusses manufacturing aspects related to unmanned aerial vehicle systems. Full and prototype scales and their testing are considered along with development of the manufacturing tools specific of UAV. Verification of manufacturing methodologies and process capabilities are also addressed. Less expensive and faster manufacturing methods using rapid prototyping technology are of interest.

Organizers - Patrick H. Browning, West Virginia University; Yin M. Chen, US Army ARDEC; Richard Garcia, Southwest Research Institute

Time	Paper No.	Title
9:45 a.m.	ORAL ONLY	Exploring Nuclear Power Plants with Unmanned Aerial Systems Richard Garcia, Southwest Research Institute
10:30 a.m.		BREAK
11:00 a.m.	2018-01-1958	Design, Manufacturing, Testing, and Analysis of a Highly-Constrained Single-Use UAV Wing Patrick H. Browning, Levi S. Hubbard, Philip Pennock, West Virginia University
11:30 a.m.	2018-01-1960	Design, Development and Integration of a Wing-Morphing, Bimodal Unmanned Vehicle Mark Simpson, Dian Guo, RMIT University

The papers in this session are available in SAE Technical Paper Collection, COLL-TP-00618, and also individually. To purchase visit collections.sae.org

Thursday, November 8

Unmanned Aerial Systems - Propulsion

Session Code: **ASTC506**

Room Private Room 41

Session Time: **1:30 p.m.**

This session discusses UAV propulsion systems development and performance. All propulsion systems will be considered, from solar to fuel cell, to turbine. Propulsion alternatives for small airborne vehicles will be also discussed. Reliability, performance, and integration of existent UAV propulsions technologies will be addressed. New engine technology, new designs, or even new fundamental research and propulsion concepts are also of interest.

Organizers - Patrick H. Browning, West Virginia University; Yin M. Chen, US Army ARDEC

Chairpersons - Patrick Browning, West Virginia University

Time	Paper No.	Title
1:30 p.m.	2018-01-1961 ORAL ONLY	Energy Optimization of High-Thickness High-Lift Wing for a Blended Wing Drone With Ducted Fan Propulsion and Boundary Layer Ingestion <i>Michele Trancossi, Sheffield Hallam University; Jose Pascoa, Universidade Da Beira Interior</i>
2:00 p.m.	2018-01-1962	Potential Improvements in Turbofan™s Performance by Electric Power Transfer <i>Hossein Balaghi Enalou; Jean-Marc Le-Peuvedic, Dassault Aviation; Mohamed Rashed, Serhiy Bozhko, University of Nottingham</i>