

AEROSPACE TechReview.com



INNOVATION &
TECHNOLOGY

GET READY FOR THE ROARING '20s

A Look at New and Emerging Aircraft Platforms



**AEROSPACE
TechWeek.com**
18/19 Mar 2020 | Toulouse, France
GET THE EVENT APP
AerospaceTechWeek.com/APP

Get it on
Google play

Download on the
App Store

SHOW GUIDE INSIDE 43

Avionics



EMBEDDED SYSTEMS
Engineers must address cybersecurity risks to avionics as aircraft become more connected.

Connected AIRCRAFT



FANS EQUIPAGE BECOMING NECESSARY
Upgrades of aircraft are in order to use the global air navigation system to full advantage.

MRO iT



PREDICTIVE MX
How predictive maintenance can help operators be smarter, safer and more efficient.

Flight Ops iT



E-GADSS!
Take a look at the latest developments in the ICAO GADSS flight tracking initiative.

AEROSPACE testing



PUSH IT TO THE LIMIT
Before an aircraft takes to the skies, its structure is put through testing that simulates stresses of flight.

**Your parts have
a destination
We know the way**



Aviation Logistics Network



GLOBAL NETWORK OF
SPECIALISTS IN AEROSPACE
TRANSPORTATION

Do you have an urgent transportation challenge?

We're here for you 24 hours a day 365 days a year



Contact us now on

**24/7/365 AOG Hotline:
00 8000 264 8326**

www.aln.aero

CONTENTS

LATEST NEWS & FEATURES ABOUT AEROSPACE TECHNOLOGY

SPRING 2020 ISSUE 1

DEPARTMENTS

04 The Buzz
06 5 X 5: News

18 Exhibitor News
96 Supply Chain Digitization

112

COVER STORY



Get Ready for the Roaring '20s

The past decade has seen first flights for several new aircraft as well technological improvements for variants of existing types. And as we roar into the '20s, the new decade brings additional aircraft platforms aimed at supporting skyrocketing projections for passengers and cargo.



CATEGORIES



20  **Navigating the Darkness of Cybersecurity Risk**
High level electronics integration and Cloud-based systems in the next generation of advanced aircraft must address security, cyberwarfare dangers and other potential risks threatening avionics.

28  **FANS Equipage Becoming a Necessity**
Future Air Navigation System 1/A is necessitating an upgrade of some aircraft despite being voluntary in some regions. But the benefits are plenty. Learn what they are in this look at the future of flight deck connectivity.

34  **Predictive Maintenance: Smarter, Safer and More Efficient Ops**
Has predictive maintenance progressed from an industry buzzword into a reality? We asked airlines and MROs how they are using data to increase fleet reliability without incurring unforeseen costs.

43  **SHOW GUIDE**
Aerospace Tech Week in Toulouse, France is here! Welcome note, conference agenda, work shops and training schedules, floor plan and more info starts on page 43.

94  **Push It to the Limit: Airframe Structural Test**
Before a new aircraft takes to the skies, it must undergo rigorous testing. OEMs explain the challenges and necessary steps to achieve certification.

102  **E-GADSS! Flight Tracking Developments**
Air France 447 and Malaysia Airlines MH370 led to an industry re-assessment of aircraft tracking and reporting capabilities, especially tracking and tracing in remote regions. Here's where the GADSS initiative stands.

Aerospace Tech Review is published quarterly by Aerospace & Security Media Ltd. POSTMASTER send address changes to Aerospace Tech Review at pcalderon@aerospace-media.com. The editor welcomes articles, engineering and technical reports, new product information and other industry news. All editorial inquiries should be directed to the editor at jfinnegan@avm-mag.com. Subscriptions: Free to qualified individuals involved in the aerospace industry. All other prepaid subscriptions, see www.aerospacetechreview.com. Content may not be produced in any form without written permission.

Aerospace Tech Review | www.aerospacetechreview.com | Spring 2020 3

AEROSPACE Tech Review

+44 (0)20 3892 3050
+1 (920) 214 0140

EDITORIAL
Editor-in-Chief
Joy Finnegan
jfinnegan@aerospace-media.com

Contributing Editors
Charlotte Adams
Charlotte Daniels
Alix Paultre
Thom Patterson
Kathryn Creedy
Dale Smith

ADVERTISING/ BUSINESS

Owner
Adrian Broadbent
+44 (0) 20 3892 3051
abroadbent@aerospace-media.com

Publisher/Sales Director
Simon Barker
+ 44 (0) 203 892 3053
sbarker@aerospace-media.com

Sales Director — Avionics
Susan Joyce
+1 920 214 0070
sjoyce@aerospace-media.com

Classified Sales Director
Danny Faupel
+1 928 458 5870
dfaupel@aerospace-media.com

DESIGN/PRODUCTION

Lisa Garrison
lgarrison@avm-mag.com

SUBSCRIPTIONS
Paula Calderon
pcalderon@aerospace-media.com
+34 91 05 71190

CLIENT SERVICES

Administration
Maria Hernandez Reyes
maria@asi-mag.com

PRINTER
Gemini Print
Unit A1 Dolphin Way
Shoreham by Sea
West Sussex BN43 6NZ



Aerospace & Security Media
is a trading arm of ASI Publications Ltd

Aviation Electronics Expo Ltd
1 Coyners Avenue
Southport
PR8 4SZ, UK
abroadbent@aerospace-media.com

www.AerospaceTechReview.com
www.AerospaceTechWeek.com

UK Company registration no 5999781
UK VAT no GB227106044



What Will the Twenties Bring?

First, for those of you joining us, welcome to Toulouse, France for Aerospace Tech Week. We are ready for some incredible presentations, workshops, training, networking and fun. This is our first event in Toulouse and we look forward to exploring the area, including an avgeek's dream – taking a tour of the Airbus facilities here. I hope you are excited as we are for this week.

Next I want to, once again, welcome you to the pages of *Aerospace Tech Review*, the second issue of our event's companion publication. Within these pages you will find stories on topics covering the same areas as the conference. Additionally, the show guide is located inside this issue and that begins on page 43. You will find schedules, the floorplan, exhibitor listings – everything you will need to follow the events of Aerospace Tech Week. Please use our app as well. Scan the QR code on the cover to get it.

Now let's talk about the future by first looking at the past. During the Roaring Twenties, a decade in beginning in 1920 the world experienced a period of economic prosperity. The economy has certainly been roaring along these past few years. Will it continue or will economic conditions take a radical turn with Brexit, pandemics and black swan events we can't even imagine yet? If anyone has an accurate crystal ball, please do tell. In the meantime, businesses must prepare for anything and look for opportunities for growth no matter what the economic conditions are. To that end, we are gathering in Toulouse, in spite of the COVID-19 outbreak, because business must go on.

As we look to the future and what is coming next in our industry, let's start with Industry 4.0 a much talked about initiative about all things digital. According to Deloitte, "Industry 4.0 combines and connects digital and physical technologies—artificial intelligence, the Internet of Things, additive manufacturing, robotics, cloud computing, and others—to drive more flexible, responsive, and interconnected enterprises capable of making more informed decisions." These are areas that are crucial

to aerospace and in many cases aerospace is leading the way.

Deloitte also says that supply chain is "a top area for both current and prospective digital transformation investments, indicating that supply chain initiatives are a top priority." Please read our column from David Grasso and Chris Brumitt from Maine Pointe Aviation's aerospace and defense practice about the digital supply chain. Grasso and Brumitt say there is a need for "widespread cultural change throughout the aerospace and defense industry and acceptance of the need for new supply chain digitization efforts." You can see their recommendations starting on page 120.

Next, we have to stress the environment and the sea change taking place in our society as we face global climate change. Climate change impacts aviation and may cause some to re-evaluate their travel needs, even though the aviation industry accounts for only 2% of global carbon dioxide emissions. In February, Delta Air Lines committed \$1 billion over the next 10 years to mitigate emissions from its global business. The airline says it will "invest in driving innovation, advancing clean air travel technologies, accelerating the reduction of carbon emissions and waste, and establishing new projects to mitigate the balance of emissions." A billion dollars.

In our inaugural issue, ICF's Martin Harrison discussed the climate change issue and how it may impact aerospace. "Public awareness is increasing, especially among the younger generations. They may not have made up their minds to fly or not yet, but maybe younger generations will select the most environmentally-friendly carrier in the years ahead. Consequently, the bottom line is that aircraft will need to be even more efficient." You can read that commentary in our digital issue at www.aerospacetechnology.com.

It seems incredible to throw the term sea change around but there is another movement underway and it's happening faster than we can imagine. Urban air mobility and drone usage is coming, ready or not. This is a classic case of lead or be

left behind. But what will this mean for the current airline flight deck? Consultants at Deloitte feel that "although commercial aircraft manufacturers are increasingly relying on automated flight controls, including automated cockpits, the commercial aerospace sector is aiming to transition to fully automated flight decks." Futuristic -yes. But with the current lack of trained and experienced pilots, this seems more realistic than ever.

There is also a clearer path forward to hybrid electric and electric flight propulsion. Rolls-Royce invested by acquiring the electric and hybrid-electric aerospace propulsion activities of Siemens last year. "We are at the dawn of the 'third era' of aviation, which will bring a new class of quieter and cleaner air transport to the skies," said Rob Watson, director – Rolls-Royce Electrical.

While China's aviation infrastructure is still young, the predicted boom there is slower than anticipated and COVID-19 will surely slow things even more. "The formerly expected boom in China-U.S. air travel is going to deflate in 2020, big time," is a prediction made by Jeremy Bogaisky from Forbes Aerospace & Defense.

In spite of the 737 MAX problems, Boeing will not only survive, but will thrive again. The Boeing/Airbus duopoly isn't going anywhere.

Bogaisky also predicts that by 2025, U.S. transatlantic flights from midsize airports will be routine. "New aircraft such as the Airbus A321XLR will make nonstop flights economically possible from points such as Albany, Grand Rapids, Louisville and Columbus," he predicts. You can read more about new and emerging aircraft platforms in Thom Patterson's update on page 112.

We also have stories including Navigating the Darkness of Cybersecurity Risk with advice on protecting systems from unauthorized access on page 20; flight needs created by FANS equipage on page 28; updates on predictive maintenance on page 34; the GADSS initiative for flight tracking on page 102; and a cool look at the structural testing needed before an aircraft can be certified starting on page 94. **ATR**

BIG DATA INSIGHTS FOR YOUR OPERATIONS.



**INTRODUCING
HONEYWELL FORGE™
AVIATION'S MOST
INTELLIGENT DATA-
DRIVEN PLATFORM**

Honeywell Forge breaks down data silos to create powerful insights with actionable information for flight efficiency, maintenance, safety, block time analysis, ground turn optimization and many more. Make decisions with confidence and execute them faster with Honeywell Forge. For more information, visit <https://aerospace.honeywell.com/honeywell-forge>

THE FUTURE IS WHAT WE MAKE IT

Honeywell

5x5

Industry News from Around the Globe



Avionics

Wind River Pioneers Continuous Delivery Subscription of Commercial Embedded Linux



Michel Genard, Wind River VP Product

Wind River has unveiled a continuous integration and continuous delivery (CI/CD) model for Wind River Linux customers. Wind River Linux follows a CI/CD process that allows customers to access new releases every few weeks. With this new cadence, teams can begin to build their own continuous integration and delivery systems for their customers,

get a head start on building new platforms sooner, and enjoy similar benefits of Common Vulnerabilities and Exposures (CVE) management, technical support, and quality typically found in annual and Long Term Support (LTS) releases.

“In the 5G era, as companies are racing to innovate, they have a greater need for frequent software updates and nonstop security monitoring. Many update their software on a weekly basis, and some are updating applications every day or even hourly,” said Michel Genard, vice president of product, Wind River. “Companies want a continuous stream of updated code and features from a trusted source. On a daily basis, Wind River tests and validates a variety of use cases relevant across industries, with thousands of test cases every night. This testing, coupled with constant feedback and active engagement from customers, is designed to ensure high levels of quality for our deliverables.”

Utilizing CI/CD practices to advance its own DevOps culture and consistently deliver high-quality software, Wind River says it is providing continuous delivery that enables customers to integrate Wind River Linux into their continuous integration processes. The development and maintenance processes for Wind River releases are certified for quality under ISO 9001:2015. The first company to ever be OpenChain conformant, Wind River says it is committed to supporting and deploying important standards for open source compliance.

CI/CD best practices contribute to a culture of continuous improvement by enabling teams to adopt, adapt, and implement

small changes rapidly and reliably. As connectivity rises across sectors, new data and applications are under constant change, and companies must adjust their processes in order to incorporate, validate, and deliver new features and applications.

Embedded system developers who are interested in CI/CD but do not yet have the infrastructure for that development model can work with Wind River for support as they move toward a CI/CD path. Those who currently develop software on a fixed version of the Linux kernel due to tight restrictions around certifications, such as those creating medical systems, can continue to work with Wind River Linux LTS yearly releases.

More common in the enterprise realm, container usage is typically a challenge in the embedded space, due to the need for a highly optimized software stack. Existing frameworks often lack the right design or support for mission-critical industries that employ embedded devices with extremely long lifecycles that require lighter-weight software with a smaller footprint. Wind River Linux already includes pre-built containers, tools, and documentation and support for frameworks such as Docker and Kubernetes, which can help developers deploy applications across the intelligent edge using cloud-native methods. Wind River Linux has added the capability to asynchronously update containers and the base operating system (OS) separately. When running multiple applications, with each in its own container, on top of Wind River Linux, these containerized applications can be updated without having to update or reboot the host OS.

As with Linux itself, Linux tools often require special adaptations for embedded software development. Wind River is providing new commercial tooling options for Linux application developers to enable their use of the latest open source innovations. A new version of the Eclipse-based Wind River Workbench for Linux LTS provides an application development environment for build, debug, and system analysis tools. Wind River also has teamed with partners such as Percepio AB to ensure that there is both an open source and a commercial ecosystem of tools that address the needs of Wind River Linux developers. The Percepio Tracealyzer trace visualization tool provides a large number of high-level views to make it easier to spot anomalies in program execution and to trace them to the root cause without requiring a great deal of Linux kernel expertise.

Hensoldt Chooses CoreAVI's COTS-D Hardware/Software

Hensoldt has selected CoreAVI's COTS-D hardware IP and graphics and compute software to provide a new generation of safety certified mission computers and display systems. The system will be certified to DO-254/ED-80 and DO-178C/ED-12C Design Assurance Level (DAL) A. The system will use the AMD E9171 GPU, AMD's latest graphics processor that is provided by CoreAVI to the avionics and high reliability markets. Hensoldt's scalable and most advanced display and compute systems will address the need for both technology refresh requirements as well as deployments for new safety critical avionics programs.

Hensoldt says their new avionics computing system offers scalable power and high performance to meet the needs of a wide range of safety critical avionics applications. Purpose-built for graphics and compute capabilities with support for both OpenGL SC 2 and Vulkan, this solution will offer enhanced video with 4K display capabilities and will enable parallel processing to host both compute and video applications concurrently. Having one partner provide the full system solution – from the GPU, to safety critical software, to certification packages – is key to speeding and easing Hensoldt's integration efforts, and this collaboration between the two companies is designed to ensure this new solution offers customers the highest levels of safety and security without sacrificing features and performance.

"Hensoldt has been a valued partner of CoreAVI for many years," said Dan Joncas, chief sales and marketing officer at CoreAVI. "We're looking forward to once again supporting Hensoldt in bringing to market a new hardware and software platform that



provides its customers with the most advanced safety critical GPU compute and graphics capabilities that today's avionics systems require."

CoreAVI has a long-standing partnership with Hensoldt as they supported previous generations of Hensoldt's mission computers with AMD's E4690 GPU, safety critical OpenGL SC graphics drivers, as well as successful completion of DO-254 and DO-178C certification. In this next-gen iteration, the companies will now work together to provide safety critical solutions based on AMD's Embedded Radeon E9171 GPU featuring CoreAVI's VkCore SC Vulkan-based graphics and compute drivers, VkCoreGL SC1 OpenGL application libraries, COTS-D hardware IP, and associated DO-254/ED-80 and DO-178C/ED-12C Design Assurance Level (DAL) A. certification packages.

Passing of DFS Managing Director Dr. Michael Hann

The German air navigation service provider DFS and its staff are mourning the death of their managing director human resources and labour director, Dr. Michael Hann. The 62-year-old passed



Dr. Michael Hann

away suddenly and unexpectedly on February 13, 2020.

Dr. Hann, who held a doctorate degree in jurisprudence, was responsible for human resources on the DFS Board of Managing Directors. Dr. Hann had been a member of the DFS Board of Managing Directors since 2012 and during this time he contributed to the successful development of

the company with great dedication and diligence. Dr. Hann leaves behind his wife and three adult daughters.

"We are very saddened by the news of Michael Hann's death

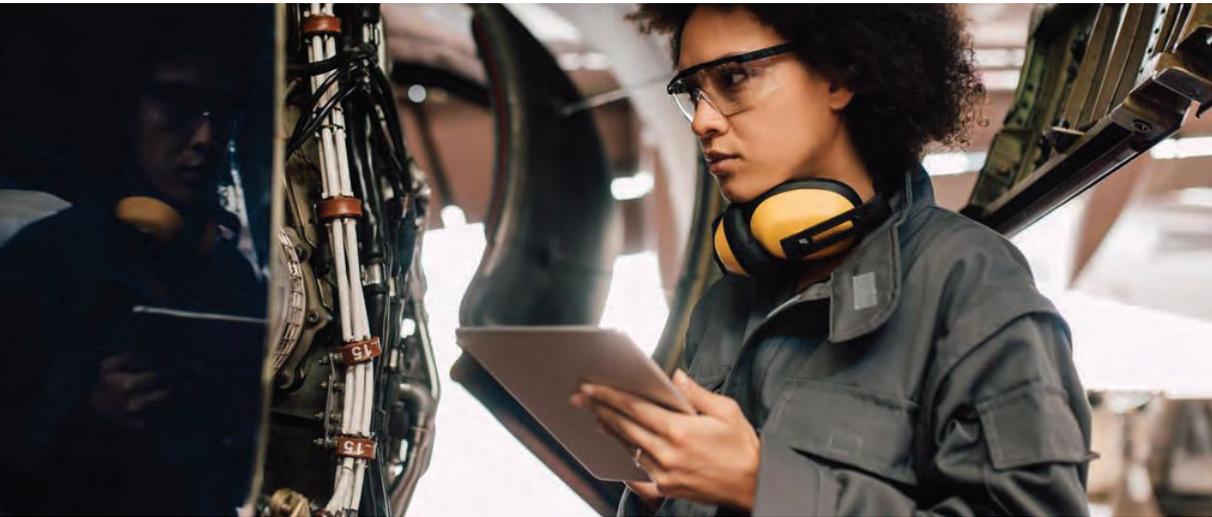
and extend our deepest sympathy to the family. Dr Hann made a lasting impact on the corporate culture of DFS, not only through his extraordinary professional expertise, but also through his inspiring personality and openness for the needs of our employees," said Professor Klaus-Dieter Scheurle, CEO and chairman of the DFS Board of Managing Directors. "His passing marks the loss of a valued colleague who earned high acclaim from all for his integrity, extensive experience, professionalism and personal qualities. We will all miss his energy and his humor."

Dr. Hann joined DFS on September 1, 2012 as managing Director Human Resources and Labour Director. His priorities included establishing and maintaining a trust-based working relationship with the social partners, modernizing human resources at the company and improving the leadership culture. Other core issues included his work on adding more flexibility to the working environment and further enhancing air traffic controller training.

Dr. Hann studied law and economics at the University of Mainz. Prior to joining DFS, he worked for more than 20 years in various functions in the field of human resources and law in the automotive and telecommunication industries. Until Dr. Hann's position is replaced, Klaus-Dieter Scheurle will temporarily take over his duties.



Boomi's Data Integration Platform Offers Next-Level Connectivity to IFS's Customers with 200 Pre-Built Connectors



HR, Finance and other functions of their choice today. Boomi brings over 200 pre-built connectors configured easily via an ultra-modern real-time drag-and-drop interface. IFS says their customers will now be able to build integrations faster, typically reducing the time spent on development by weeks or months, "an unheard-of step-change for many

IFS announced a new partnership with Boomi. The two say the resulting technology stack combines best-in-class enterprise resource management (ERP), enterprise asset management (EAM) and field service management (FSM) into a 'digital switchboard' that unites industrial process expertise with cloud agility. The IFS team says industries such as manufacturing, aerospace & defense, engineering, construction & infrastructure, energy & utilities, and service management now digitize their processes, they need to connect silos of information, increasingly held in the cloud. This requires increasingly agile ways to connect, disconnect and reconnect large and fast-changing pools of data. Boomi was conceived to solve just these issues.

"By adopting 'switchboard thinking',

where all business-critical applications are connected by one central point, organizations can speed up supply chains, improve service responses and compete globally like never before," said Sakari Jorma, senior vice president of IFS. "Businesses across all industries—from aerospace and defense to power generation—will be able to connect their best-of-breed systems to their IFS core through Boomi's unified, cloud-native platform. The partnership reaffirms IFS's commitment to offering customers choice and freedom to leverage their existing digital property to achieve faster time to value."

This new partnership means IFS customers can now access a "digital switchboard" integrating the deep functionality of IFS Applications with the dozens of others required to run

legacy industries," the company says.

"The strength of this partnership is in the different expertise IFS and Boomi bring," says Derek Thompson, VP of EMEA at Boomi. "The loyal customer base of IFS deserves the most intelligent, scalable and flexible platform and Boomi is honored to be chosen as the foundation for the ERP solution of the future."

IFS Chief Product Officer Christian Pedersen concluded, "As one component in our customers' ecosystem of solutions, technologies, and data, we fully understand the need to offer complete openness and freedom of choice. By partnering with Boomi, we are taking the next logical step to empower businesses with out-of-the-box connectivity to the digital switchboard from our already open and natively API-enabled platform."

ALKYM7
POWERING Airlines | MROs | Helicopters | Defense | CAMO

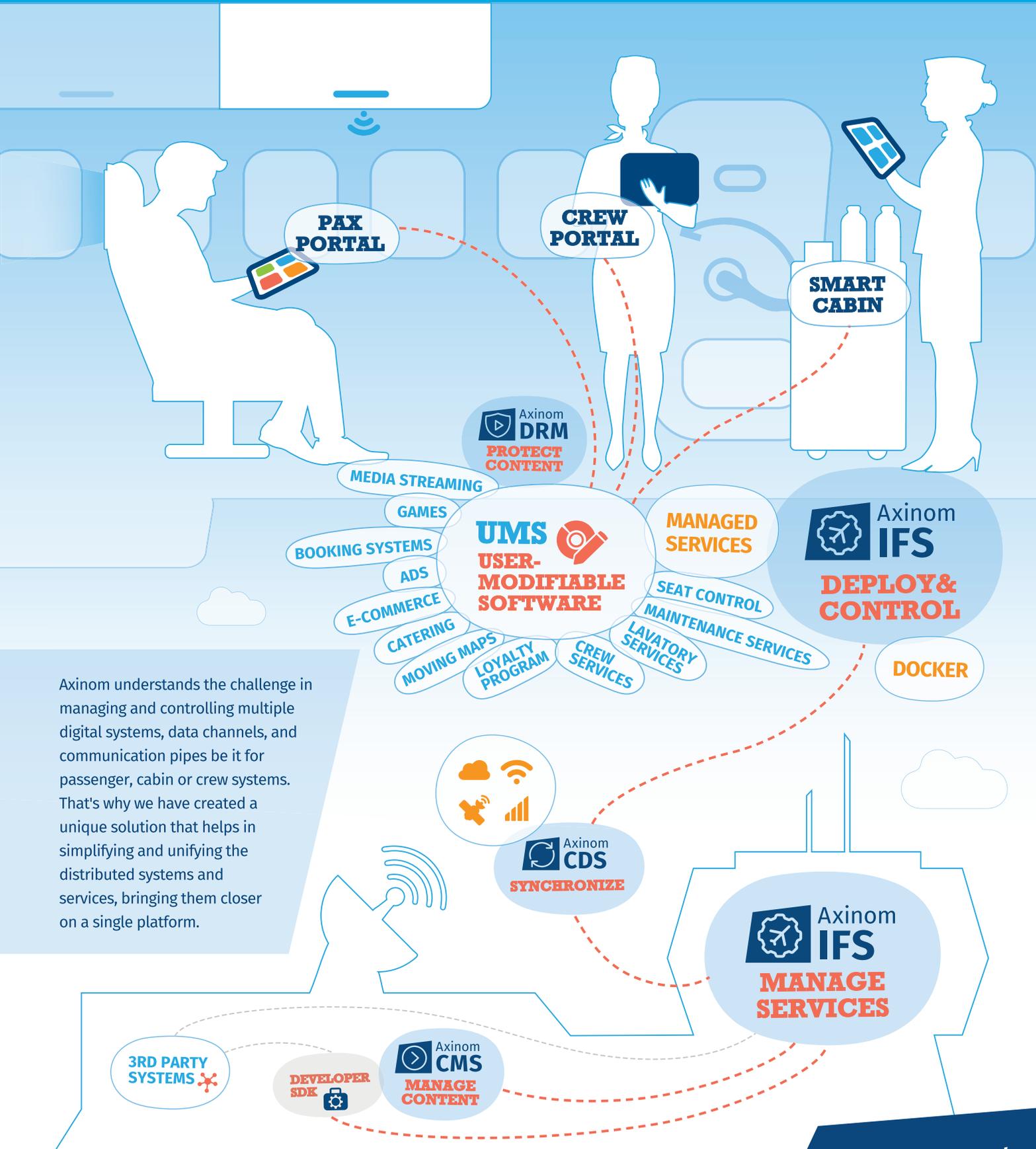
Industry Leader in Aircraft MRO/M&E Software

DRIVING EFFICIENCIES THROUGH YOUR ORGANISATION
FASTEST RETURN ON INVESTMENT

SEABURY SOLUTIONS Aviation Digital Transformation
eAUTHORITY
EPAS

mkl@seaburysolutions.com
www.seaburysolutions.com

ON-BOARD DIGITAL SERVICES, MANAGED CENTRALLY



Axinom understands the challenge in managing and controlling multiple digital systems, data channels, and communication pipes be it for passenger, cabin or crew systems. That's why we have created a unique solution that helps in simplifying and unifying the distributed systems and services, bringing them closer on a single platform.

MEET US AT AEROSPACE TECH WEEK BOOTH #502 18-19 MARCH

axinom!
axinom.com

OneWeb Successfully Launches 34 More Satellites



OneWeb, the global communications company with a mission to bring connectivity to everyone everywhere, recently announced the successful launch of 34 satellites, aboard a Soyuz launch vehicle from the historic Baikonur Cosmodrome, Kazakhstan.

Lift-off occurred on February 6, 2020. The OneWeb satellites separated from the rocket and were dispensed in nine batches over a period of several hours, with signal acquisition

on all 34 confirmed within hours.

This launch is the second successful launch in one of the largest civilian satellite launch campaigns in history. It will help build OneWeb's phase one constellation of 648 satellites that will deliver high-speed, low-latency global connectivity, while addressing the world's most pressing connectivity problems.

The communications company is on schedule to provide global coverage to

customers in 2021, starting with the first commercial services in the Arctic this year. This follows OneWeb both securing global priority spectrum rights and successfully launching its first batch of satellites in 2019.

OneWeb's network will provide a unique combination of high data throughput, low latency, true global coverage and a range of user terminals for multiple markets including maritime, aviation, government and enterprise.

"The successful manufacture, delivery and launch of this batch of 34 satellites is the latest proof point of the OneWeb plan. Importantly, today's mission also brings us closer to our next step, realizing our ultimate vision of providing access to high speed, reliable internet to everyone, everywhere," Adrian Steckel, CEO of OneWeb, said. "We are seeing considerable interest from prospective customers and partners. Later this year, we will provide service in the arctic region and 2021 will see OneWeb achieve global coverage, making the digital divide a thing of the past. I'm very proud of our team and partners who continue to collaborate to make our ambitious scale a reality, and also those in Kazakhstan for supporting our vision."

Axinom is First in Aerospace to Bring CMAF File-Format for App-Free Browser-Based IFE

Continuing with its initiative of standardization in digital aerospace, Axinom says it has become the first digital solutions provider in the industry to provide a production common media application format (CMAF) with cipher block chaining encryption (CBCS). The technology eliminates the need for a native app and multiple file-formats to deliver the video content to mobile devices that can utilize browsers and DRM protection for playback.

The first successful adoption by a notable industry-leading integrator came in the form of a streaming solution that utilizes Axinom VIP (Video Ingest and Processing) to encode and package video assets in the CMAF file format. "The CMAF format paired with the common encryption scheme makes the assets interoperable across device platforms while maintaining industry-grade security," says Ralph Wagner, CEO, Axinom. "This is a crucial step in

our initiative to bring standardization in the digital vertical of the aerospace industry."

Smart and portable devices have become a crucial part of consumer experience and adopting this trend to aerospace not only enhances the value but also makes digital operations more efficient. A multi-screen IFEC offering with modern technological solutions allows passengers to use whatever devices (bring your device scenario) on-board to consume entertainment or connectivity. Axinom says its product-stack is enabling companies in the aerospace industry to leverage the multi-screen trend. Advancements include the ability of Axinom VIP to encapsulate the video assets in to a single format that is compatible with both HLS and MPEG-DASH streaming; Axinom VIP with CBCS mode common key encrypts video assets, described in either an m3u8 (HLS) or MPD



Ralph Wagner, Axinom CEO

(MPEG-DASH) playlist; and, Axinom DRM (Digital Rights Management) delivers licenses to on-board devices for content protection and playback.

Axinom says providers are also realizing cost benefits as the new solution eliminates the need for an app, multiple file-formats, and vast amounts of space for the storage and playback of videos. Moreover, the comprehensive solution extends to a large number of commonly used devices and platforms, making it extremely practical.

HOW SAFE ARE YOUR SYSTEMS FROM CYBERTHREATS?

They may not be as safe as you think. Ensuring ironclad security for your systems requires a multifaceted approach. Take this basic assessment to see how you fare.

www.windriver.com/announces/security-assessment-survey



Titan Airways Selects Conduce eTechLog8

Titan Airways has chosen Conduce Group's TechLog8 mobile software solution as an element to their ongoing progress to the greater digitalization of its processes and procedures. eTechLog8 will replace the current paper-based aircraft technical logbooks including its deferred defect logbook and cabin logs. The Conduce eTechLog8 application will also be fully integrated into Titan's CAMO solution – Commsoft OASES – to enable real time aircraft status data to be available 24/7.

"This is an exciting step forward for Titan as it moves toward an all Airbus fleet and looks for greater digitization of the Airline," said Dave Bunker, engineering director at Titan Airways. "As an ACMI provider it is critical that the business has real time aircraft status data in order to be able to provide excellent operational service

to our client base around the world. Following a review of the market for ETL solutions Conduce Group was selected due to several factors, including a proven track record with many airworthiness authorities, total integration capability with back-office systems, and a unique and intuitive interface that will both minimize training requirements but also allow for a rapid implementation and acceptance of the solution."

Conduce MD Paul Boyd commented: "We are extremely pleased to welcome Titan Airways to the growing community



of airlines that have chosen eTechLog8. The adoption of eTechLog8 allows an ACMI providers' fleet to be totally "base" independent, operating anywhere in the world ensuring full visibility and integrity of the aircraft technical status. Implementation will commence this month with full rollout planned for mid-2020."

Aero Contractors Company of Nigeria Goes Live with Ramco Aviation



Ramco Systems announced the successful implementation of its Aviation Suite V5.8 at Aero Contractors Company of Nigeria

Limited, a state-controlled Nigerian airline company, for its MRO operations, thereby automating manual work execution processes and enabling organization-wide visibility.

With modules for Planning, Work Execution, Stores, Procurement,

MRO Sales and billing process, Ramco's integrated Aviation M&E MRO Solution automates and optimizes Aero Contractors'

MRO Services. The company says their solution will help the organization optimize employee utilization and improve efficiency and accuracy in billing processes.

"Aero is known for its scheduled operations and reliable services. To keep up with the market demand, we needed a technological partner who would be with us in every step of our digital journey," Captain Ado Sanusi, CEO, Aero Contractors Company of Nigeria Limited, said. "Ramco's next-gen, integrated Aviation suite has helped streamline our maintenance processes, thereby giving us a bird's eye-view of all our operations and enabling digital transformation."



NAVBLUE Acquires AviolineX and the RAIDO Application to Complete the N-Operations Control Center Suite



Joakim Andersson, AviolineX Founder (L) and Fabrice Hamel, NAVBLUE CEO (R)

Airbus Services subsidiary NAVBLUE has acquired AviolineX. AviolineX provides software and services to the airline industry, including N-RAIDO Ops & Crew Management, that handles all aspects of Network Scheduling, Operations Control, Crew Planning, Crew Management, and day-of-ops Crew Scheduling in a single Flight Operations system. N-RAIDO is a dynamic event-engine coupled with a rules-engine that interacts with a single

database. The result is "one dynamic application that can handle both day-of-ops management as well as long-term planning requirements of any sized airline," according to the company.

For the past two years, NAVBLUE has been the exclusive re-seller of RAIDO under the name N-RAIDO Ops & Crew Management. The company says the acquisition of RAIDO complements NAVBLUE's solutions across the flight

operations eco-system (Flight Planning/ Ground Solutions, EFB solutions, ATM). The acquisition will also enable NAVBLUE and Aviolinx to leverage additional joint capabilities to innovate further, industrialize their solutions and expand their market footprint, especially in Tier 1 and 2 airlines.

The two companies say they share the same vision and values. "After two years of partnering with Aviolinx, we are delighted today to welcome them as part of the NAVBLUE family, joining our forces to provide combined offers and reach a larger market penetration, while having a common goal of making tomorrow's airspace and airline operations more efficient and sustainable," said Fabrice Hamel, CEO at NAVBLUE. "Meanwhile we will expand our global footprint by adding a new office and team in Sweden."

Joakim ANDERSSON, Aviolinx founder, will take on the role as managing director for NAVBLUE in Sweden, added, "We are very excited about this new chapter for Aviolinx. Being part of NAVBLUE will allow us to advance our technical competences and expertise even further in combination with NAVBLUE's expertise and flight operations resources. We are confident that joining our solutions and offering a fully integrated suite will create unbeatable value for any airline looking for a modern and highly efficient technology solution to manage their operations. We look forward to continuing to be game-changers in the industry as part of NAVBLUE."

AeroWeather and SKYTRAC Sign MoU to Develop Mobile Aviation Apps

Swiss-based Lakehorn, specializing in the development of mobile aviation applications including AeroWeather, and SKYTRAC, a full-service data-driven solutions provider to the global aviation industry, have agreed to terms on a Memorandum of Understanding (MoU) to bring AeroWeather's widely adopted aviation weather application to the cockpit with the use of SKYTRAC's intelligent connectivity capabilities.

The two parties say they share the mutual goal of enabling inflight functionality of applications through cellular and satellite connectivity. SKYTRAC, an Iridium aviation partner currently developing next generation Certus terminals that will increase bandwidth capabilities 35-fold, will explore ways to address the gap in inflight connectivity when cellular transmissions are unavailable for a wide range of web-based

applications within the rotorcraft and general aviation segments.

"SKYTRAC is excited to collaborate with Lakehorn to support their market penetration and inflight connectivity goals. We want to ensure we're at the cutting edge of what's possible by working with agile companies intent on moving our industry forward. This project will help us leverage each other's expertise and will open the door to more exciting opportunities in the future," said Malachi Nordine, president, SKYTRAC.

In addition to application development and potential software integrations between the two entities, SKYTRAC and AeroWeather will leverage their customer bases for novel co-marketing opportunities to expand the global reach of their respective product portfolios.



"We're excited to see what's possible with our partnership going forward. SKYTRAC has a vast knowledge of satellite communications and we intend to leverage their expertise in sales, marketing, and engineering to propel our capabilities to new heights," said Pascal Dreer, president, Lakehorn.

Visit us at booth 505

Major Airlines N°1 Choice for Modern and Legacy Fleets

Proven in the field since 2013



MBS provides the tools to:

Protect, Manage & Control the distribution and collection of **Your Airline data.**

Secure Data Loading via:

ARINC 615, ARINC 615A, LEAP Engine up & down, USB Emulation, PCMCIA ATA & Linear Emulation, Compact Flash Emulation.



Innovation in Avionics System Interfacing and Control – www.mbs-electronics.com

SITAONAIR Supports Airlines Ops Across Turkey Through VHF Expansion

SITAONAIR has been instrumental in the expansion of Very High Frequency (VHF) coverage throughout Turkey, during the development of the country's largest new airport hub in Istanbul, which opened in April 2019. SITAONAIR's expansion of the current VHF infrastructure enhances operations for airlines serving the regional domestic market and the country's main airports.



In addition to the 29 existing VHF antennae which currently serve Turkey's main cities, including Istanbul, Ankara, and Antalya, SITAONAIR is planning to install a further 14 at six additional sites across the country. This will include six new antennae at Istanbul Airport which opened its doors in April 2019.

Istanbul Airport covers around 76.5 square kilometers and plans to accommodate up to 200 million passengers per year upon the completion of all phases. The developments come at a time when Istanbul's air transport management services face increasingly busy traffic through the flight corridor between Europe and Asia, which spans the region, following the recent closure of Istanbul Atatürk Airport.

SITAONAIR says the company has worked consistently to improve and evolve from its VHF origins by embracing satellite services and VHF Digital Link (VDL) to deal with steep rises in air traffic.

"The expansion of VHF coverage in the region comes at a vital time for the country's airport migration process," said Stephan Egli, Commercial VP Middle-East, Africa & Europe comments. "Our inherent expertise in serving the air transport industry make SITAONAIR the right partner at a crucial time where air traffic is booming and in need of a seamless transition, alongside carriers like Turkish Airlines, Pegasus and Sun Express who are poised to support the region's increased passenger demands. As always, SITAONAIR is proud to support the aviation sector throughout its growth."

AirAsia Implements New Digital Solutions To Improve Efficiency, Reduce Carbon Footprint

In line with its continued focus on innovation and sustainability, AirAsia is taking its environmental responsibilities a step further by implementing digital solutions that are aimed at further improving fuel efficiency and reducing carbon emissions.

Developed by Paris-based Safety Line, the OptiFlight-In-flight guidance is a suite of digital solutions that optimizes all flight phases.

Following extensive validation tests, AirAsia has implemented OptiClimb which will save up to three percent of its climb fuel, potentially representing a fleetwide carbon footprint reduction of at least 73,000 tons of CO2 per year.

By introducing a number of new digital initiatives to its flight operations, AirAsia is not only offsetting its carbon emissions but also pro-actively reducing them at the source whilst also further reducing costs for the benefit of its customers.

"AirAsia is making every effort to improve its operational efficiency and become a digital airline in all aspects of our business including flight operations, and OptiFlight will allow us to leverage vast amounts of flight data with the aim of reducing CO2 emissions," AirAsia Group Chief Operations Officer Javed Malik said. "Needless to say, we are excited to be the very first airline to implement OptiClimb in Asia and we continue to look at new ways to innovate and further reduce our carbon footprint."

Safety Line founder & CEO, Pierre Jouniaux said, "On AirAsia's medium haul flights, the initial climb alone can represent more than 30% of trip fuel, offering the most potential for savings. However, climb is also the most complex phase, with many parameters changing simultaneously as the aircraft ascends. AirAsia will use historical flight data and Artificial



Intelligence to address this complexity and predict fuel burn in different scenarios to recommend optimal climb speeds to pilots for each flight, taking into account individual aircraft performance and accurate 4D weather forecasts."

In addition to implementing OptiClimb, AirAsia has joined the OptiFlight Innovation Partnership in September 2019 which provides further flight optimization opportunities that will be explored in all flight phases. For instance, AirAsia will be the first airline in Asia to trial OptiDirect, a solution that recommends some adjustments to pilots based on historical tracks flown and forecasted weather on the route.



Rohde & Schwarz Extends Collaboration with Thales to Minimize Field Testing for IoT modules

Rohde & Schwarz and Gemalto are working on significantly reducing expensive and time-consuming drive tests. IoT protocol stack features have been specified by 3GPP, but IoT devices have to interact with different network configurations worldwide. This makes it important to ensure that these features are working well in all sorts of configurations, configured by different network operators, Rohde & Schwarz says.

Thanks to the current cooperation, manufacturers of IoT solutions can use virtual drive tests during the development phase of CAT M1 and NB IoT modules to find and fix problems at an earlier stage. This also enables seamless cellular coverage and reliable connectivity before the integration process continues and further field tests are performed. Network-specific integration tests and field tests include analysis of unique network configurations in different countries, challenging RF Power level conditions and verification of signaling under compelling RF environments.

The setup consists of R&S Field-to-Lab wireless communication test system, R&S CMWcards smart network emulator, R&S CMW500/CMW290 wideband radio communication tester from Rohde & Schwarz. The successful LTE based R&S Field-to-Lab solution by Rohde & Schwarz has now been extended to support LTE-M and NB-IoT technologies. With the same user interface, customers can seamlessly move between LTE and IoT testing. The simple process of loading the field logs, extracting the required information from the field log and generating R&S CMWcards test script helps to replicate the real network environment in a lab with just a few mouse clicks.



The R&S Field-to-Lab supports 3GPP IoT features. Unlike other simulated drive test solutions, it is also the first virtual drive test solution for IoT offering replication of signaling and RF conditions in an easy-to-operate GUI on the R&S CMW500 and R&SCMW290 and mobile radio testers.

Consequently, this new IoT approach enables for Thales an increasingly efficient and rapid IoT testing procedure, the company says. Collaboration between Gemalto, a Thales company, and Rohde & Schwarz on the topic of field-to-lab continues actively, enabling both companies to help each other in verification of software builds and releases.

Testing Tool Being Added to Boeing AMMs

The ExLRT loop resistance tester has been awarded ATEX and IECEx Intrinsic Safe certification. The company adds that UL certification is due to follow within weeks for the loop testing tool.



“The Intrinsically Safe certification of the ExLRT is the latest stage in what has been an extensive and close collaboration with Boeing to create a world-class tool. The key requirement was an Intrinsically Safe design – once this was achieved, we knew the product would be well-received,” says Alan Wilson, engineering director at MK Test Systems.

The ExLRT is classified for Zone 0 usage, meaning it can be used on fueled and unfueled aircraft. Users can now carry out loop resistance testing using a significantly lighter, advanced tool than the current industry standard LRT. “We developed the ExLRT as a much-needed replacement for the existing LRT,” said Carl Bullock, managing director at MK Test Systems. “It eradicates the problems commonly associated with the current tool which is heavy, uses ageing technology and has obsolescence issues. I’m incredibly proud of the team for their efforts in developing such a fantastic new product.”

A detailed document update program is underway by Boeing to ensure operators are aware of the newly approval tool. The aircraft manufacturer has released a Multi Operator Message (MOM) confirming the ExLRT is an approved alternative to the LRT. The MOM also advises that Boeing will grant a Non-Technical Objection (NTO) prior to the AMMs being updated in 2020.

The company says the ExLRT is now commercially available; the first units will be delivered to Boeing any day.



Optimized Flight Routes for Climate-Friendly Air Transport

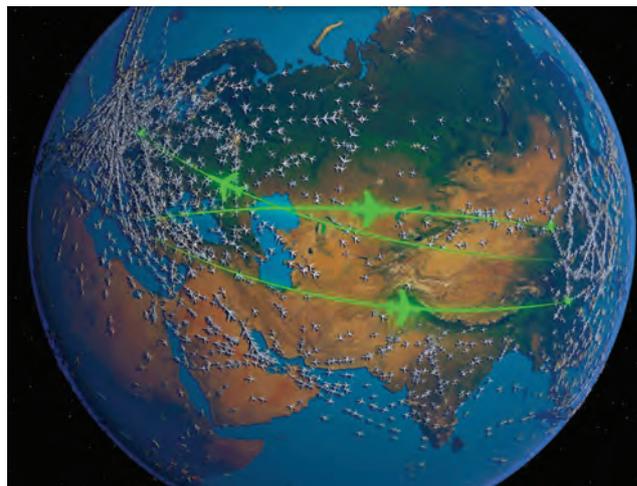
Last month, the new project “Greener Air Traffic Operations” (GreAT) held its launch event at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Institute of Flight Guidance in Braunschweig, Germany. This European-Chinese research and innovation project aims to reduce the impact of air transport on climate change.

The project focuses on new strategies aimed at greener flight routings. The group say these will be achieved through “innovative air traffic guidance concepts and optimized operations on airports, in the terminal control area and during cruising flight.” The concepts will consider various factors such as atmospheric conditions and real-time airspace constraints. An intense air-ground data exchange is one of the pillars of this approach. In contrast to previous optimization strategies, GreAT will not focus solely on efficiency and capacity. Instead its focal point is the reduction of the environmental impact of air transport, a crucial part of future air traffic management.

The GreAT project will be conducted in collaboration with seven European and six Chinese partners. Researchers will investigate optimization strategies for short-haul flights on the European side and long-haul flights on the Chinese side.

The partners will develop and evaluate more flexible airspace structures as well as more predictable guidance principles, supported by next-generation assistance systems. This will allow for a better compromise between the shortest routes and conflict-free traffic pre-planning. In addition to initial conceptual work, comprehensive validation activities are planned, which will make use of the simulation capabilities and expertise that are available in the project consortium. The knowledge gained during this work will be exchanged and published to further support research and development after the project has been completed.

The official project kick-off was attended by all the European members of the consortium. During the two-day meeting, the international partners planned and communicated the project activities and discussed the steps needed to achieve the milestones on time.



In addition to DLR, which is acting as project coordinator, the consortium consists of HungaroControl – Hungarian Air Navigation Services (Hungary), Universidad Politécnica de Madrid (UPM, Spain), L-UP (France), Royal Dutch Airlines (Koninklijke Luchtvaart Maatschappij; KLM, Netherlands), the Italian Aerospace Research Centre (Centro Italiano Ricerche Aerospaziali; CIRA, Italy), and Pildo Labs (Spain) on the European side. On the Chinese side, the Chinese Aeronautical Radio Electronics Research Institute (CARERI), the Civil Aviation Administration of China (CAAC), the Civil Aviation University of China (CAUC), the China Electronics Technology Avionics Company (CETCA), the Nanjing Research Institute of Electronic Engineering (NRIEE) and the Nanjing University of Aeronautics and Astronautics (NUAA) are participating in the project.

An advisory board will support the project. It consists of the air navigation service providers Deutsche Flugsicherung GmbH (Germany), Austro Control (Austria) and LFV (Sweden), together with the suppliers Harris-Orthogon GmbH and ATRiCS Advanced Traffic Solutions GmbH (both Germany), the International Federation of Air Traffic Controllers’ Associations (IFATCA) and Lufthansa (Germany).

Daedalean Awarded Multi-Million Euro Grant Under the Horizon 2020 Program

Zürich-based Daedalean, a startup developing autonomous dynamic flight control systems, was selected as one of the European deeptech champions and will receive a €2.3 million EIC Accelerator grant from the European Innovation Council. It is listed among the 75 SMEs and startups who will receive funding under the pilot phase of the European Innovation Council (EIC) Accelerator.

The projects were selected from the 1852 applicants, which makes them the top 4% of the European tech champions. The total funding raised by Daedalean has now exceeded €17 million

Daedalean became one of the latest recipients of the grant awarded by the European Commission under its EIC Accelerator Pilot programme. The EIC Accelerator is the new SME instrument – a funding program for Small and Medium Enterprises launched in June 2019 as part of Horizon 2020, the EU’s Framework Program for Research and Innovation.

The program is highly competitive. Only 180 projects of the 1852 filed were invited for interviewing, and only 75 of them will receive financial support. The project proposed by the Swiss startup to the EIC jury in Brussels is the next phase of its development of the autonomous flight control instruments aimed to enable safer and denser use of the airspace by eliminating dependencies on humans. The eventual goal of the company is bringing full autonomy to the air, which is considered the key enabler for the urban air mobility market emerging at full scale in the near future. “For Daedalean, receiving such an award marks its technology and the path to the market being assessed as disruptive and potentially having a huge impact for the European air mobility industry,” says Anna Chernova, the co-founder of the company. The EIC Accelerator jury noted in their evaluation summary report on Daedalean, “This is a highly strategic technology for the European market.”

Develop Your Software to the Highest Levels of Safety and Security



AUTOMOTIVE ISO 26262 ASIL D

AVIONICS DO-178/ED-12 DAL A

MEDICAL FDA Class III

INDUSTRIAL IEC 61508 SIL 3

RAILWAY EN 50128 SIL 4



For 38 years, world-class companies have trusted Green Hills Software's integrated software platforms, engineering services, and certification experts as the foundation to develop and deploy next-generation embedded systems with confidence to the highest levels of safety and security.

Call us on **+44 1844 267 950** or contact us at **ghs.com/go/contact**



More News from Exhibitors



Implement Safe, Interactive, Real-time Human-Machine-Interfaces Using PRESAGIS Software Tools

PRESAGIS Embedded Graphics (EG) is a recognized leader in development tools for interactive display graphics. We offer intuitive and robust software tools to develop safe and certifiable cockpit graphics for the aerospace, defense, security, and critical infrastructure markets.

Since 1985, PRESAGIS EG has been delivering first in-class cockpit graphics design tools, and for the last 15 years it has been delivering DO-178 certifiable solutions. The company pioneered the prototyping of avionic display graphics and the automatic code generation for embedded systems in the 1990s. Since then, code generated by its flagship HMI modeling and embedded graphics products have been deployed to hundreds of aircraft worldwide and its embedded graphics software has been certified on over 30 major aircraft programs worldwide.

PRESAGIS EG provides its customers the tools and services necessary to bring new products to market fast, and with reduced risk. Its latest generation of software tools combine the reliability customers need for mission- and safety-critical graphics development with leading-edge technology developed for modern cockpit graphics. In today's world, modern cockpit designers and engineers are increasingly adopting the ARINC 661 architecture, and are starting to deploy touch and gesture as the

preferred means of human-machine interaction. PRESAGIS EG's technology, developed in conjunction with major aircraft OEMs, provides leading-edge capabilities to enable the development of such products.

VAPS XT, PRESAGIS EG's flagship product, is an easy to use tool that supports the complete lifecycle of the development of cockpit graphics systems. Users can capture requirements and design; express functionality in integrated state charts and automatically generate code that implements the design. The company's UA Accelerator product is a robust software tool enabling system and software engineers to quickly, consistently and accurately develop ARINC 661 user applications without being experts on the ARINC 661 standard. The UA Emulator product is a powerful stand-alone software tool providing complete ARINC 661 protocol emulation and analysis. It can capture, analyze and replay protocol in an operational system, allowing the most complex of problems to be resolved.

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



Ensuring Critical Systems Software Has the Highest Quality and Reliability

Rapita Systems provides on-target software verification tools and services globally to the embedded aerospace and automotive electronics industries. Rapita's solutions help to increase software quality, deliver evidence to meet safety and certification objectives and reduce project costs.

Rapita's verification tools and services are used throughout the aerospace industry, offering the means to test critical software used in avionics and space-based applications. Rapita have a firm history of providing the evidence needed to satisfy DO-178B/C objectives, for example that code meets its low-level requirements, is covered by tests and operates within timing deadlines.

Rapita's tools also meet these evolving needs for testing of

automotive electronics by producing data needed to verify functional testing and optimize timing behavior. They help guide software design to meet safety standards such as ISO 26262.

Verification of the timing behavior of multicore systems offers unique challenges. Rapita's multicore timing solution solves these challenges by understanding and observing these complex systems and gathering and assessing verification evidence collected by running RapiDaemons (interference generating applications) written from experimental design. This approach helps to achieve CAST-32a compliance.

To find out more about Rapita Systems and its offering, visit www.rapitasystems.com



Vector Informatik

Vector Informatik is the leading manufacturer of hardware and software tools for the design and test of embedded electronics and their networking via CAN, Ethernet and AFDX up to ARINC 429.

Since 1988 Vector has been a partner of manufacturers and suppliers to the aerospace and automotive industry. Design and test engineers in the aerospace environment benefit from the Vector tools for system, integration and flight testing as well as monitoring and analysis of bus communication.

Worldwide customers in the automotive, commercial vehicles,

aerospace, transportation, and control technology industries rely on the solutions and products of the independent Vector Group for the development of technologies for future mobility.

Vector worldwide currently employs more than 3,000 people with sales of EUR 770 million in 2019. With its headquarters in Germany (Stuttgart), Vector has subsidiaries in the USA, Japan, France, Great Britain, Italy, Austria, Sweden, South Korea, India, China, and Brazil.



Safety-Critical Systems and Cybersecurity Tech Fly Better Together

Avionics systems are not immune to the growing wave of cybersecurity breaches. In recent years, cybersecurity policies and approaches have been maturing and rapidly growing in adoption to keep up with the demand of securing aircraft cyber systems. This is particularly important given that modern aircraft platforms are complex system-of-systems implementations with a wide range of computing, networking, storage, and display elements interconnected and configured to enable operators to carry out their flights successfully.

Avionics include a flight-critical portion that is required to safely manage aircraft flight, as well as other mission-centric elements intended to enable the missions of a particular aircraft (e.g., search and rescue applications, imaging, remote sensing, Wi-Fi service, or streamed entertainment). Safety-critical software standards and processes for avionics software are focused on the development and deployment of safety-critical avionics system software.

The evolution of airborne networking and increased network connectivity through the advent of the 5G revolution mean that these systems now need to be developed with both safety and security in mind. Avionics security standards such as RTCA DO-326A/EUROCAE ED-202A, DO-355/EUROCAE ED-204, and RTCA DO-356 have had a significant impact on the development of safety-critical avionics systems and their ongoing assurance post deployment.

The European Aviation Safety Agency (EASA) proposed new cybersecurity amendments to the way aircraft electronic

networks and systems are certified, mainly highlighting new requirements that address threats that can lead to unauthorized access and disruption of electronic information or electronic aircraft system interfaces. The Department of Homeland Security (DHS), the Pentagon, and the Department of Transportation (DOT) have also been working to implement the cybersecurity goals of the National Strategy for Aviation Security, released in 2019, and to coordinate cybersecurity priorities.

This affects the way software is being developed as well. Legacy software acquisition and development practices in the DoD now strive to provide the agility to deploy new software "at the speed of operations." In addition, security is not an afterthought anymore; it is built in from the beginning of the lifecycle of the application and underlying infrastructure, following industry best practices for rapid, secure software development such as DevSecOps.

There are many ways for manufacturers to protect critical systems, but it all starts with a robust avionics architecture, complemented by other system-level measures such as STIGs (Security Technical Implementation Guides), simulation testing, and secure software updates.

Check out this Wind River executive briefing to find out how new testing and validation approaches can help protect avionics systems from evolving cybersecurity threats. This view looks beyond the usual roadblocks, such as testing a production system that may not be built yet or relying on physical replicas that are too expensive to spare.



NAVIGATING THE DARKNESS OF CYBERSECURITY RISK

By Alix Paultre

The aerospace industry can be looked at as a hi-rel subset of advanced embedded engineering, with the added pressure of a life-critical application space. Many of the trends rocking the consumer electronics, automotive, and industrial spaces also impact the mil/aero marketplace, from the Internet of Things to next-generation power electronics architectures. Another issue roiling the electronics industry is security, especially cybersecurity and protecting electronics systems from tampering and hacking.

The high level of electronics integration empowering the next generation of advanced aircraft must deal with the security and cyberwarfare dangers that exist. As Cloud-based systems and other connected technologies become more and more a part of avionics, engineers must address the potential

risks threatening avionics. In this article we reached out to several companies in the avionics space, to get a real-time snapshot of the state of the industry.

An Expanded Risk Environment

For example, “Connected Aircraft” are replacing manual upload of avionics systems, such as Flight Management Navigation and Terrain database updates with wireless datalinks (SATCOM, WiFi, 4/5G). This creates potential for unauthorized access from a malicious player. Avionics architectures that used point-to-point connections, such as ARINC 429, are being phased out in favour of networked-based systems which are fundamentally open access.

Cybersecurity was once a software-only application space, with issues ranging from password management to back-door access through software exploits or

simple holes in the code. Now security is becoming a hardware/software solution, manifested in devices like single-board computers (SBCs) with secure/trusted boot mechanisms, security features built into operating systems and board support packages.

The keys to the kingdom are also being protected now, with security of Data-In-Transit and Data-At-Rest, with certification processes compliant with ISO and DO-326A, along with techniques like penetration testing and white-hat hacking testing. Trusted Computing and Secure boot mechanisms use devices like Trusted Platform Modules (TPMs).

TPMs authenticate the executable code running on the SBC using Secure Hash Algorithms (SHAs), which produce unique encrypted codes for executable files when installed on an embedded computing platform. In addition, network security mechanisms



processors (<https://www.coreavi.com/>). Deployed on most major commercial and military platforms, CoreAVI drivers have been certified to DO-178C/ED-12C up to and including DAL A, and are aligned with the Future Airborne Capability Environment (FACE) Technical Standards.

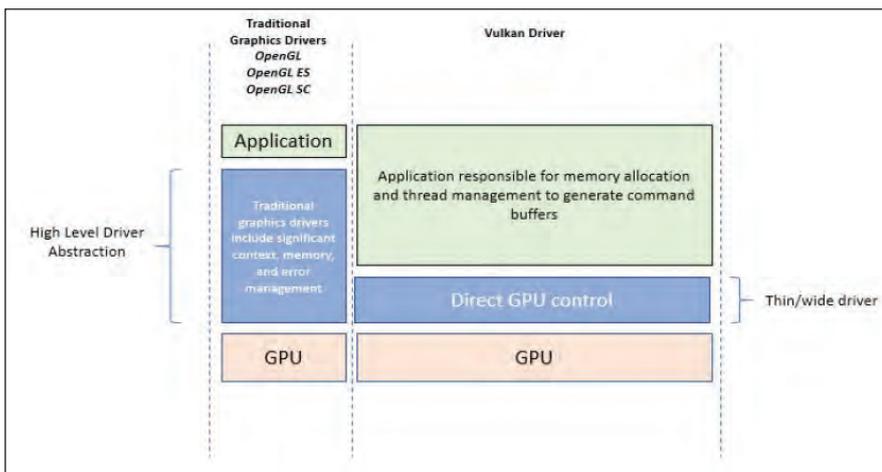
We reached out to Michael Pyne, director of Strategic Accounts & Solutions Architect for CoreAVI. He pointed out that the company agrees with the challenges laid out in the ICAO Assembly Resolution A40-10 on Addressing Cybersecurity in Civil Aviation, in that threats are increasing, vulnerabilities are expanding, and that a holistic approach to solutions for security problems is required.

According to Pyne, CoreAVI is particularly sensitive to the relationship between safety criticality/certification and cybersecurity, especially in an aviation world that is increasingly adopting an Internet-of-Things approach in the cockpit, with things such as WiFi-enabled Electronic Flight Bags, Off Boarding Systems, and other connected functionalities.

As Pyne points out, "CoreAVI is applying its robust safety critical processes, for system and software development, integration, and validation, to cybersecurity requirements. We are working with our customers to augment our development process discipline and rigor with cyber-threat assessment modeling and cyber-threat testing approaches."

He continued, "This environment is being guided by previous work with DOD standards like CNSS 1253 and FIPS 140-2, and evolving directives such as FAA ESSA Section 2111. CoreAVI's exhaustive Failure Modes & Effects Analysis (FMEA) process is being enhanced with cyber-security considerations such as confidentiality, availability, and integrity, as well as impact assessments such as catastrophic, critical, marginal, and negligible."

CoreAVI's products ensure graphics presented to operators in today's most sophisticated cockpits are protected to the highest levels of safety criticality (Design Assurance Level A). These solutions address heterogeneous computing architectures (CPUs + GPUs) for things like artificial intelligence, machine learning and autonomous flight in next-generation aircraft cockpits. CoreAVI recently invested in Safety Critical Vulkan (a Khronos group-sponsored GPU acceleration API for



Vulkan is a high efficiency, open standards API that provides easy cross-platform access to modern GPUs. CoreAVI image.

such as MACsec, IPsec, and Transport Layer Security (TLS) provide additional protection, with Security of Data-At-Rest provided by dual-layer FIPS140-2 encryption for networked attached storage.

CoreAVI

Core Avionics & Industrial (CoreAVI) is a leading supplier of real-time safety-critical graphics and compute drivers, COTS Hardware IP, and embedded graphics



ENSCO's Universal Test Environment offers a range of configurations tailorable to support a variety of avionics and mission-critical systems. ENSCO image.

modern CPUs/GPUs). Vulkan's Safety Critical compute and graphics API is a natural starting point for cybersecure solutions in the cockpit (Figure 1).

When asked about the security landscape going forward, Pyne mused, "Advances in avionics systems are providing the roadmap to where the threats are going to come from, and communication systems like CPDLC are

becoming more prevalent. So we would expect to see threats via datalink hacks to become more common. Air Traffic Controller communications are becoming more automated, taking the man out of the loop more and more, which poses additional cyber threat challenges."

"Off-boarding tools used for flight pre-planning and maintenance reporting may also present new threat opportunities. Pilots and maintainers using these off-boarding devices in international operations further complicates security measures. CoreAVI expects to see an increase in 'economic' motivations for cyber threats as opposed to terrorism or mischief motivations."

ENSCO Avionics

ENSCO Avionics (<https://www.ensco.com/>) develops sophisticated airborne systems for the aerospace industry to meet DO-178C/ED-12, DO-254/ED-80, DO-278A/ED-109, DO-326A, and military standards for manned and unmanned systems. The company's IData

development platform aligns with the FACE Technical Standard, established by The Open Group Future Airborne Capability Environment Consortium.

Defining an open avionics environment for all military airborne platform types, the FACE Consortium is a vendor-neutral forum that provides standardized approaches for using open standards with avionics systems, developing and consolidating the open standards, best practices, guidance documents and business models needed.

We spoke with Robert Sanders, vice president of ENSCO Avionics, on the security issue. He explained to us how they see the cybersecurity landscape as very broad, encapsulating software and hardware domains ranging from Operational (OT) and Information Technologies, (IT) to Physical Access, to assets and equipment. Robert observed that it seems that many of the recent Cybersecurity threats perceived are focused on IT's response to hacker attacks on company and government servers and domains, to gain access to protected or sensitive data.

In the area of avionics systems, the company is also concerned about risks to aircraft that result from malicious passenger access to embedded software and systems within the aircraft boundary, or cyberattacks on Air Traffic Control systems. The ability to gain access to on-board systems like In-Flight Entertainment systems as a means to interact maliciously with safety-critical systems, like Flight and Engine Controls, is a real Cybersecurity threat to Avionics systems. However, compliance with Airworthiness Safety criteria helps limit or potentially eliminate broad opportunities to gain access to higher criticality subsystems from lower criticality subsystems.

The reality of the Cybersecurity threat to Aircraft today and in the future is sourced from a more diverse set of Aircraft interaction risk domains. The threats potentially start very early in the safety-critical hardware and software design processes, with introduction of malicious function. Threats extend to real-time interaction with air traffic control and navigation systems by injecting misleading or false data throughout the mission envelope. Even aircraft maintenance operations performed by maintenance organizations are a risk point, where aircraft access controls may be challenging to enforce.

In the case of Unmanned Aircraft Systems (UAS) and Urban Air Mobility

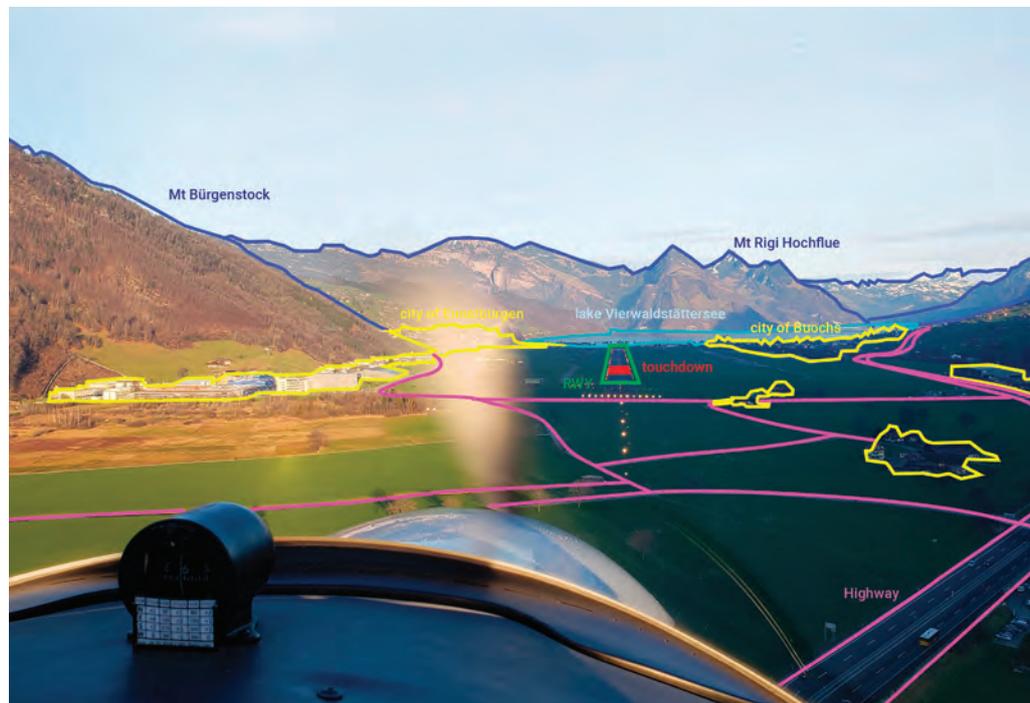
(UAM) initiatives, it is reasonable to assume there will soon be a major transformation in National Air Space (NAS) Safety and Security. It's a fair assumption that a higher degree of network and vehicle interconnectivity and control complexity will be required to ensure the future NAS remains safe and secure. However, higher degrees of connectivity may increase aircraft and infrastructure vulnerability to cyberwarfare tactics and exposure to cybersecurity threats.

When asked about what the company is doing to address these concerns, Sanders said, "ENSCO has been supporting corporate and government Cybersecurity objectives for years throughout the Physical Access and IT domains, and aggressively pursued and achieved compliance with the Defense Federal Acquisition Regulation Supplement (DFARS) 800.171, which is Cybersecurity criteria mandated for Government Contractors."

"DFARS 800.171 ensures that ENSCO's internal Information Technology Systems are consistent with DoD Cybersecurity standards. This strategic compliance ensures that Safety-Critical Avionics HW and SW life cycle activities performed on systems within the ENSCO domain and facilities are secure from Cybersecurity threats for both customer and internal programs and data."

Sanders further explained, "ENSCO has been providing Cybersecurity compliance services to the US Government and Aerospace Customer facilities, servers, networks, and system software for years, with NIST compliance assessments and accreditation for both Customer and Government organizations. For Commercial Avionics, industry guidance for mitigation of Cybersecurity risks is available from RTCA in DO-326A Airworthiness Security Process Specification, DO-356A Airworthiness Security Methods and Considerations, and DO-355 Information Security Guidance for Continuing Airworthiness."

"This "Airworthiness Security" guidance was prepared by a Special Committee (SC-216) comprised of industry expert volunteers, and ENSCO Avionics has been a contributing member of the SC-216 special committee as the guidelines were developed. In addition to involvement in Aerospace Industry Cybersecurity Working Groups, ENSCO has initiated internal R&D investigations into Cybersecurity domain knowledge, Tools, and Design Assurance Strategies for Airworthiness Security compliance."



Sanders continued, "Today, ENSCO Avionics' internal HW and SW development activities are performed with built-in Airworthiness Security compliance in mind. With appropriate diligence and continued focus on the full Cybersecurity Risk landscape, we keep ahead of daily Cybersecurity threats to our business and products. ENSCO has mature security processes and enforcement mechanisms in place to ensure secure special test/lab facilities, software and hardware development environments and verification environments (Figure 2)."

ENSCO states that the most significant cybersecurity threats will likely emerge from transformation of the National Air Space to accommodate next-generation vehicles and systems. It is a technological imperative to leverage current and emerging advanced technologies, to ensure superior computing capabilities needed to manage the complexity of the diverse aircraft types, functions and platforms involved.

Advanced technologies like multi-core processors, system-on-a-chip, wireless/WiFi, and virtual networks into Aircraft tends to disrupt Airworthiness Safety and Security, meaning that safety, reliability, and security could degrade based on the unique impact of their specific integration and use. It's more than speculative to believe that the complex interactions between UAS/UAM market forces, diverse Aircraft types/capabilities and technology demands will increase Cybersecurity risks and introduce new, unforeseen threats.

Daedalean AI says any data that is critical for flight planning, for technical navigation decisions and for collision avoidance decisions, becomes part of a safety-critical path of control. Every aircraft connection with the outside world is an attack vector and the more external data paths you have into and out of the aircraft, the more exposed the aircraft is to cyber-attacks. Daedalean AI Image.



Curtiss-Wright

Curtiss-Wright's (<https://www.curtisswright.com/>)

participation in the aviation industry goes as far back as the industry itself, from the Wright brothers's invention of the aircraft to today. From Curtiss-Wright's sensor and data recording products to monitor and communicate vital data on conditions within and surrounding the aircraft, to fire-protection systems, to enhanced cockpit controls and mechanical actuation systems.

We were able to catch up with Paul Hart, chief technology officer at Curtiss-Wright. When it comes to cyberware dangers do you see threatening avionics, Hart feels that one of the dangers stems from traditional data exchanges between an aircraft and the aircraft system on the ground. For example, manual uploading of navigation databases is now being replaced with wireless connectivity.

In that scenario, an aircraft arrives at the gate, flags that it needs to update its database, and the maintenance control center or the airline operation control center will automatically trigger an upload. The danger there is that without cybersecurity in that link, a malicious player could intercept that transmission, and maybe perhaps spoof a broadcast onto the aircraft. So a result of aircraft becoming more connected is that it introduces a number of potential vulnerabilities, especially on the aircraft with WiFi domains.

Passenger-in-flight entertainment is using wifi, but the pilots are using it too, with tablets that connect to the aircraft control system. They use them to pull up parameters from outside, air temperature, and pitot-static data, among others, to calculate takeoff performances for example, or weight and balance calculations. Now normally these are protected by Wireless Protection Access encryption methods, but there have been cases where these have been breached, and there is potential to connect across the different wifi domains on an aircraft.

A military aircraft is traditionally connected with a MIL-STD-1553 bus, and commercial aircraft avionics and sensors have all been connected together using ARINC 429 point-to-point data buses. These are all giving way to having CAN- or ethernet-based networks, which are fundamentally open architectures designed for plug and play in the commercial world. By connecting a network that's onboard the aircraft to a netbook that's wifi enabled, you have a

couple of areas where there's exposure to cyber risks.

Hart elaborated, "If an airline has decided they're going to update all of the flight management system databases every 28 days, which is the mandatory requirement, using some wireless connectivity, a malicious player could hack into that system, and could disrupt the uploads for those databases for the whole fleet of aircraft. So there's a potential risk that would encompass a large number of aircraft."

When asked about the growing hardware-based security aspect, Hart observed that a lot of processes now come with trusted platform modules, so the objective is to authenticate the code to ensure there's no malware. Prior to code being executed, the trusted platform module will run a secure hash algorithm on it. If it comes up with a different answer, something's tampered with that code. What's happening now is more and more people are looking to use trusted platform modules or trust zones so that there is a secure boot process."

"For example, our UNS, Unattended Network Storage, is a rugged network attached storage system that supports standard network storage protocols through four 10 GbE and eight 1 GbE ports (Figure 3). Trusted to protect critical data-at-rest, the UNS incorporates Top Secret/Sensitive Compartmented Information encryption for unattended applications."

"For network security, you embed in IPSec, MACsec, or Transport Layer Security, which essentially creates a session key between the source and the destination IP addresses. And the keys are sent separately so that anyone that wants to break and inspect in that link either by physically plugging into a network switch or joining a WiFi network, would be unable to intercept those messages."

"So use of crypto processes, Transport Layer Security, network security are becoming more and more widespread and necessary. Curtiss-Wright computer systems are available fitted with an Intel tracker platform module, and the ruggedized computers out of the company's Salt Lake Parvus facility are now fitted with trusted platform modules. This capability extends to our dedicated ultra-small form-factor mission computers."

Hart continued, "Customers need to start specifying cyber-secure features when they buy an SBC, and make sure it comes with a trusted boot, or some form of trust zone or trusted platform module

embedded on the board. Are you able to authenticate the code using an accredited secure hash algorithm? That way you can guarantee that if your code has been tampered with, you can then have a policy that will prevent it from being executed."

"The next thing is encryption, and we have FIPS 140-2 layer encryption, where you have full drive software encryption and full drive hardware encryption. It's kind of like two bits of Swiss cheese. If you overlay them the chances are you have closed up all the holes. So by having the data at rest, anything that's stored on a hard drive or removable media have encryption layers built in to show it meets an accredited recognized standards such as FIPS 140-2, and also the grade, there's grades one to four and generally grades two and above would be acceptable for aerospace."

"From the regulatory aspects in terms of avionics, the FAA has issued a policy statement on cybersecurity and the ASA is putting two pieces of legislation through the European commission right now, which will be mandatory in the next few months to deal with aircraft cybersecurity and another one to deal with the management of information security risks. Now in all three cases, where it boils down to the avionics, there is a document called DO-326A on aviation cyber-security airworthiness certification, and there are some companion documents that go with it. They're known as the DO-326 set on compliance in making the assessments of cybersecurity and building and testing out the mitigation strategies. Cybersecurity is a constantly moving target and we have to be vigilant."

Daedalean AI

Artificial Intelligence (AI) is a rapidly-advancing disruptive technology that is now beginning to address the aviation space. Daedalean (<https://www.daedalean.ai/>) is a Zürich-based startup with a mission to create a certified airworthy autopilot based on AI that can pass the exams for human pilots. The company recently signed an agreement with Honeywell on joint testing and technological partnership in developing solutions for autonomous takeoff, landing, and GPS-independent navigation and collision avoidance for GA aircraft and electric vertical takeoff and landing vehicles (eVTOL).

To talk about cybersecurity in AI-based systems, we spoke with Luuk van Dijk, founder and CEO of Daedalean. On the security and cyber warfare dangers



Advanced Lighted Pushbutton
Switches and Indicators

There's Never Been a Better Time to Make the Switch

12
Internal NEXSYS
Component
Options



VIVISUN® has set the standard in ruggedized MIL-SPEC avionics switches and indicators for more than 50 years. With advanced internal NEXSYS® component options, our products simply outperform the competition.

If you're looking for personal customer service, worldwide factory support and the industry's fastest delivery, it's time that you make the switch to VIVISUN, manufactured by Applied Avionics.

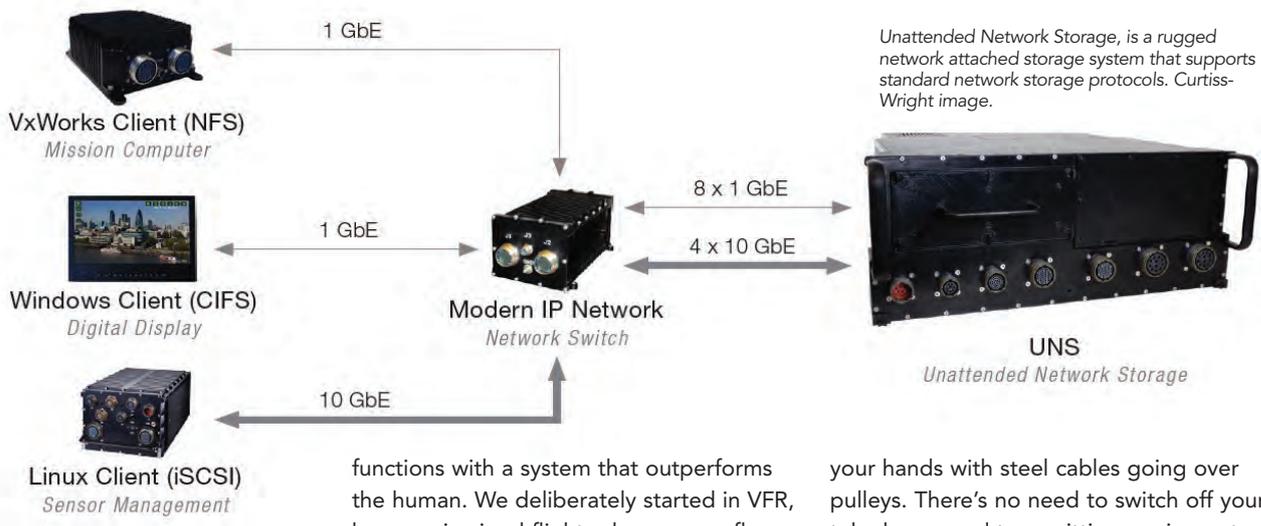
Speaking of making the switch, our easy-to-use Part Configurator allows you to design a switch and get a complete part number 24/7 as part of our online paperless ordering process.

Ready to make the switch? Visit our website at:

www.AppliedAvionics.com/VIVISUN

Manufactured by
Applied Avionics

Fort Worth, Texas, USA
Sales and Support: +1 (888) 848-4786



threatening avionics, the company's position is that there is a clear trend to the more connected aircraft, and every connection with the outside world is an attack vector. The more external data paths you have into and out of the aircraft, the more possible exposed surface you have for cyber-attacks.

Any data that is critical for flight planning and for technical navigation decisions and collision avoidance decisions, any piece of data becomes part of a safety-critical path of control. As van Dijk points out, "GPS, for example, can be notoriously spoofed or jammed actually. It's routinely jammed over whole parts of the United States to practice what things would look like without GPS for the U.S. military. You can buy a jammer on Alibaba for a couple of bucks to disable it in a small circle around you. That has implications for the safety of systems that rely on these signals to be there."

"No serious aircraft critically relies on GPS, but still pilots might become reliant on it as a matter of habit, and especially in general aviation. If you plan your own path, you sort of expect your glass cockpit to display accurately where you are roughly, and you're supposed to be able to deal with it if it's not there. But the more reliable these things are in daily life, the more surprising it is and the more risky it is if it's suddenly not there. For example, an ILS system does not use GPS to guide you to the ground, because it's known to be not sufficiently reliable for those last meters of altitude."

van Dijk stressed, "But then the ILS beam itself is a radio beam that you could spoof and hack. It would probably be obvious to all involved if this was going on. But the more avionics you have that become routine part of how the plane flies, the more you have to keep these attack vectors in mind."

"In the case of our product roadmap, our intent is to replace how a human pilot

functions with a system that outperforms the human. We deliberately started in VFR, because in visual flight rules you can fly around without too many dependencies and uncontrolled space, and in specifically that gives us a chance to start without having to worry about the data links. For example, one of the systems we have developed is as a human pilot who's flying on visual rules, your GPS is completely optional. You look out the window and you're supposed to be able to navigate a rough map of landmarks."

"That's actually the system we replicated. Our computer vision system can just look out the window, actually it looks out of the camera that's mounted somewhere on the aircraft, and it recognizes really big things like mountains and coastlines and big roads, and it can use that to fly from A to B without a GPS. We took the human performance there as a baseline. First thing you have is your eyes to see where you are. The second thing you have your eyes for is to see where you can land, which is also very important if you're flying. And the third thing you use your eyes for in VFR is for collision avoidance to see all the cooperative and non-cooperative traffic for which you're also supposed to use your eyes in VFR."

"An interesting consideration there was exactly that we don't want to depend on external data. You have lots of collision avoidance systems that assume that the other party has a transponder and that's great. In the U.S. that's currently rolled out as mandatory. So that means that most things that fly will actually be broadcasting a signal saying, "I am here and I am this and I'm going that way," and that's as far as they're reliable. But it also introduces a dependency, and if that transponder is gone, you're not allowed to fly into them just because they have their transponder off."

"A human can fly a Piper Cub aircraft with almost no instruments perfectly fine by just looking out the window. And that is... I don't know if you've ever flown in one, but there's a steel bar in

your hands with steel cables going over pulleys. There's no need to switch off your telephones and transmitting equipment because there's nothing on board remotely electronic to interfere with. It's very hard to spoof a mountain range. If you want to disorient a pilot who is looking out the window, then provided the vision is good, the visibility is good, it's going to be hard to beat that. So that's exactly one of the things we're trying to build in that level of resilience and reliability, without depending on external data."

"When it comes to security, one of the things we do is that we don't actually learn online. Once the system is deployed in the aircraft, you're not going to have it magically learn new things without your supervision. It's fine to collect the data, send the data back to the lab, train a new version of your algorithm in the lab, but then you reassert and you reassure all the design and performance aspects before you roll it out."

van Dijk concluded, "We have all the safety critical decision making-capability on board. We can vet all external data sources against something that we can see for ourselves, which is what the human pilot's also expected to do. So if somebody spoofs the GPS or if somebody falsified the maps, we can look out the window and say, "I'm quite sure I'm here and not somewhere else," or "I'm quite sure that the whole mountain range actually is still in the same place."

Looking forward

The aviation industry has to pay attention to a large variety of threats, and cybersecurity is only one aspect of the whole safety and security solution set. However, with the high levels of connectivity and processing functionality involved in avionics, ensuring system and code security is a paramount concern. Getting a handle on the cybersecurity solutions available and implementing them effectively will go far to ensuring the security of your aircraft. **ATR**



EFB Tablet Cradles



Contact us today to discuss your Avionics Engineering program requirements.

AVIONICS SUPPORT GROUP, INC.

13155 SW 132nd Avenue
Miami, Florida 33186

Ph: +1 305-378-9786
Fax: +1 305-378-9726
sales@asginc.net



AVIONICS SUPPORT GROUP, INC.

"Committed To Keep You Flying"

www.asginc.net

**ELECTRONIC FLIGHT BAG
CERTIFICATION LEADERS**

Featuring STC's for:

Airbus A319/A320/A321/A330-200/300

Boeing 737-400/500/600/700/800/900 • Boeing 747-400/8

Boeing 757-200/300 • Boeing 767-200/300/400ER

Boeing 777-200/300 • Embraer E-145, E-170/175, E-190

DC-10/MD-10/MD-11 • Lockheed L382G and more!

**ETHERNET AND POWER
EFB SOLUTIONS
WITH OUR PATENTED
CONSTANT FRICTION MOUNT**

**As world leaders in avionics
upgrades, we also provide:**

STC Development • Engineering & Certification
Worldwide Technical Support

We Support your projects with:

FAA DERs • FAA DARs
Onsite Technical Support

**Your single source solution
for any retrofit:**

- SATCOM
- ELT
- ADS-B
- IFE LCD Replacement
- EFB/iPad
- FANS 1/A

Contact us today to discuss your Avionics Engineering program requirements.



FANS Equipage Becoming a Necessity

By Kathryn B. Creedy

The deployment of the Future Air Navigation System 1/A is necessitating an upgrade of non-airliner aircraft in order to use the global air navigation system despite its being voluntary in some regions. In addition, according to SITA, the airline industry needs to stay vigilant in order to optimize the equipment.

"The world is flying more, with an increasing number of data laden, new-generation aircraft taking off every day," SITAONAIR head of Cockpit Communications Portfolio Andy Hubbard told *Aerospace Tech Review*.

"This not only puts pressure on Air Navigation Service Providers (ANSPs) to manage limited airspace but also manage the world's aircraft communications infrastructure across increasingly limited bandwidth. Additionally, the industry is facing pressure to reduce its carbon footprint, as well as adapting to regional regulatory activity. Fortunately, a digital shift in aircraft communications is already well underway. There are dedicated IP links for the flight deck that offer secure, global and higher-throughput channels for vital air-to-ground and ground-to-air exchanges, as well as an uptake of 3G and 4G cellular networks which offer cost-effective options for expanding ground coverage. However, conventional VHF/VDL will remain key to delivering safety communications for the foreseeable future."

The technology essentially allows digital communications between aircraft and controller by text instead of voice for clearances and reducing pilot and controller workloads. The increased accuracy also significantly expands airspace by reducing separation requirements. Benefits include reduced delays and more efficient routes, improved controller and pilot efficiency, reduced operational errors, reduced ground

delays owing to congestion and weather and reduced fuel burn and emissions.

"FANS 1/A+ was established in certain North Atlantic airspace while Aeronautical Telecommunications Network Baseline 1 (ATN B1) was its European equivalent," explained Universal Avionics in its white paper. "In the US, Controller-Pilot Data Link (CPDLC) and CPDLC Departure Clearance (CPDLC DCL) more effectively manages airspace, addresses communication frequency congestion and improves safety. Data Comm FANS today uses automatic position reporting and CPDLC to directly communicate to ATC over VHF using VDL Mode 2 or SATCOM (Inmarsat or Iridium) in lieu of ACARS, to enable more efficient communications between the aircraft and ATC."

And it is this automation that is attracting users. With the best-equipped, best-served philosophy of air traffic management systems, it is now in the operators' best interest to upgrade their aircraft. Airliner manufacturers are well along in equipage and while business aviation OEMs have



LOCATION
unknown
Brampton
unknown

been preparing for this brave new world and avionics manufacturers such as Collins Aerospace, Universal Avionics (UA), GE Aviation, Honeywell and others, developing equipment, the onus is now on operators.

"We've seen a lot of focus so far on the benefit of equipping airline and Part 121

How the Data Comm System Pieces Work

The current data link system relies on the networks of Data Link Service Providers (DSP), such as SITA and ARINC, for the delivery of data link messages.

Also referred to as Communication Service Providers (CSP), the DSPs are commercial entities that offer similar services, but run their networks in different configurations.





Satcom Direct detects and prevents malicious cyber events on aircraft during all phases of flight. Such attacks are not new and are largely aimed at passenger devices. Satcom Direct image.

operations,” said Dan Reida, vice president sales and support for Universal Avionics. “However, there is substantial operational improvement for business aviation operators who take advantage of CPDLC DCL and en route capabilities.”

Chuck Wade, Collins Aerospace principal marketing manager, agreed. “Unfortunately, in business aviation, because they are used only 300 to 400 hours a year, sometimes the cost/benefit doesn’t add up,” he said. “But the value proposition is in the participation in the National Airspace System (NAS) and as this technology unfolds throughout the 2020s, it will just be a cost of doing business. For business aircraft to remain relevant, especially in busy areas such as Southern California, Florida and the Northeast, CPDLC will be an expectation and you won’t be able to manage without it. But you will also see cost effective solutions come to the market. I know that is top of mind at Collins.”

For those doing that cost/benefit analysis Wade offers this. “Put yourself in the controller’s position,” he said. “The controller has 60% of the fleet they



The FAA successfully completed the first phase of FAA’s NextGen efforts to deploy CPDLC at 62 of the busiest airports in the US two years ahead of schedule. Universal Avionics image.

are handling equipped. So, where do you think that puts an aircraft that isn’t equipped? The FAA is deploying all this new technology to benefit NAS so the priority will be on those who will help them achieve the efficiencies they are after. As far as the FAA is concerned everything about flight deck connectivity is about NextGen

Data Comm. Eventually, it will get to the point if you want to participate in the NAS, you are going to need this equipment. We are experiencing increased conversations around this technology and the benefits associated with it.”

SITA has been a key enabler for a number of ANSPs and aircraft operators to help unlock the benefits with its FANS managed service but still the cost/benefit analysis is complex because it also includes carbon emissions and that isn’t necessarily top of mind in business aviation operations.

“There are several operational factors at play, at the heart of which is airspace productivity,” Hubbard explained. “In this sense, coordination and exchange of flight data between systems on the flight deck and ATC is rapidly becoming a key factor in unlocking further airspace productivity. The ultimate panacea is the enablement of free routing airspace through Trajectory Based Operations and applications like Extended Projected Profile (EPP) and 4D Trajectory coordination (4DTRAD) brought over the next generation of data link services. EUROCONTROL estimates the benefits of the shift to free routing airspace at 10,000 tons/day in reduced CO2 emissions and a daily saving in fuel bills of around €3 million. Other regional campaigns put the savings estimate at between 200 and 500 kg of CO2 per flight from optimized arrivals and approaches based on RNP and 4D Trajectory coordination over data link.”

Brave New World

For a growing number of ANSPs, the suite of technologies supporting FANs is a requirement, according to a Universal Avionics.

“Data Comm systems have matured over the past three decades from an aircraft OEM cost-saving feature to a necessity for effective worldwide airspace management and communication advancements,” it said in its white paper. “Several areas are mandating Data Comm capabilities and excluding non-equipped aircraft from airspaces with the most-desirable and cost-saving routes. Equipping for FANS 1/A+, CPDLC DCL, or ATN B1 operations can meet regulatory requirements and provide a substantial return on investment for aircraft dependent on those airspaces. The addition of FANS Domestic initial capabilities such as CPDLC DCL at major U.S. airports can



virtually eliminate wait times for aircraft clearance delivery, potentially reducing operating costs significantly over time.”

Besides CPDLC, FANS Oceanic requires Automatic Dependent Surveillance-Contract (ADS-B-C), VDL Mode 2 data link radio and/or satellite communications, and of course ADS-B, required in the U.S. since January 1, for domestic operations.

UA noted VDL Mode 2 network, a high-speed and high-capacity digital communications network, provides a massive increase in message capacity –

of capabilities to make this communication seamless for the pilot and ATC. The wide adoption of tablets in the flight deck, high-bandwidth/high-reliability connectivity, and growing applications really enable and encourage a tighter integration among the pilots, ATC, and operations. With our new connected FMS – TrueCourse FMS and Connected FMS, we expect significant improvements in situational awareness, seamless/automated communication, optimization of routes, additional/automated safety checks, just to name a few.”

Last year, Lufthansa Systems and GE

Data Comm. Most Boeing and larger Airbus models are equipped, but many mid-size Airbus planes and regional aircraft are not. Other airliners either don't have a flight management system that can be upgraded or are close enough to retirement that airlines won't spend the money to upgrade. Nearly all international airliners, of course, are already equipped for FANS equipment that includes data link.”

The fact that more than 2,500 business jets are equipped is a testament to a proactive industry in which OEMs have prepared and flight departments understand that there are benefits to be had.

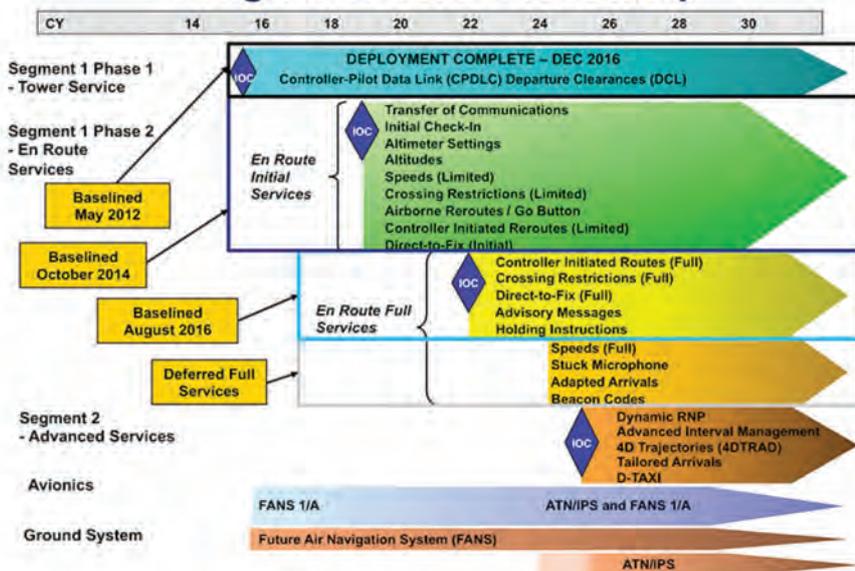
On the airline side, Wizz Air recently became Europe's first airline to deploy SITAONAIR's pioneering ACARS over IP service using terrestrial cellular networks. This flexible channel for on-ground data transmission offers increased capacity and coverage, and higher data throughput, as well as an ample on-ground alternative to VHF/VDL-sparse locations. The service also brings enhanced resilience through the interoperable use of cellular and ACARS networks.

Similarly, Cebu Pacific also uses the platform because it flies to a number of airports that are surrounded by high terrain and that have no VHF Ground Stations (VGS). However, they do have 3G connectivity. ACARS over IP enables their operational ACARS traffic to be sent normally when previously this would have had to wait until a VGS/RGS was in range. Cebu's aircraft have moved 33% of their VHF Datalink traffic to Cellular.

“The shift to new IP-based datalinks offer new, largely uncharted potential for connecting applications in the cockpit,” said Hubbard. “Dedicated broadband connections enable airframers to maximize the capability of onboard communications management and enable real-time connectivity for updates on graphical weather or fuel optimization. Greater value can also be achieved through the enabling of connected aircraft tracking applications such as SITAONAIR's AIRCOM FlightTracker which, in conjunction with ACARS, Aireon's space-based ADS-B and FlightAware's ground-based data, supports ICAO's Global Aeronautic Distress & Safety System (GADSS) recommendations.”

Hubbard noted, however, cost barriers and the complexity of making changes to avionics means that datalink advances have not been as swift as required. “With new aircraft continuing to be equipped with conventional ACARS technologies, which are still core to aircraft communications operations, some carriers might not yet feel motivated to upgrade. SITAONAIR's VHF Data Link mode 2 (VDLm2) proposition

Program Services Roadmap



FAA image.

roughly 20 times that of ACARS – and is more cost efficient and reliable than traditional VHF.

CPDLC Deployed

The FAA successfully completed the first phase of FAA's NextGen efforts to deploy CPDLC at 62 of the busiest airports in the US two years ahead of schedule and is now deploying it to centers having completed Kansas City and Indianapolis centers.

However, a 2019 DOT Office of Inspector General report on the aircraft equipage noted this phase will likely take longer and be paced by equipage of non-airline and regional airline fleets. The schedule calls for the balance of en route centers to be operational by the end of 2021 and then the full set of Data Comm capabilities will be brought on in 2025.

“The introduction of FANS is big step for the industry in terms of easing the communication between pilots and ATC,” Gary Thelen, director, Navigation & Guidance for GE Aviation, said. “However, FANS is just the first step in the roadmap

Aviation became the first providers in the airline market to offer a solution that allows for the inflight synchronization of the flight plan between the GE Aviation flight management system (FMS) and Lufthansa Systems pilot applications directly on-aircraft.

“Utilizing capabilities of a connected FMS is a true milestone for digital navigation in aviation, because it automates the daily manual data entry processes of pilots, which are prone to error, and enables the data flow between different applications,” said Dr. Bernd Jurisch, head of flight & navigation products & solutions at Lufthansa Systems. “This synchronization of valuable flight-relevant data between the FMS and pilot applications reduces pilots' workload and greatly improves their situational awareness, while also significantly mitigating errors through incorporated cross checks that are even graphically visible for the crew.”

The IG's aircraft census revealed 7,800 aircraft currently equipped. “Of these, 3,166 are domestic airliners, 1,946 are international airliners, and 2,688 are business jets,” the IG reported. “The equipped domestic airliners are 72% of the domestic fleet that can be equipped with



Solving the Connectivity Puzzle.

For over two decades, Teledyne Controls has been leading the way in enabling the connected aircraft. Our popular GroundLink® solutions provide all the pieces to fully connect an airline's operations and streamline data distribution across its key stakeholders; and as the connectivity puzzle continues to evolve, so do we.

GroundLink® Connectivity Solutions

Available today | Evolving for tomorrow

Visit us at: Aerospace TechWeek, Toulouse, France, Booth 412



overcomes these issues. VDLm2 requires only changes to the ground network – essentially to allow ground stations to pick up messages addressed to other stations in their vicinity – and allows the avionics to remain unchanged. Implementing VDLm2 amounts to deploying a virtual ground station, in addition to the existing ground stations that will continue to operate in the normal point-to-point ‘virtual cable’ mode.”

Mandates on the Horizon

Ultimately, it will not be a matter of choice, UA indicated. “Operators not equipped for FANS 1/A+ capabilities will be excluded from airspace which requires it, increasing total trip distance, time, emissions and ultimately more money,” its white paper explained. “The fact is that some aircraft simply do not have the range to get across the Atlantic without operating on the NAT at optimum altitudes. Operating outside of those optimum altitudes may mean not being able to make the trip nonstop. With the additional requirements in the North Atlantic, even aircraft that would normally fly a random route above or outside of the affected tracks will not be allowed to transition through the NAT if they are not equipped for FANS. This trend will continue as equipage rises and demand for more operations in the airspace increases.”

Satcom Direct agrees. “FANS brings great benefit to business aviation, providing operators the ability to use optimized transatlantic routes,” said Nick Cook, SD director of flight deck services, adding SD offers the FlightDeck Freedom (FDF) datalink service, enabling FANS 1/A and other advanced datalink capabilities for many airframes previously unable to use FANS 1/A. “Upgrades to the FDF datalink offering have been put in place to support multiple FANS retrofit and upgrade options for legacy aircraft. This is all part of our strategy to deliver the latest technologies to reduce pilot workload and contribute to more efficient aircraft operations.”

FlightDeck Freedom supports aircraft equipped with Rockwell Collins CMU-1000 datalink systems as well as aircraft equipped with a Universal Avionics UniLink UL-800/801 Communications Management Unit (CMU) operating simultaneously with Honeywell’s AFIS DMU, providing a simplified upgrade path for legacy AFIS DMU equipped aircraft to become FANS compliant. FDF supports all FANS/LINK 2000+ equipment and will be compatible with all future upgrades to other avionics. The UniLink UL-800/801 CMU upgrades are certified for installation



GE image.

on Gulfstream models GV, GIV, GIVSP and additional aircraft types will be certified in the future. The mode of communication is flexible and can be adjusted to meet the needs of the individual aircraft. Certification of the CMU-1000 system is expected late this year for Falcon 50EX/2000/2000EX and Challenger 604 aircraft.

“Our role really is ensuring a channel is available and users know up front if there are any problems or gaps with coverage,” Cook told Aerospace Tech Review. “Customers get an alert during trip planning on gaps or problems. This information is updated en route. In addition, alerts are sent as reminders as the aircraft approaches a gap, how long it will last and when they are reconnecting with a coverage area. We also provide a means to test an aircraft’s systems and do familiarity training before flight. In addition to bringing automated alerts on gaps, the SD technology monitors hazardous weather and helps with flight crew workload. SD also provides real-time security alerts alerting crews to any attempted cyberattacks or geopolitical issues that would require changing the flight plan or diverting to alternative airports.”

Safety First

While all this is geared toward improved communications and expanding airspace, it also has a safety benefit in eliminated language barriers by establishing a standardized message set. It also eliminates HF problems during solar flares and reduces HF traffic.

Hubbard cautioned not all communication networks are created equal. “Different networks are required within a safe and sustainable service across each operational domain in order to support diverse needs, from high-traffic continental areas to remote oceanic areas,” he said. “To serve these needs, new IP-based technologies must be highly integrated and industrialized into a single, seamless delivery model, to be market-ready, and bring significant advantages for airlines and airspace management service users.”

There has been an uptick in interest. “A number of our customers have seen the benefits,” Wade, told Aerospace Tech Review, “so we have a good volume of queries from unequipped customers. FANS/CPDLC was built on the backbone of ACARS and airlines have been using that for 30 years. Now we can bring different operational benefits to business aviation. The EFB world continues to expand, leveraging the ACARS network, providing a nice incremental value to customers. Users of super mid-sized aircraft and up are anxious to adopt this technology. The smaller aircraft users, however, are not traditional data link users and so they are less familiar with the technology. However, the value proposition of CPDLC is there and they are responding. We don’t have a lot of these users moving from voice to text, but it will be natural to see crews want to use text.”

Wade also spoke of the financial benefit in being more efficient inflight. “You get quicker clearances with data comm, so you spend less time taxiing and you get more efficient re-routes,” he explained. “Since it is built on the backbone of ACARS we can bring different operational benefits. For instance, this would mean the expansion of EFBs leveraging the ACARS network which will give users an incremental value such as routing messages through ACARS. More will be added to the data stream that can be coupled with pilot logs and scheduling. That hasn’t resonated yet with small flight departments. It is just a matter of getting more value for the same costs and that argument is starting to gain traction.”

As for the future, Wade is anticipating changes will be needed. “As ATC evolves and finds new use cases, it will help us react to the market if updates are needed,” he said. “Towards the end of the decade there may be use cases FAA might find that would help them and could have an impact to products possible. As far as new product or systems, not a lot is being talked about. If you look at FAA road map, the discussions are about upgrading and getting more bandwidth but all that is pretty much using the same backbone on which to build.” **ATR**

Digital on your mind?

Challenges in creating seamless digital experience for passengers and crew

Passengers today live in a connected world. They love their convenience, their portable devices, and foremost a seamless, integrated experience. While the automotive industry is already embracing this digital transformation with electric drivetrains and smart cabins, the aviation industry has long struggled due to a lack of available technology and a stern regulatory environment. The latter has also made this vast and lucrative industry off-bounds for a number of innovative digital service providers.

Ancillary revenues constitute a large part of global airline revenues, which largely depends on the passenger experience. In the year 2018 alone, the airline industry netted USD 92.8 Billion through ancillary services, a whole 10.7% of the total industry revenue. With a very attractive CAGR of 18.5% over the period of 2019-2027 (Marketwatch), it's foolish not to get a slice of this gold stream.

ANCILLARY SERVICES



However, due to the strict nature of the aviation industry, technology adoption and provisioning external digital services through third-parties or vendors is a complicated and daunting task. Any provider aiming to enter the cabin with their digital offering not only has to tailor their applications for a specific server and device hardware, but also have to go through long certification cycles to get on-board. Hence, the industry direly needs a solution that can reduce the hassle of certifications, standardize the process of digital services management (own or vendor-supplied), and further deliver, deploy, and orchestrate them to the cabin.

The innovations in digital technologies now empower us to isolate the various services and manage them as UMS (User-Modifiable Software). Moreover, with containerization, any service can run on top of fragmented hardware with different specifications. Axinom, with its IFS (In-Flight Services) system, does just that and more. With Axinom IFS, airlines, integrators, and digital service providers can manage and serve innovative applications and compelling user experiences. The standardized technology stack also unites the various digital passenger, cockpit, cabin, and crew services.

Axinom IFS comprises of all the required components for centralized management of own or third-party digital services, whether on-ground or on-board. It takes care of identification, access, and control of stakeholders; ingestion and management of services; delivery of services as well as backchannel data; orchestration and deployment of services to on-board servers and devices.

To ensure true isolation and separation from non-modifiable software, IFS encapsulates all applications and services in separate software containers. And, as extra measures of security, data is encrypted with industrial-grade encryption standards, with added redundancies on top. IFS also gives granular controls over

each service's execution, data access, and communication.

As for use cases, there are infinite. Airlines can build seamless connected experiences not just for passengers but also for their crew - from IFEC and smart cabins to IoT and predictive maintenance. For example, applications connected to CRM systems that allow for innovative e-commerce. Crew devices that would enable individual passenger insights to give them tailored service; greater operational efficiency through connected IoT systems that also allow for predictive maintenance.



Personalized IFEC services - IFEC that knows passenger likes and dislikes, and offers media, advertising, and e-commerce tailored to their taste.



Wireless services - Wireless Seatback IFE, Wireless IFE for BYOD scenarios, and full-service connectivity portals.



Destination services - Pre-booking of the taxi, airport duty-free e-commerce, hotel bookings, tours, itinerary planning, travel guides, maps and more.



Connected seats - Up-selling or cross-selling, seat-belt indications, health data, and more.



Connected baggage and cargo - IoT enabled baggage bins, pet carriers, and environment controlled cargo.

Serving passengers at all touchpoints with tailored offerings is the key to make the integrated experience a reality.

To know how Axinom IFS can help with your digital challenges, get in touch at aero@axinom.com



Predictive maintenance has progressed from industry buzzword into a goal for many operators. Today, several airlines and MROs are demonstrating how to use data to increase fleet reliability. But how are they able to fully benefit from the vast wealth of information available, and mine it effectively without incurring unmanageable costs?

Data comes in many forms and from various sources in an airline – the vast amount available today created the term ‘big data’. Unless robust digital solutions are installed that can aggregate, distribute and analyse information, data is useless. Complex algorithms are required for this analysis, specifically machine-learning algorithms to handle aircraft and engine sensor information.

According to an Oliver Wyman MRO Survey, the global fleet of commercial aircraft could generate 98 million terabytes of data per year by 2026, due to big data. Aircraft data comes from sources including the flight data recorder (FDR), engine health monitoring (EHM) and airframe health monitoring (AHM); each receiving and transmitting thousands of parameters from in-built sensors, often down to component level. The amount of data has implications for transmission costs and for an airline’s connectivity and storage capabilities. That is, for the data to perform proactively, it needs to feed data regularly into maintenance (M&E) and operational systems to create a current picture. Having the infrastructure for this can feel cost-prohibitive for carriers.

Engine and airframe original equipment manufacturers (OEMs) were initially at

the forefront of these digital solutions; as aircraft become more sophisticated, the intellectual property (IP) that governed them meant that OEMs were ideally positioned to generate software that could manage data effectively. However, airlines with multiple fleet types still sought solutions that could ingest different data standards and forms. To maximise the ability of big data in the industry, it can’t be kept in-house. “Today, OEMs, airlines and maintenance, repair & overhaul (MRO) operators are showing interest not just in gathering data, but sharing it for a number of different uses—predictive maintenance or health monitoring systems being key applications,” says James Elliott, Principal Business Architect, Aerospace & Defence at IFS.

Predictive maintenance is explored here. By utilising solutions that can interpret aircraft data, maintenance control centres can build a day-to-day picture of individual aircraft (and fleet-wide) performance. Overlaying this with historical information means one can forecast – using advanced analytics - when a part will fault. Moreover, this performance data will contribute to the historical data – meaning that predictive models generated become ever more accurate. By predicting fault behaviour, operators can schedule maintenance ahead of the fault being flagged in operation.

As Aerospace Technology Week approaches, ATR is reviewing the industry stance on predictive maintenance analytics – that is, how are airlines best utilising maintenance and operational data to maximise time-on-wing (TOW). “Ideally, predictive solutions shall reduce the overall cost of operation, reduce interruptions and increase the reliability of the fleet,” agrees Frank Martens, Head of Customer Development Digital Products at Lufthansa Technik (LHT). “There is no generic number available, but some predictive solutions reduce the number of unscheduled removals by 80%, and just one predictive solution can save an airline more than a million Euros per year, but this strongly depends on specific operational patterns.”

Before predictive maintenance can reach maximum potential in the industry there remain challenges pertaining to data ownership, connectivity and regulatory support.

Data Origins and Access

In addition to FDR, AHM and EHM data, predictive maintenance can utilise information from other sources to present a robust picture of aircraft and engine performance.

Honeywell’s digital platform – Honeywell Forge – supports its Connected Maintenance application. Connected Maintenance analyses aircraft data in order to generate trends, maintenance alerts and proximity warnings for failures and faults. Honeywell Forge then allows customers to assimilate and distribute data effectively, which are key for predictive maintenance. “There are a variety of data sources used for predictive maintenance, namely quick

PREDICTIVE MAINTENANCE ANALYTICS:

SMARTER, SAFER & MORE EFFICIENT OPERATIONS

By
Charlotte Daniels

access recorder (QAR) Data (or a subset thereof), ACMS Fault Messages, ACMS Performance Reports, and Maintenance Tech Logs," describes Josh Melin, product line director for Honeywell Forge Connected Maintenance at Honeywell. "The richest data set is direct sensor data from the 717 bus or 429 buses which can be pulled from the QAR, or tapped directly from the bus using wireless enablers. These can be installed on the aircraft."

While wireless enablers can simplify data flow for airlines, Melin adds that data can be extracted in other ways for the operator, with no need for aircraft modification or retrofits. "We do find, however, that if data is not collected regularly, the value of predictive maintenance solutions is lower, because predictive maintenance relies on regular data feeds to predict failures," continues Melin. "Furthermore, it is important that the airlines owns the data it generates, and can decide which elements to share and withhold. So Honeywell actually does not need a full set of QAR data to create a predictive solution, in fact, we only need a subset of data labels from the 717 bus which we can provide as a list to the airline." Melin adds that Honeywell

can offer wireless enablers to the airline which can tap the 717 bus and pull only the exact parameters needed to provide the service the airline requests.

If an airline has issues pertaining to cost, data ownership or distribution, Melin explains that Honeywell does not need to collect all aircraft data in order to provide a predictive solution. "Honeywell Forge has airlines providing everything from ACMS Performance Reports, QAR data, to Maintenance Tech Logs in order to formulate their solution. While all the data sets listed are ideal, it's possible to get started with just a subset of data, such as ACMS data and then as ROI is established the data set can be expanded," he adds. The solution started as a tool to analyze data coming from thousands of Honeywell APUs. In 30 years, just one

model of Honeywell APU has amassed over 100 million hours of service data; an ideal starting point for predictive analytics involving the complex systems which make up the APU.

Saravanan Rajarajan (Saran), Associate Director for Aviation Practice at Ramco Systems explains that maintenance-related data on the Components / Aircraft recorded in their MRO platforms provide another



Honeywell has amassed more than 100 million hours per model in testing and operations for their APU. This historical data forms an ideal platform for intelligent analytics. Honeywell image.



data stream for predictive maintenance. "Non-routines, removals / NFF / minimum equipment list (MEL)

occurrences and Operator Maintenance programs all enhance predictive data analytics," he says. "Analysing both the operational data from the sensors and the MRO data is key for high accuracy."

Due to the data now available from connected aircraft, Sander de Bree of Exsyn Aviation Solutions adds that operators can now go further than traditional maintenance and health data, to boost predictive and analytical capabilities. "Non-aircraft related data such as weather information and airport data are important data-sources to be used in predictive maintenance algorithms," he says. "These can be used to detect the impact of operational conditions (such as dry or humid operations) on component health. Additionally maintenance data from MRO's needs to be used to report back any failure data to an operator's prediction models."

Data platforms and advanced analytical

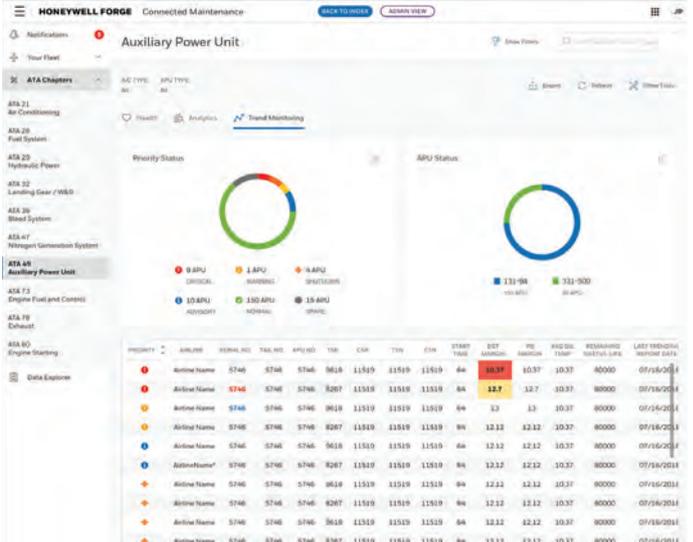
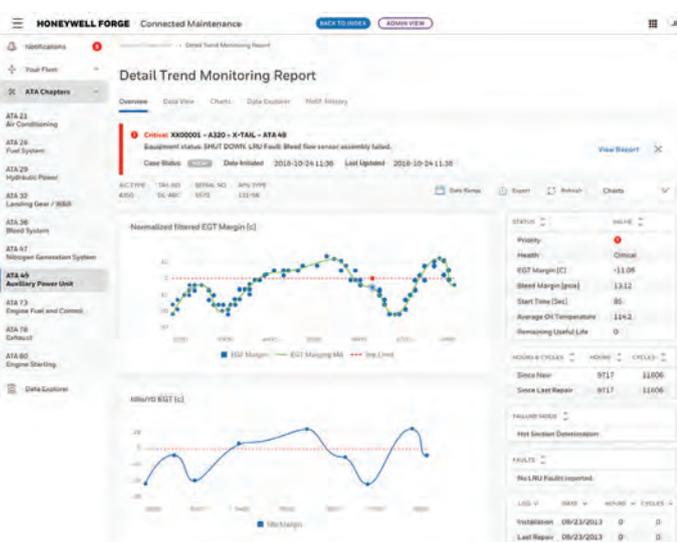
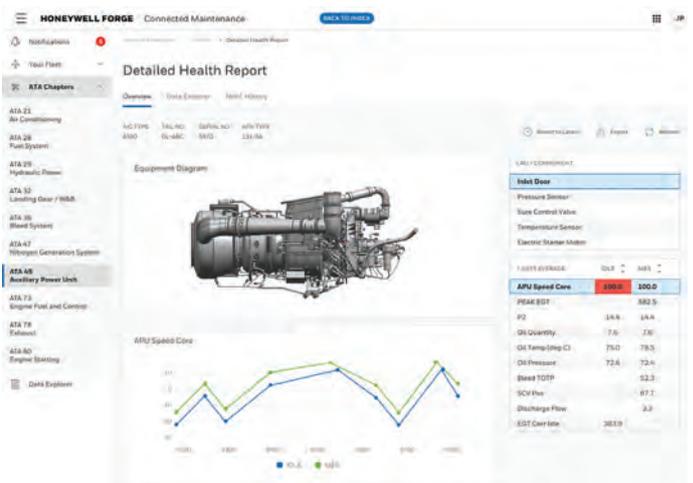
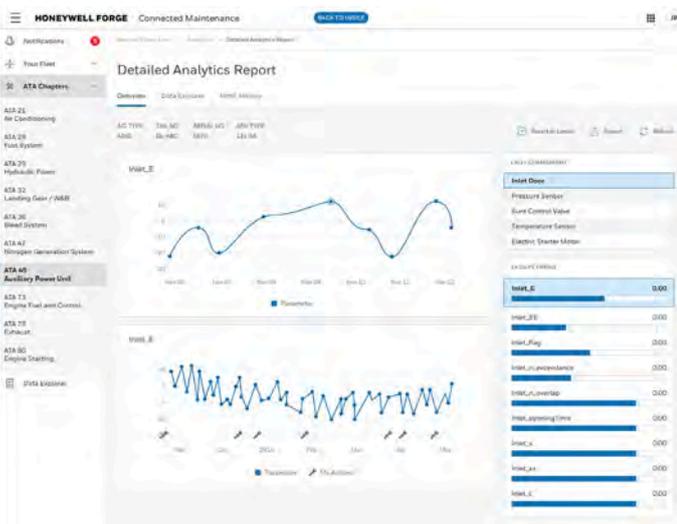


The predictive nature of this variety of analytics occurs by overlaying operational and historical aircraft data. Sander de Bree of EXSYN explains that this concept is different to preventative maintenance. EXSYN image.

capabilities aside, there is one digital tool that a growing number of operators use today: the electronic techlog (ETL). It was the implementation of this device for recording faults that gave rise to the potential for predictive maintenance to flourish. It is also the primary interface between operational and maintenance data; an area where data can become

disconnected.

"Data for predictive maintenance is critical, as there are so many areas in which it can be exploited—if it can be collected," explains Elliott. "Think about a paper technical logbook on the plane, which is only accessible by a single person at a time. Handwritten entries cannot be used in analytics, and cannot be mined for



The primary aim of predictive maintenance is to reduce operational disruptions by addressing potential issues before an actual fault occurs. Pictured are examples of the Honeywell Forge Connected Maintenance system. Honeywell images.

ULTRAMAIN ELB™

The Market Leading Electronic Logbook

Flight Deck • Cabin • Ground



ULTRAMAIN®

SimpleMobilePaperless

March 18-19, 2020 | Aerospace Tech Week | Toulouse | CONNECTED Aircraft Hall, Booth 407
April 28-30, 2020 | MRO Americas | Dallas | Booth 1749

www.ultramain.com
+1.505.828.9000



information.

"An electronic, connected logbook can be used by multiple people at the same time," continues Elliott. "A mechanic can see what faults are on the aircraft, and arrange for proper parts and tools for arrival at the aircraft. And, of course, that digital data can be aggregated and mined. The Internet of Things (IoT) will also help, with sensors being used to measure and collect data.

Digital twins are one industry development linked inherently to predictive maintenance, and applications of the technology are becoming more prevalent. For example GE has helped develop a digital twin for an aircraft's landing gear. "In this last scenario, sensors placed on typical landing gear failure points, such as hydraulic pressure and brake temperature, provide real-time data to help predict early malfunctions or diagnose the remaining lifecycle of the landing gear," adds Elliott.

Preventative vs. Predictive Maintenance

There are two core approaches to data-based maintenance, each geared towards different connected capabilities of aircraft or component. For instance, an A320 Classic aircraft will not transmit the same level of operational data as the A320neo; therefore maintenance strategies are different.

Preventative maintenance relies more on 'trend monitoring'; trying to prevent a fault from being flagged by a line maintenance

team by removing a component in the next scheduled maintenance event. The onus is less on the data being transmitted 'that minute', or the condition of a specific serial number, but rather taking an intelligent look at historical patterns across a fleet with that part installed, and determining based on age and hours or cycles when that part should be removed for inspection. But is preventative maintenance less dynamic or effective than predictive maintenance?

"Preventative maintenance is an age-based maintenance philosophy, not taking into account actual condition of systems & components," explains Sander de Bree, founder of EXSYN Aviation Solutions. "Predictive maintenance aims to use the actual calculated condition of components (based on operational usage) to serve as triggers for maintenance requirements."

"Effectiveness of the predictive maintenance (over preventative) lies in its ability to leverage the historical data alongside live operational data," explains Saran. "This is purely aided by the latest developments on processing the high volume of dynamic data feeds and analysing with sophisticated statistical tools. Because preventive maintenance relies only on historical data it is less effective." Moreover, the age-based approach often leads to parts being removed ahead of time; meaning 'wasted' time remaining on the part if not re-installed.

There are instances where preventative maintenance is more appropriate for operators. "It is a good option in the absence of insights into the actual condition

of a component/system," describes Melin. "But as those insights become available, moving from preventative to predictive can ensure that maintenance actions be prescribed to exactly what maintenance action is required to remedy the current issues and at the right time."

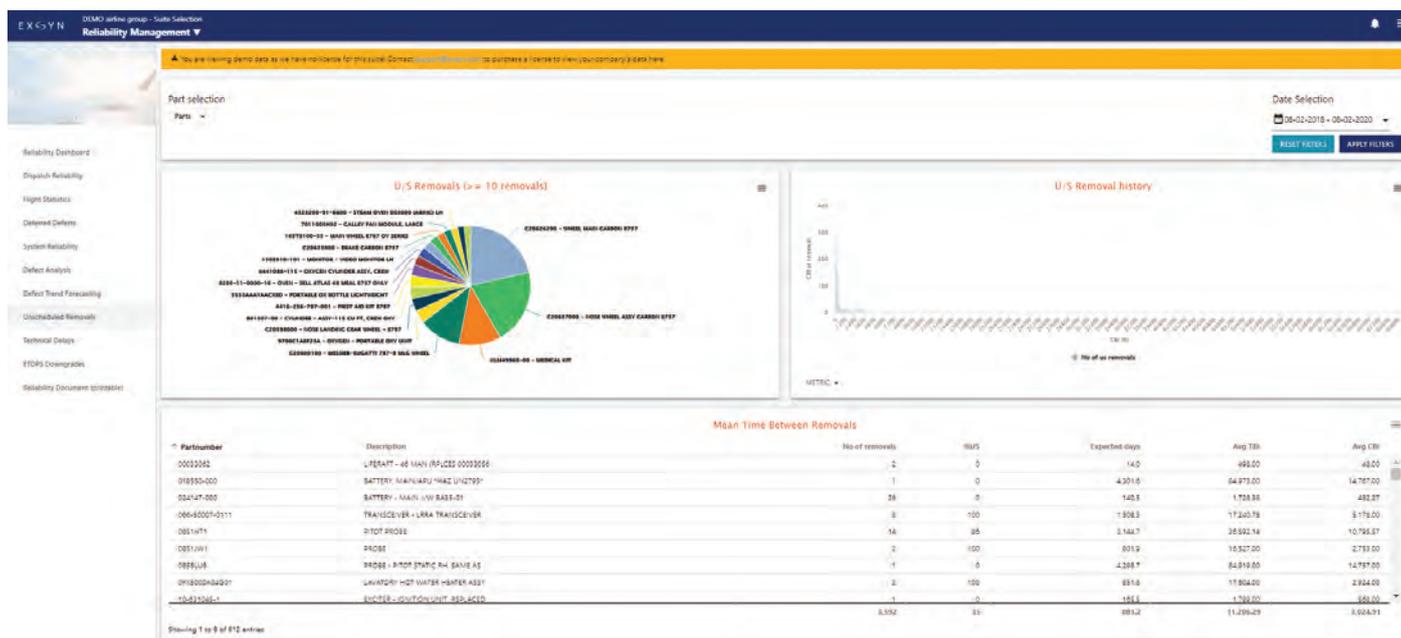
Data Hurdles in Maintenance

One of the main hurdles preventing operators from investing fully in predictive maintenance initiatives is the data itself – the completeness of it, and the ability to synch data from different sources, departments and formats.

Melin of Honeywell states two primary hurdles that preventing airlines realising predictive maintenance potential. "Some Airlines have a wait-and-see approach to data sharing. This is understandable but unless it's shared, it is difficult for a software provider to demonstrate potential," he explains. "Moreover, airlines' traditional decision-making processes are tough for the software, applications and platforms that can harness and interpret data."

"Airlines should be in full control of their operational data and be able to share it with their partners like MROs for example," elaborates Martens. "We doubt that the approach of certain OEMs to restrict operational data access and control will prevail, since all airlines have a strategic interest to control their data."

"Feedback from component shops on the actual health of components once removed from the aircraft based on



To unleash the true potential for predictive maintenance, various data hurdles must be overcome. Considerations pertain to efficient data mining, sharing and general ownership. Regardless, AI is now an essential tool for large-fleet commercial operators and aviation MRO providers alike. EXSYN image.

AMOS. AGAIN.



“AMOS, which is already used as a standard tool by many LH group airlines, will also help us at Lufthansa to make our Technical Fleet Management processes even more transparent and, above all, even more efficient. Among other things, we are relying on the already very broad AMOS know-how of our sister companies. We chose AMOS because of its 30 years of success in the industry, but also because of its continuous product innovations, which help us to establish state-of-the-art processes in Technical Fleet Management at Lufthansa as well.”

says CEO Lufthansa German Airlines
Hub Frankfurt

Lufthansa and Lufthansa Cargo take off with AMOS, the world-class M&E software solution.

Both carriers will implement AMOS including AMOSmobile, enabling paperless maintenance operations from the beginning.

The close cooperation of the Lufthansa group members will be further promoted by AMOScentral, which enables the exchange of data between AMOS instances while nevertheless allowing each group member to keep control over their individual AMOS environments.



prediction models is another hurdle,” adds de Bree.

“This information is not readily available to airlines

either because they are in a parts pool programme, or have components contracts based on time on wing (power by the hour). For the latter, there is an economical incentive to classify parts removed based on predictions as no-fault-found (NFF).

After all, the part did not fail on wing ‘yet’.

“Also, many airlines are looking into predictive maintenance; some with OEM’s, some independently. Currently it seems a race for the best possible algorithm and platform, meaning each initiative is siloed. To make predictive maintenance work we need OEMs & local CAA’s to approve changes to the MPD, airlines to make available operational data, MRO’s to make available maintenance records and solution providers to provide algorithms and calculations,” says de Bree.

Data Platforms & Infrastructure

One way to connect data from different applications and departments is via a data platform; a repository that can exchange information between applications and systems – for instance between an ETL and an operator’s M&E system. “The most data-driven often work with a provider that can cover their entire fleet,” says Melin, “which for many airlines consists of multiple aircraft types from multiple aircraft OEMs.”

“The responsibility for the maintenance of an airline is of the operator and its CAMO and not the OEM’s expertise,” explains Martens. “More airlines realise the potential of digital solutions and the requirement to adapt these solutions to the specific needs of their fleet and operations. Open digital platforms like AVIATAR enable operators to provide digital interfaces to MRO’s and other players in the market, who help them in maintaining their fleet.”

Elliott explains that airlines are starting to work on their own data platforms to get in on the benefits of sharing engineering data. These platforms were initially pioneered by airframe and engine original equipment manufacturer (OEMs) in order to support OEM-developed applications that are often chosen when operators order new aircraft types. Furthermore, OEM platforms benefit from having access to global customer data, thereby bolstering their analytical data provisions. “Airbus launched its cloud-based data platform, Skywise, in 2017 which collects data such as work orders, spares consumption and flight schedules from multiple sources across the industry for MRO operators to perform predictive and

preventative maintenance. Early adopters included easyJet, Air Asia, Emirates and Delta Airlines, all of which are using the platform for predictive maintenance,” says Elliott.

Not all data is so readily available. “Sensor data from aircraft is still “locked-up” with the OEM’s as it mostly uses OEM IP in order to be decoded,” highlights de Bree. “You do see independent flight data acquisition avionics becoming available to work around this issue.”

According to Ramco, an M&E MRO system provides the foundational block to support predictive maintenance capabilities. “With the recent advancement on data processing power and ability to store TB of data, the key challenge is agility to connect to the external eco systems and leverage with inhouse data for prediction,” adds Saran. “API based protocol is essential for the organization to achieve software collaboration and encourage data sharing.”

“The number of airlines using the latest big data solutions is limited but growing fast,” adds Martens. “Many airlines are looking at the solutions, but the offerings of real predictive maintenance are limited. Many offerings just provide digital results without direct connection to maintenance actions. Connecting a data platform such as AVIATAR with different M&E System vendors like AMOS or TRAX and other airline IT providers such as Netline help to create the necessary solution.”

Data Transmission

Much of the data required for predictive maintenance suggests a high level of data transmission; but to what extent does this need to be performed in-flight, which incurs a great cost? “Data synchronized in flight is mainly linked to EHM/AHM parameters or ACARS data and contain fault messages once a situation has already occurred,” explains de Bree. For instance, while LHT’s AVIATAR ingests data from multiple data sources in-flight and on the ground; the extent of this is defined by the operator. Engines and other components can send data via aircraft interfaces. “In many cases data such as fault messages is sent via ACARS in flight and Wifi/GSM on the ground, but this is up to the airline to define it, based on requirements,” says Martens. “For engineers it can be very helpful to receive these while the aircraft is in flight, since manpower, tools and spare parts can be ordered ahead of landing. This helps operators to save costs by avoiding AOGs (aircraft-on-ground).”

In general, airlines transmit the bulk of their data once on the ground, saving cost. “Honeywell Forge Connected Maintenance

has been able to predict component failures days and weeks in advance,” says Melin. “The process of detecting an impending failure and alerting the relevant maintenance engineers can be automated. Typically, the process of then deciding when to complete that maintenance action and submitting the work order is still manual so that the airline can remain in control of that final decision.” Airlines can reduce operational disruptions with the current generation of systems, transmitting data on the ground. Honeywell believes that in future there will be a shift towards transmission of a subset of key data during flights, utilizing existing satcom connectivity, in order predict a wider set of ATA chapters with high accuracy.

The ETL can provide the means to notify of faults in flight. “An effective ETL allows pilots to communicate with the whole team involved in flying an aircraft on the day of operations—spanning mechanics, maintenance control centres, engineers and more,” continues Elliott. “Once a pilot is flying, if they encounter any problems, they can log the fault in the electronic technical logbook app. On aircraft with in-flight internet connectivity the maintenance organization will receive a push notification in real time outlining the fault and start preparing work orders and parts, so they are ready to address it the moment the aircraft lands. From a more preventative perspective, on aircraft without in-flight connectivity, an electronic technical logbook can push updates to the maintenance department when the aircraft lands.”

IFS’s customer, China Airlines, has been utilising IFS Maintenix to optimize data sharing of real-time management of line and heavy maintenance events, as well as data capture at the point of maintenance across the airline and its subsidiaries. This included expanding third-party MRO services for the airline’s customers. “In addition to reducing operating costs by \$3.5 million, IFS Maintenix has helped China Airlines significantly decrease its aircraft layover due to more efficient scheduled and unscheduled line maintenance,” adds Elliott. “This means that its aircraft spend more time in the air and less time in the hangar.”

“While real-time data transmission in-air is a benefit for EHM/AHM fault messages, for predictive maintenance trend calculations an offline datafeed is sufficient,” agrees de Bree. “In terms of wider infrastructure, server capacity is going to be critical to ensure timely processing of data and visualizing outcomes. As an airline you don’t want to wait 4 hours for a calculation to finish prior to giving indications on component condition.”

Can you imagine the future is now?



Open. Modular. Neutral.

AVIATAR is the only operator-focused aviation platform developed with the knowledge and experience of leading airlines and MROs. The independent and fast-growing platform provides digital products and services through a wide range of applications – tailored precisely to your needs. Manage complex operations, increase aircraft availability, improve efficiency, save costs – all in one digital TechOps platform. Become part of a strong community and join us in shaping the future of aviation.

GET IN TOUCH.

E-mail: info@aviatar.com
www.aviatar.com
www.lufthansa-technik.com



AVIATAR
by Lufthansa Technik



Unnecessary Part Removal

Removing parts if a fault arises is the traditional business model of the industry, and reactive rather than proactive.

An issue of predictive maintenance lies in the clinical and rigid nature of data if intelligent parameters aren't built in; we run the risk of incorrect forecasts and erroneous 'fault' messages. For instance, if an operator forecasts that a component will fail within 200 hours, based on historical behaviour, it might schedule removal to prevent failure in operation. However, upon removal the part tests no fault found (NFF), costing unnecessary time and money for the operator.

How do we prevent parts being taken off for testing, only to be NFF? And is there risk of oversensitive data, causing unnecessary time off wing for testing? "No algorithm can be 100% reliable," says de Bree. "The key is feeding back MRO shop data of actual components removed based on prediction models. This is the only real evidence if a failure of that component was imminent. Feeding back such data will make models more reliable."

"Parts pre-emptively removed need to undergo longer troubleshooting time due to non -availability of fault code or maintenance findings," says Saran of Ramco. "High sensitivity on the Part removals and longer turnaround time (TAT) will also lead to increased investment in float for airlines. The sensitivity can only be reduced over the time by a continuous closed loop data flow on maintenance findings on the removed part back into the prediction algorithms. It is also imperative that parts are sent to shops with the data leading the predicted fault which reduces the troubleshooting and turnaround time."

"Ultimately, condition-based removal avoids costly AOGs, improves the fleet's reliability and ensures high rates of passenger satisfaction," counters Martens. "If MRO providers don't know the predictive reason of the removal, it may lead to NFF, but the operator will save on operational cost. An AOG at the wrong location can cost more than €100,000."

"There are several examples where predictors are used successfully. The parameter of these parts are continuously tracked and analyzed, resulting in a trigger/information when the fill level/temperature/pressure parameters start to shift without causing a real aircraft failure. This helps us to change or service these parts preventively to avoid AOGs. Very often the work order can be transferred automatically

into the maintenance information system," adds Martens.

According to IFS, Rolls-Royce has disclosed high expectations for the accuracy of its own predictive analytics strategy. The OEM targets a 100 percent success rate in terms of ensuring they never miss something they are looking for, at the same time as zero false predictions including NFFs.

Predictive Maintenance vs. MSG-3

What effect might predictive maintenance have on scheduled maintenance? For instance, will airlines that maximise its potential still follow an MSG-lead maintenance programme? Or will we see an evolution away from this and scheduled shop visits? "Going forward condition-based maintenance will be used more often, but requires close collaboration between the authorities, operators, MROs and OEMs," says Martens. "Predictive maintenance should result in less unscheduled, high priority repairs and eventually, we can make many checks obsolete because we calculate figures and probabilities per system which previously were checked manually."

"Ultimately this might become a new maintenance standard, however no airline today is allowed by CAA regulation to deviate by themselves from the (MSG-based) approved maintenance program and OEM MPD," explains de Bree. "As long as these are still leading, predictive maintenance initiatives can only impact on-condition components of an aircraft."

"In the next few years, predictive maintenance can eliminate airline determined soft time maintenance intervals in order to optimize costs and efficiencies, however, it is less likely that predictive maintenance would be a substitute for hard time service requirements," says Melin at Honeywell. "Ultimately, the change in maintenance practices must be spearheaded by airlines maintenance teams."

Rolls-Royce is pioneering the concept of an adaptive and evolving maintenance programme, that can effectively go a step further than MSG-3 logic. In 2019 IFS partnered with the OEM to support its data exchange program with airline customers operating the Trent Engine family.

"The IFS Maintenix Aviation Analytics capability enables the automated provision of field data, which ensures that Rolls-Royce receives timely and accurate information on its Trent 1000, Trent XWB and Trent 7000 engines," explains Elliott. "IFS Maintenix then acts as a gateway to automatically push maintenance program changes from Rolls-Royce back to the airline operators.

As a result, life-limited engine part maintenance deadlines can be updated based on actual operating conditions and life consumed by each engine in use."

Artificial Intelligence (AI)

AI is increasingly referred in conjunction with predictive maintenance. "The use of AI revolves around algorithms being used for predictive calculations to become more reliable over time by themselves," explains de Bree. "It allows systems to detect possible failures to monitor purely based on data supplied without any relation between parameters and component failure being known," explains de Bree.

"AI is a valuable tool for analytics, along with machine learning and neural networks," says Melin of Honeywell. "AI can be used to determine the state of a system (how it operates in given conditions) and then detect anomalies through time series data which can then be used to predict remaining life and recommend mitigation strategies. AI is different from the historically human-based maintenance systems in that it enables integration of contextual data as well as behavioural parameters of assets."

In addition while AI can be used in predicting the item removal through predictive maintenance, it is also expected that it can offer additional services to increase the intelligence of the predictive maintenance solution, Saran of Ramco explains. "For instance, AI might also assist an M&E systems in suggesting part replacement options and other parts which might also be needed in replacement, therefore streamlining maintenance downtime. The confluence of Predictive maintenance, AI and Big data drives maximum benefit."

For large-fleet commercial operators and aviation MRO providers alike, AI is now an essential tool. "Recent examples of airlines such as Delta, and MROs such as Lufthansa Industry Solutions working on adopting AI and machine learning (ML) into their aircraft maintenance strategies highlight the transition organizations are already making towards digital and predictive-focused maintenance strategies," continues Elliott. "The reduced maintenance technician and engineering labour hours spent analysing data makes intelligent maintenance strategies particularly desirable."

Want to learn more? Several presentations will take a deeper dive into predictive maintenance at Aerospace Tech Week. See page 43 for the full Show Guide. **ATR**

AEROSPACE TechWeek.com

18/19 Mar 2020 | Toulouse, France

6  EVENTS UNDER 1 ROOF

GET THE EVENT APP



AerospaceTechWeek.com/APP

2020 OFFICIAL SHOW GUIDE



AIRBUS



inmarsat
aviation



**Collins
Aerospace**

COBHAM

BOEING



Green Hills
SOFTWARE



Honeywell

RAPITA Systems

Great River
Technology

18 MARCH
CMC
Electronics

19 MARCH
AMC
iCare AMS

PRESAGIS
HMI Development

PARASOFT
Automated Software Testing

SPONSORS AND SUPPORTERS

Aerospace Technology Week wish to thank the following sponsors and supporters:



AIRBUS



Connected AIRCRAFT





























18 MARCH







19 MARCH















SUPPORTING ORGANISATIONS

















MEDIA PARTNERS



































FLAGSHIP MEDIA PARTNER



WELCOME TO AEROSPACE TECH WEEK 2020



Dear Attendee,

Welcome to Toulouse, home of AIRBUS our Platinum Sponsors and one of the biggest aerospace clusters in the WORLD!

THANK YOU for coming despite the fears surrounding the GLOBAL outbreak of COVID 19, especially when it is clear that so many people would have been deterred from attending or even prohibited by travel restrictions. We are very GRATEFUL that you chose to conduct business as usual. It's also testament to the fact the Aerospace Industry does need a niche quality platform like this where you can discuss, learn and network with people within the core synergistic sectors we cover.

We are taking all the precautions we can to make sure this is a SAFE platform to do business. Therefore, I'd like to highlight the following measures:

- **SANITIZERS** – You will have been given hand sanitizers, sponsored by Great River Technology, as I'm sure you are aware by now this is the first line of defence against the virus.
- **PERSONAL SPACE** – It is recommended to minimise ultra close contact (less than a metre) so we are spacing the conference chairs out and advise leaving an empty seat next to you in the conference rooms. We are therefore also NOT allowing standing room in the conference rooms.
- **HANDSHAKING** – For the same reasons it is advised that you do NOT shake hands and even kiss (even though we ARE in Europe).
- **EXCHANGING BUSINESS CARDS** – you can use our APP to scan anyone's badge, so you do not have to physically exchange business cards.

With over 7 conferences taking place and more than 100 speakers do make sure you DOWNLOAD the new EVENT APP, sponsored by Rapita, that gives you the very latest timings and rooms etc., as again, due to the disruption caused by COVID 19, there are inevitable changes since this physical guide was published.

I hope you have a productive trip and hope to see you next year when we return to Munich, GERMANY on 23/24th March 2021.

Regards and stay safe,

Adrian Broadbent, CEO/Owner
+44 (20) 3892 3051 | abroadbent@aerospace-media.com



CONTACTS

Neil Walker
Conference / Marketing Director
+44 (0) 7725 318601
neilw@aerospace-media.com

Paula Calderon
Operations Director
+34 91 623 79 69
pcalderon@aerospace-media.com

Simon Barker
Publisher & Sales Director
+44 (0) 203 892 3053
sbarker@aerospace-media.com

Amanda Kevan
Sales Director – AVIONICS/FACE
+44 (20) 3892 3057
akevan@aerospace-media.com

Jo Pembroke
Sales – AEROSPACE TESTING
+44 (0) 203 892 3054
jpembroke@aerospace-media.com

CONTENTS

Conference Agenda	46	MRO IT Conference Programme	54	Workshops Programme	62
Conference Advisory Committees	48	Flight Ops IT Conference Programme	56	Sponsors & Supporters	64
Networking Reception	49	Aerospace Testing Conference Programme	58	Exhibition	65
Avionics Conference Programme	50	Certified Training	61	Registered Airlines	91
Connected Aircraft Conference Programme	52			Floor Map	92

CONFERENCE AGENDA

	Avionics Room: Hemicycle	CONNECTED aircraft Room: Salle Pastel 1	Flight Ops IT Room: Salle Lauragais 2
Wednesday 18th March			
9am	JOINT OPENING KEYNOTE Audi		
10.30am	Networking Coffee Break		
11am	Mandates and Regulatory Framework Updates Enhanced safety and communications between the aircraft in the sky and the ground control continue to dominate the industry as technology becomes and increasing driver. What's the latest regulations and how are regulators and mandates impacting on the industry? What needs to be installed in the aircraft to meet these mandates and what is the impact on avionics for operators?	The Connected Aircraft Revolution: Increasing the Benefits of Connectivity With technology developing at a rapid rate, what do we now mean by the 'Connected Aircraft'? A truly Connected Aircraft becomes a great business enabler and offers airlines and the broader industry great benefits and opportunities. What are these and how can we deliver enhanced services and solutions for a more integrated aerospace world?	The Business Case and Use Case for Flight Ops IT A well-established use case motivates airlines to investigate new Flight Ops technologies, while the business case quantifies these benefits and encourages investment. This session addresses the 'combined business case'; that is, the importance of partnerships between airline departments in addition to third party providers. An IT support team's role in realising potentials is also addressed.
12.30pm	Delegate Networking Lunch		
2pm	CNS Updates What are the latest developments and trends in Communication, Navigation and Surveillance surveillance and flight tracking to mitigate these possibilities. How can we optimise infrastructure and how can enhanced surveillance contribute towards safety and security? What is safety services approved? How do we make positioning more robust with hybridisation? How do we transition from SES to the next systems using the EASA framework?	Connectivity, Communications and Technology For the Connected Aircraft, communications systems are key, but each offer different benefits and solutions. What you can do with satcom, LEO, L and Ku Bands? What type of system is best for different communications such as traffic, ACARS messages, safety services and non-safety services?	EFB Operational Use & Regulations The Electronic Flight Bag (EFB) has been in operational use for some time, however implementation and use is closely regulated. The regulatory framework is summarised, and benefits analysed via real use cases. Maximising the use of the EFB requires integration of various data sources, and subsequent training for Flight Crews on effective use of these technologies. Explore key considerations here.
3.30pm	Networking Coffee Break		
4.00pm	Connectivity, Architecture and Cybersecurity As the aircraft becomes more integrated and connected, security and safety concerns are becoming heightened. What are the challenges with connected FMS and what are cyber security implications of IMA? How do we ensure safety and security with the increasing use of multicore processors?	Application and benefits of Connectivity What are the applications of connectivity and how do these most benefit airlines/operators and the supporting supply chain? Here we explore case studies of connectivity applications.	Additional Operational Drivers When one considers Flight Ops IT, the EFB is a leading factor. Yet there is a wealth of additional benefits on offer other than fuel savings and efficient route planning; process efficiencies and greater operational reliability are recognised here. To define these wider operational drivers, real-time data, weather 'nowcasts', and ground handling / line maintenance efficiencies are explored, combined with an appreciation of Flight Ops IT in the overall enhancement of Flight Safety.
5.30pm	Networking Reception		
Thursday 19th March			
9am	Data, usage of data, trends and monitoring Avionics needs to analyse more and more different types of data rates – data which is difficult to treat with single protocol/architecture, causing major under or over use of bandwidth. How can new services and applications be better supported? What is the Data Value Chain and benefit of data sourcing (collected by airlines)?	The Impact of the Connected Aircraft on ATM What services can be expected from ATM and what is the value chain of connectivity? Where can the connected aircraft contribute to the wider chain and how can it impact on other operations within the 4 As?	Data – Standardisation, Management and Analysis An airline's ability to ingest and analyse flight data efficiently, then filter effectively to pilots via a suite of EFB applications is complex but of key importance. Interfacing different applications to communicate and process data is one aspect, while assimilating various data standards, codes and formats from a mixed fleet of aircraft is another. Learn from the experiences of airlines, OEMs and software providers.
10.30am	Networking Coffee Break		
11am	Challenges for Avionics in the Environment The impact of the aviation industry has been in the spotlight for its adverse impact on the environment, yet huge strides have been made to reduce the environmental impact of aircraft. What are technical capabilities for environmental challenges, how do we decrease emissions and what is the CO ₂ limitation challenge? What is impact of given technology of environment (at different stages of flight) and what realistic role can electrical power play?	Aircraft Data management solutions and Cyber security As data becomes more prolific and more 'valuable' to an organisation, how do we control this flow of information and who 'owns' the data? As processing data offline becomes more economical, what are data limitations, how do we value data and share just required data and ensure its security?	Innovations Development and progression are vital aspects of technology. Join this session to see what is evolving to benefit flight operations, and what innovations can / will extract additional value for airlines. The capabilities offered by new and emerging aircraft types are discussed, in addition to an exploration of what other industries are doing and how this might inspire aviation's own technological endeavours.
12.30pm	Delegate Networking Lunch		
2pm	Innovations in the Industry With more research and investment being applied in urban mobility, single pilot operations and autonomous systems, what does the future hold and what part will avionics have to play? How do we develop standards for use of AI and machine learning and what impact will autonomy have on the pilot and passenger?	Future of Connectivity and Satcom (Funky Future Stuff!) What could be done in the future with connectivity? With giant leaps in technological development, what is possible, how can AI and machine learning benefit safety and security? What are other industries doing with connectivity that could be applicable to the aerospace industry?	Joint Panel Discussion: Conflict between Flight Ops How can MRO IT and Flight Ops IT best work together times? With the advent of paperless aviation, where do can the supply chain best support the airlines to ensure
4.00pm	Conference Close		

MRO IT Room: Salle Lauragais 1

AEROSPACE testing Room: Salon D'Honneur

CERTIFIED TRAINING

torium

Creating a value case – the business proposition – ROI Significant investment in IT/technology is required to ensure successful digitalisation of systems, often with ROI not immediately visible. How do we create a value case for new mobile application of new systems and to help transform maintenance, increase productivity and efficiencies?	Urban Air Mobility, EVTOLS and UAVs The concept of Urban Air Mobility is rapidly developing, but with little in terms of regulations and understanding the impact on the airspace – what do we have to test for if we have hundreds in the sky? What are the requirements, how do we appropriately test a crash, what about acoustic emissions tests, how to test without autorotation, what about detect and avoid? In this session we discuss some of the requirements and implications.	Introduction to the Emerging & Required DO-326/ED-202-Set: Aviation-Cyber-Security Regulation for Safety Optimizing DO-178C/DO-254 Avionics Software & Hardware Development Guidelines
The ETL, and other Regulatory Considerations for MRO IT The electronic techlog (ETL) is an important tool in digital maintenance. But what regulatory considerations are there, and what are the implications for safety management? Key compliance and approval requirements are explored.	Complex and Embedded Systems With systems becoming more complex and the integration of systems of systems, greater use of multicore processors, how can we ensure testing and certification integrity? What are the issues with GPUs and GPGPUs with no current regulatory guidance? How can we test blockchain authentication to identify corruption? In this session we investigate the challenges in testing and caliation of complex and embedded systems.	
Business modelling and Risk modelling Technology and data being used for predictive maintenance provides many challenges. Why is predictive maintenance important, but what are the risks involved and how can this affect the business model and supply chain?	High level integration and testing Where systems are becoming more complex, how to we successfully achieve high level testing and testing of systems at multiple levels. How can we test the integration of COTS components (especially those from other industries) for safety and efficiency. What's the impact on multicore, digital twins and digital manufacturing, and what role can predictive maintenance play? How do we employ measures to ensure data security and integrity?	
Enhancing MRO efficiencies via emerging technologies As technologies advance at rapid pace, how do airlines best take advantage and ensure technology gets into the production environment? How can we successfully and safely implement newer generations of mobile technology, software in legacy systems and paperless systems? What should the long term digital strategy look like?	Space, High Altitude & EMC Testing What are the challenges in Space, High Altitude & EMC Testing and the impact on testing of critical components? What are the results of ageing and obsolescence? How and what do we test for single event or mutli event effects? How and for what can we test smaller components miniaturised for space?	
Data, Analytics & Cyber Security Big data provides the potential to facilitate maintenance planning and predictive maintenance, and the opportunity to optimise decisions, but how do we best achieve this? What role can machine learning and digital twins play? What is our ability to maximise the use of data and how do we ensure data transfer/delivery is secure?	Electrification, Aerostructures, Materials With more new materials in aerostructures, new processes are required to successfully test from birth to death. How do we standardise testing for 3D printing, conductive inks, graphine, ALM for temperature, pressure, loads, corrossion, reliability, obsolence or robustness? Electrification brings new power supply issues, providing potential problems for avionics. How can electrification develop reliable tests of electrical systems?	Model Based Development (MBD) Techniques & DO-331 application for Aviation Software Development: moving from Documents to Models Applying the New Mandatory Aviation Systems/ Safety Regulations: ARP4754A (with ARP4761/A) The Emerging & Required DO-326/ED-202-Set Essentials: The Airworthiness Security Process, Methods & Considerations
and Maintenance – able bedfellows! r for maximum efficiency and minimise turnaround oe TechLogs, EFBs and CabinLogs converge and how e complex decisions are made easier?	The Future of Testing With Machine Learnign and AI the current buzz for the future of the aerospace industry, how do we approach designing and testing for automation? How do we identify what to test and to what standards, how do we ensure safety of systems and how to test new processes such as transition from automation to pilot and vice versa? In this session we take a look at what the future of testing holds.	

REGISTRATION HOURS

Tuesday 17th March
2:00pm – 5:00pm

Wednesday 18th March
8:00am – 7:00pm

Thursday 19th March
8:00am – 5:00pm

*(Registration closes
30 minutes prior to
exhibition hall closing)*

EXHIBITION OPENING HOURS

Wednesday 18th March
10:30am – 7:30pm

Thursday 19th March
9.30am – 5.30pm

GET THE EVENT APP



[AerospaceTechWeek.com/APP](https://www.aerospacetechnology.com/APP)

CONFERENCE ADVISORY COMMITTEES

Aerospace Tech Week would like to thank the following representatives for providing their valuable time and contribution towards delivering these excellent conference programmes.



AVIONICS

Thierry Harquin, Airbus
Christian Schleifer, EUROCAE
Peter Green, EUROCONTROL
Darren L'Heureux, Honeywell
Bob Darby, IET
Philippe Lievin, Collins Aerospace
Marouan Chida, SESAR JU
Murray Skelton, Teledyne Controls
Marc Gatti, Thales Avionics SAS
Mirko Jakovljevic, TTTech
Alex Wilson, Wind River
John McHale, Avionics Design / Military Embedded Systems
Woodrow Bellamy, Avionics Magazine
Vance Hilderman, Afuzion
John Warther, Green Hills Software
Jacques Gatard



Flight Ops IT

Rene de Vogel, Boeing
Warren Lampitt, Air Canada
Marina Schwimmer, Flatirons Solutions
Diogenis Papiomytis, Frost & Sullivan
Philippe Lievin, Collins Aerospace
Martin Lubormirov Mitev, airBaltic



CONNECTED AIRCRAFT

Henk Hof, EUROCONTROL
Philippe Lievin, Collins Aerospace
Murray Skelton, Teledyne Controls
John Bradshaw, Honeywell Aerospace
Woodrow Bellamy, Avionics Magazine
Chris Bigwood, Honeywell
Mark ter Hove, Cobham SATCOM
Alex Holt, Cobham SATCOM
Anthony Spouncer, Inmarsat
Steve Bogie, Air Canada
Jean-Marie Begis, Esterline Avionics Systems
David Okrent, Boeing
Samy Mahdi
Mark Aizlewood, Easyjet
Euan Mitchell, SITAONAIR



MRO IT

Paul Boyd, Conduce
Nick Godwin, Commsoft
Adrian Ionascu, Blue Air
Sander de Bree, EXSYN Aviation Solutions
Hugh Revie, Ubisense
Marina Schwimmer, Flatirons Solutions
Matt Tobin, IFS
Fabian Hoehner, Lokad



AEROSPACE TESTING

Doug Ullah, AIM UK
Matthew Jackson, Presagis
John McHale, Avionics Design / Military Embedded Systems
Mirko Jakovljevic, TTTech
Paul Hart, Curtiss-Wright Controls Avionics & Electronics
Joy Finnegan, Aviation Maintenance Magazine
Albert Ramirez Perez, Rohde & Schwarz
Jacques Gatard

Want to Be a Part of this Great Conference?

Aerospace Tech Week delivers an exciting and relevant conference agenda due to the valuable contribution of its industry experts on the Conference Committees.

We are always looking for new members of these Conference Committees, who can contribute and enhance the content of these exciting conference programmes, making them more relevant to the aerospace industry.

If you are interested in getting more involved and able to provide your contribution with a growing depth and understanding to one of these committees, please contact Neil Walker, Conference Director, at neilw@aerospace-media.com, who will be delighted to have a discussion with you.

NETWORKING RECEPTION

SPONSORED BY

Honeywell



Wednesday 18th March 2020

5.30pm-7.30pm | Exhibition Floor

FREE TO ATTEND

We look forward to welcoming you.

Next Steps in Integration and Implementation for SESAR and Next-Gen

EU and US collaboration in SESAR and Next-Gen aims to harmonise and secure Air Traffic Management (ATM) modernisation efforts as drivers of and in support of the International Civil Aviation Organisation (ICAO) Global Air Navigation Plan (GANP) with the Aviation System Block Upgrade (ASBU) programme.

Both SESAR and Next-Gen recognise the need to integrate the air and ground parts of their air traffic management systems by addressing efficiency needs of flight trajectories planning and execution and the seamless sharing of accurate information.

This framework provides a vehicle for the US and Europe to work together towards interoperable standards and in support of efforts towards achievement of ICAO global Harmonisation. For example, a significant achievement in the NextGen and SESAR collaboration is the delivery of an agreed-upon baseline NextGen/SESAR Joint Avionics Roadmap.

ICAO estimates that 120 billion US dollars will be spent on air transportation systems transformation in the next 10 years. While the NextGen and SESAR modernisation programmes account for a large share of this spending in Europe and the US, there are parallel investment initiatives in other regions.

CONFERENCE PROGRAMME

WEDNESDAY 18TH MARCH | Hemicycle

9am Joint Opening Keynote

Chair: Woodrow Bellamy, Editor, Avionics Magazine

Remi Maillard, Senior Vice President, Airbus Services

Joel Otto, Head of Connected & Digital Strategy, Collins Aerospace

Bruno Stoufflet, Chief Technology Officer, Dassault Aviation

Yann Barbaux, CEO, Aerospace Valley

10.30am-11am Coffee Break

11am-12.30pm Session 1

Mandates and Regulatory Framework Updates

Enhanced safety and communications between the aircraft in the sky and the ground control continue to dominate the industry as technology becomes an increasing driver. What's the latest regulations and how are regulators and mandates impacting on the industry? What needs to be installed in the aircraft to meet these mandates and what is the impact on avionics for operators?

Chair: Luc Deneufchatel, EUROCAE

PCP and Connection with SES – Senior Representative, SESAR Deployment Manager

Mandates and Regulatory Framework Updates – Impact on ANSPs – Andrea Gartemann, Senior Expert EU Regulations, DFS Deutsche Flugsicherung GmbH

ADSB and Datalink Services - where do mandates and regulations need to go, from mandate to operational framework - Achim Baumann, A4E

GADSS – The Next Steps – Henk Hof, Head of ICAO and Concept Unit, EUROCONTROL

Meeting GADSS Autonomous Distress Tracking Requirements with Distress Tracking ELT – Emmanuel Sicsik-Pare, Strategic Product Manager, OROLIA

12.30pm-2pm Lunch Break

2pm-3.30pm Session 2

CNS Updates

What are the latest developments and trends in Communication, Navigation and Surveillance surveillance and flight tracking to mitigate these possibilities. How can we optimise infrastructure and how can enhanced surveillance contribute towards safety and security? What is safety services approved? How do we make positioning more robust with hybridisation? How do we transition from SES to the next systems using the EASA framework?

Chair: Philippe Lievin, Collins Aerospace

Trends in Navigation (GNSS (incl. SBAS,GBAS), DME/DME) – Senior Representative, EUROCONTROL

Trends in the Surveillance Domain – Jean-Marc Loscos (DSNA, Chair of the CANSO Technical TF)

ADS-B In – Sabine Vieyres, Cockpit Operations – Engineering, Airbus & Pierre Nieradka, Cockpit Engineering, Airbus

Data Link Service Status and Concerns – Manfred Mohr, Assistant Director SESAR, IATA

Trends in Communication (VHF/HF satcoms, datalinks, cellular) – Stephane Pelleschi, Principal Systems Engineer, Collins Aerospace

3.30pm-4pm Coffee Break

4pm-5.30pm Session 3

Connectivity, Architecture and Cybersecurity

As the aircraft becomes more integrated and connected, security and safety concerns are becoming heightened. What are the challenges with connected FMS and what are cyber security implications of IMA? How do we ensure safety and security with the increasing use of multicore processors?

Chair: Marc Gatti, Thales Avionics

Connected FMS – Senior Representative, Honeywell

Blockchain and AI in Aviation - Sergio Ruiz, EUROCONTROL

DO-326/ED-202A: Where Now for Reusable Software Components – Ehsan Salehi, Field Application Manager, LDRA

Cyber Security Implications of Integrated Modular Avionics – Noam Menscher, Head of Aviation R&D, Argus Cyber Security

Title TBC – Sean Reilly, VP Business Development, GE Aviation / Avionics

5.30pm Networking Reception

THURSDAY 19TH MARCH MARCH | Hemicycle

9:00am Session 4

Data, Usage of Data, Trends and Monitoring

Avionics needs to analyse more and more different types of data rates – data which is difficult to treat with single protocol/architecture, causing major under or over use of bandwidth. How can new services and applications be better supported? What is the Data Value Chain and benefit of data sourcing (collected by airlines)?

Chair John McHale, Avionics Design

Data Link Applications Supporting AIS and Meteorological Data (New Services) – Boris Resnick, Deputy Chief Designer, IANS Inc., Russia (WG76, EUROCAE)

End to End Data Extraction and Usage – View from an Engine Manufacturer – Senior Representative, Pratt & Whitney

Data Value Chain – Usage of Met Data Derived from Aircraft by Met Office – Bruno Piguet, Météo France

Title TBC – Willie Cecil, Director, Sales & Service, Teledyne

10.30am-11am Coffee Break

11am-12.30pm Session 5

Challenges for Avionics in the Environment

The impact of the aviation industry has been in the spotlight for its adverse impact on the environment, yet huge strides have been made to reduce the environmental impact of aircraft. What are technical capabilities for environmental challenges, how do we decrease emissions and what is the CO2 limitation challenge? What is impact of given technology of environment (at different stages of flight) and what realistic role can electrical power play?

Chair: Alex Wilson, Wind River

General Framework on CO2 Limitations Perspective/ICAO Protocol – David Marsh or Andrew Watt, EUROCONTROL

UAS Traffic Management (UTM) and Impact on Environment – Marouan Chida, SESAR JU

Airline Perspective – What Does it Mean in Constraints. CO2 Credits – Laurent Renou, Air France

Flight Management Systems/Mission Management – Serge Bruillot, Director for Technical Systems, Dassault Aviation

Aviation Environmental Impact – Jacques Gatard, Aerospace Specialist

The Effects of Information Automation Systems on Pilot Cognitive Skills: An Exploratory Study – Jamie Barrett, Engineering Research Psychologist, Federal Aviation Administration (FAA)

12.30pm-2pm Lunch Break

2pm-4.00pm Session 6

Innovations in the Industry

With more research and investment being applied in urban mobility, single pilot operations and autonomous systems, what does the future hold and what part will avionics have to play? How do we develop standards for use of AI and machine learning and what impact will autonomy have on the pilot and passenger?

Chair Darren L'Heureux, Honeywell

Is the Future of Avionics is Autonomous? – Alex Wilson, Wind River

Towards Design Assurance of Neural Network in Avionics – Luuk van Dijk, Founder & CEO, Daedalean

Enabling the Migration to Future Commercial and Defence Avionics Platforms Using Software Defined Platforms and Virtualisation – Paul Parkinson, Wind River

EUROCAE WG-114 on Artificial Intelligence – Anna Guegan, Technical Programme Manager, EUROCAE

AEROSPACE TechWeek.com
18/19 Mar 2020 | Toulouse, France

GET THE EVENT APP
AerospaceTechWeek.com/APP

ANDROID APP ON Google play

Download on the App Store

Two QR codes are provided for downloading the event app.

For the latest information and programme visit aerospacetechweek.com/avionics-prog

Connected AIRCRAFT

aerospacetechnology.com/connected-aircraft-prog

Optimising Connectivity for Maximising Profitability

The London School of Economics (LSE) report there are 3.8 billion passengers flying annually with only around 25% of aircraft in the air offering passengers some form of onboard broadband connectivity service. This service is often of variable quality, with patchy coverage, slow speeds and low data limits.

By 2035, it is likely that IFC will be ubiquitous across the world as aircraft become smarter, fully connected machines, and with the new services being introduced to benefit the passenger experience, grow revenues for airlines and improve safety. However, to achieve these goals it relies on reliable and seamless connectivity – from the cabin to the cockpit.

According to Inmarsat the connected aircraft can transmit data in real-time to reveal insights that could transform operations, potentially saving \$5.6bn a year in unplanned maintenance costs. Connectivity enables airlines to bring dramatic, yet cost effective enhancements to the passenger experience – and to take advantage of the new revenue streams that accompany them.

CONFERENCE PROGRAMME

WEDNESDAY 18TH MARCH | Salle Pastel 1

9am Joint Opening Keynote

Chair: Woodrow Bellamy, Editor, Avionics Magazine

Remi Maillard, Senior Vice President, Airbus Services

Joel Otto, Head of Connected & Digital Strategy, Collins Aerospace

Bruno Stoufflet, Chief Technology Officer, Dassault Aviation

Yann Barbaux, CEO, Aerospace Valley

10.30am-11am Coffee Break

11am-12.30pm Session 1

The Connected Aircraft Revolution: Increasing the Benefits of Connectivity

With technology developing at a rapid rate, what do we now mean by the 'Connected Aircraft'? A truly Connected Aircraft becomes a great business enabler and offers airlines and the broader industry great benefits and opportunities. What are these and how can we deliver enhanced services and solutions for a more integrated aerospace world?

Chair: Murray Skelton, Teledyne

Connectivity Evolution and How to Overcome Challenges to Meet Customer Expectations – Alia Al Qalam, Oman Air

Connected Aircraft: Immense Opportunities – Kiran Perikala, Honeywell Technology Solutions

Connected Aircraft Value Chain Uncomplicated – Mohan Singh Tomar, Honeywell

Who Owns The Digital Aircraft Strategy Within The Airline – and Why it is Important to Have One? – Samy Mahdi, Partnership Manager, Lufthansa Systems

12.30pm-2pm Lunch Break

2pm-3.30pm Session 2

Connectivity, Communications and Technology

For the Connected Aircraft, communications systems are key, but each offer different benefits and solutions. What you can do with satcom, LEO, L and Ku Bands? What type of system is best for different communications such as traffic, ACARS messages, safety services and non-safety services?

Chair: Woodrow Bellamy, Avionics Magazine

Enabling On-Board Wireless Communications – Sander van Lochem, Avionics Specialist, ADSE

Data Integrity for Cockpit Communications – Anthony Spouncer, Senior Director – Aircraft Operations, Safety, UAV's & UTM, Inmarsat

4G/5G Air-to-Ground Technology for Connectivity, Communications and e-Enablement of Aircraft – Dr Michael Ohm, CTO & Founder, SkyFive

How Does an Airline Achieve a Balance of Data and Bandwidth Consumption – Mike Pigott, Senior Vice President of Connectivity, Global Eagle

Full, Fast and Free (Ka Band) - Gary Echo, ViaSat

3.30pm-4pm Coffee Break



**AEROSPACE
TechWeek**.com
18/19 Mar 2020 | Toulouse, France

GET THE EVENT APP
AerospaceTechWeek.com/APP

ANDROID APP ON Google play

Download on the App Store

Two QR codes are provided for downloading the app.

4pm-5.30pm Session 3

Application and Benefits of Connectivity

What are the applications of connectivity and how do these most benefit airlines/operators and the supporting supply chain? Here we explore case studies of connectivity applications.

Chair: Philippe Lievin, Collins Aerospace

Upcoming Challenges for Connectivity/e-Enablement – Gary

Anderson, Flight Deck Communications Specialist, Collins Aerospace

Benefits of Connected EFB Weather Awareness Solution - Avoiding the Avoidable - Euan Mitchell, Senior Product Manager and Daniel Froehly, Business Development, SITAONAIR

ACARS over IP - Konstantin Milarov, Technical Services Manager, Wizz Air / Murray Skelton, Senior Director of Sales, Europe and CIS, Teledyne

Escape Entropy – Mark Ter Hove, Cobham SATCOM

THURSDAY 19TH MARCH | Salle Pastel 1

5.30pm Networking Reception

9:00am Session 4

The Impact of the Connected Aircraft on ATM

What services can be expected from ATM and what is the value chain of connectivity? Where can the connected aircraft contribute to the wider chain and how can it impact on other operations within the 4 As?

Chair: Mark Ter Hove, Cobham

Trajectory Based Operations (TBO) – Henk Hof, Head of ICAO and Concept Unit, EUROCONTROL

GADSS/Autonomous Distress Tracking – Miguel Marin, ICAO*

Title TBC – Jonathan Astill, Vice President and General Manager of Air Traffic Flow Management Services, Aireon

GADSS ADT: Identify Your Path to Compliance – Ruben Stepin, Director of GADSS and Airline Business Development, Skytrac

10.30am-11am Coffee Break

11am-12.30pm Session 5

Aircraft Data Management Solutions and Cyber Security

As data becomes more prolific and more 'valuable' to an organisation, how do we control this flow of information and who 'owns' the data? As processing data offline becomes more economical, what are data limitations, how do we value data and share just required data and ensure its security?

Chair: Chris Bigwood, Honeywell

Aircraft Security Logs Analysis and Monitoring – RubiArbel, Argus Cyber Security

Protecting Wireless Networks on Aircraft – Markus Gilges, Director Business Development EMEA, VT Miltope

Synchronisation and Deployment of Data Driven Services on an Aircraft – Ralph Wagner, CEO, Axinom

Title TBC – Sean Reilly, VP Business Development, GE Aviation / Avionica

Lori Pierelli, A-ISAC, Collins Aerospace

12.30pm-2pm Lunch Break

2pm-4.00pm Session 6

Future of Connectivity and Satcom (Funky Future Stuff!)

What could be done in the future with connectivity? With giant leaps in technological development, what is possible, how can AI and machine learning benefit safety and security? What are other industries doing with connectivity that could be applicable to the aerospace industry?

Chair: Murray Skelton, Teledyne

Internet of Things for Aviation – Michel Palomeque, Head of aircraft enabler and fleet performance, Airbus

New/LEO Satcom – constellations, when available and what deliver – George Nicola, Aviation Product Management Director, Oneweb

New Aviation Technologies: the Human Contribution to Risk – David Gleave, Chief Investigator, Aviation Safety Investigations

What could be done in the future with connectivity? - Syed Bilal, Boeing

For the latest information and programme visit [aerospacetechweek.com/connected-aircraft-prog](https://www.aerospacetechweek.com/connected-aircraft-prog)

Maximising IT for Minimising Costs

Five years ago, the concept of 'paperless' and mobile maintenance formed the buzzwords of our industry. It took time for aviation and its cohort of operators, lessors, regulators, financiers, manufacturers and MRO providers to become more at ease with the disruptive technologies that enabled a new age of maintenance to gain traction.

Today, we see drones, artificial intelligence (AI), machine learning, blockchain and predictive maintenance being discussed more and more. While aviation is still undeniably cautious with new innovations, it is more open to learning how to adapt to them. The MRO IT conference track sessions will encourage forward, proactive thinking in addition to a focus on establishing tangible and robust business cases. End the experience at a joint-panel session with the Flight Ops IT conference speakers, where we will explore the most constructive methods to maximise communications and data-sharing between two of the most important departments in an airline.

CONFERENCE PROGRAMME

WEDNESDAY 18TH MARCH | Salle Lauragais 1

9am Joint Opening Keynote

Chair: Woodrow Bellamy, Editor, Avionics Magazine

Remi Maillard, Senior Vice President, Airbus Services

Joel Otto, Head of Connected & Digital Strategy, Collins Aerospace

Bruno Stoufflet, Chief Technology Officer, Dassault Aviation

Yann Barbaux, CEO, Aerospace Valley

11am-12.30pm Session 1

Creating a Value Case – the Business Proposition – ROI

Significant investment in IT/technology is required to ensure successful digitalisation of systems, often with ROI not immediately visible. How do we create a value case for new mobile application of new systems and to help transform maintenance, increase productivity and efficiencies?

Chair: Adrian Ionascu, Blue Air

Using Maintenance Training ROI as a Tool to Boost Reliability – Management & Excellence SA, Dr. William Cox, Chief Executive Officer

Cabin Maintenance and Digitalisation – What Benefits and Perspectives for Airlines & MROs? Airlnt Services, Michael Lopez, Sales Manager

Delivering Value at Scale: How Pratt & Whitney applies digital MRO to reconcile as-Built with As-Maintained Records – John Rassieur, Managing Partner DXC Technology & Farnaz Jadbabaie, iBASEt

Digital Operations: Making IT Work. From Innovation to Stable Production – Amir Bennegadi, IT Application Manager, Cathay Pacific Airways

12.30pm-2pm Lunch Break

2pm-3.30pm Session 2

The ETL, and Other Regulatory Considerations for MRO IT

The electronic techlog (ETL) is an important tool in digital maintenance. But what regulatory considerations are there, and what are the implications for safety management? Key compliance and approval requirements are explored.

Chair: Nick Godwin, Commsoft

Techlog Regulatory Approval – Conduce, Paul Boyd, Managing Director

MRO IT Safety Management System & Interface – Sotirakis Stamou, Aviation Safety Inspector, Hellenic CAA

Considerations for the ETL & Digital Maintenance – Ultramain, Robert Saunders

Why Real Time Onboard LSAP Compliance Management is Critical to Operations & OTP – FORLOOP – Sergio Tarzia, CEO

3.30pm-4pm Coffee Break

4pm-5.30pm Session 3

Business Modelling and Risk Modelling

Technology and data being used for predictive maintenance provides many challenges. Why is predictive maintenance important, but what are the risks involved and how can this affect the business model and supply chain?

Chair: Hugh Revie, Ubisense

Predictive Maintenance – Beyond the Buzzwords. What is it and Why Does it Matter for Aircraft Maintenance? EXSYN Aviation Solutions, Sander de Bree, Founder & Chief Visionary

Common Pitfalls of Aeronautic Supply Chains – Quantifying Risk through Data – Lokad, Simon Schalitt, Chief Operating Officer

What are Model-Driven Predictive Simulations and How Can

They Benefit Your Maintenance Planning? – Aerogility – Phil Cole, Business Manager Civil Aviation

Prognos Predictive Maintenance Solutions – AFIKLM E&M – James Kornberg, Innovations Director

THURSDAY 19TH MARCH | Salle Lauragais 1

9:00am Session 4

Enhancing MRO Efficiencies Through Use of Emerging Technologies

As technologies advance at rapid pace, how do airlines best take advantage and ensure technology gets into the production environment? How can we successfully and safely implement newer generations of mobile technology, software in legacy systems and paperless systems? What should the long term digital strategy look like?

Chair: Julien Methot, Swiss Aviation Software Ltd

The MRO Digital Twin – Hugh Review, Ubisense

The Use of Blockchain in MRO – Authenticiti, Andrew Yang, CEO

Delivering a Mission-Critical MRO IT Solution in the Cloud – Considerations and a Case Study – IFS Aerospace & Defense, Matthew Tobin, Vice President

AI in MRO – Ramco Systems, Saravanan Rajarajan, Associate Director Aviation Practice

10.30am-11am Coffee Break

11am-12.30pm Session 5

Data, Analytics & Cyber Security

Big data provides the potential to facilitate maintenance planning and predictive maintenance, and the opportunity to optimise decisions, but how do we best achieve this? What role can machine learning and digital twins play? What is our ability to maximise the use of data and how do we ensure data transfer/delivery is secure?

Chair: Matt Tobin, IFS Aerospace & Defense

Aircraft Technical Services & Availability Challenges – THALES, Francois Gandon, A320 Technical Support Manager

Line Maintenance Management: Dealing with Third Party Contractors through Mobile Solutions – Commssoft – Nick Godwin, Managing Director

5.30pm Networking Reception

Digital Tech-Ops: Providing Data & Mobility to Mechanics – Experiencing & Benchmarking – Swiss Aviation Software, Julien Methot, Senior Manager Business Consulting

Fast Track to Mature Operational Reliability – Collins Aerospace, Amy Grace, Fellow, Applied Data Science

Digital Threads, Integrating Core and Innovative Technologies to Optimise Technical Operations – CapGemini – Michael Wm. Denis, Principal, Aviation & Aerospace Strategy

12.30pm-2pm Lunch Break

2pm-4.00pm Session 6

Conflict Between Flight Ops and Maintenance – Able Bedfellows!

How can MRO IT and Flight Ops IT best work together for maximum efficiency and minimise turnaround times? With the advent of paperless aviation, where do TechLogs, EFBs and CabinLogs converge and how can the supply chain best support the airlines to ensure complex decisions are made easier?

Moderator: Nick Godwin, Commssoft

Paul Boyd, Managing Director, Conduce Group Limited

Rene de Vogel, Senior Manager, Flight Deck and Data Solution, Boeing

Martin Mitev, Captain Airbus 220 and Assistant to SVP Flight Operatio, airBaltic Corporation

Robert Saunders, Digital Transformation, Ultramain Systems / Air2MRO

Matthew Tobin, Vice President, IFS Aerospace & Defense

Alexandre Beaux, Commercial Director – EMEA, GE Aviation's Digital Group

AEROSPACE TechWeek.com
18/19 Mar 2020 | Toulouse, France

GET THE EVENT APP
AerospaceTechWeek.com/APP

ANDROID APP ON Google play

Download on the App Store

Two QR codes are provided for downloading the app.

For the latest information and programme visit aerospacetechweek.com/mro-it-prog

Enhancing Flight Operations Solutions

The software that supports flight operations (or 'Flight Ops') can mean a myriad things. It can be specific to a pilot's electronic techlog or flight bag (ETL or EFB) functionality, or it can focus on the wider processes surrounding a flight. For instance, it can be more directed towards crew training, ground handling, line maintenance or fuel efficiency and

management and so on. This is before one considers environmental pressures, operational reliability or efforts or airlines to decrease turnaround times (TATs).

The extent that an airline will therefore prioritise each element will depend on its operational style, and there is no 'one stop shop' or fix-all solution that is the single answer. Establishing connectivity 'hubs' or data platforms are becoming more common and will be one of the approaches explored throughout the Flight Ops IT conference sessions.

CONFERENCE PROGRAMME

WEDNESDAY 18TH MARCH | Salle Lauragais 2

9am Joint Opening Keynote

Chair: Woodrow Bellamy, Editor, Avionics Magazine

Remi Maillard, Senior Vice President, Airbus Services

Joel Otto, Head of Connected & Digital Strategy, Collins Aerospace

Bruno Stoufflet, Chief Technology Officer, Dassault Aviation

Yann Barbaux, CEO, Aerospace Valley

11am-12.30pm Session 1

The Business Case and Use Case for Flight Ops IT

A well-established use case motivates airlines to investigate new Flight Ops technologies, while the business case quantifies these benefits and encourages investment. This session addresses the 'combined business case'; that is, the importance of partnerships between airline departments in addition to third party providers. An IT support team's role in realising potentials is also addressed.

Chair: Ido Biger, ELAL

Airline Operational Challengers and the Value of Digital Solutions – Frost & Sullivan & GE Joint Presentation – Diogenis Papiomytis, Director of Commercial Aviation F&S, Miles Gogad, CMO GE Aviation's Digital Group

The Business Case and Use Case for Flight Ops IT - Rene DeVogel, Senior Manager, Flight Deck and Data Solutions & Marco Gaertner, Senior Product Manager, Flight Deck Solutions, Boeing

Ultramain – Electronic Tech Log – From the Pilots Perspective – Robert Saunders, Digital Transformation

Development of Flight Efficiency Information Without FDM Availability – Jan Bruegmann, Fuel Efficiency Manager, Condor Flugdienst GmbH

12.30pm-2pm Lunch Break

2pm-3.30pm Session 2

EFB Operational Use & Regulations

The Electronic Flight Bag (EFB) has been in operational use for some time, however implementation and use is closely regulated. The regulatory framework is summarised, and benefits analysed via real use cases. Maximising the use of the EFB requires integration of various data sources, and subsequent training for Flight Crews on effective use of these technologies. Explore key considerations here.

Chair: Rene de Vogel, Boeing

What Benefits are Delivered to Airlines by an Integrated EFB Application Suite – Wim de Munck, Chief Technical Officer, AVIOBOOK

The Challenge – Visibility and Control of Regulatory Stringent Processes – Rhyss Williams, Director Sales, Flatirons Solutions

New Pilot Flight Briefing Experiences – Capt. Olivier Aspe, Airbus TRI/TRE and Ops Advisor for EFB, NAVBLUE

Engaging, Enabling and Empowering Pilots with FlightPulse – Luke Bowman, Senior Product Manager, GE Aviation's Digital Group & Vinita Israni, User Experience Manager, Qantas Airways

3.30pm-4pm Coffee Break

4pm-5.30pm Session 3

Additional Operational Drivers

When one considers Flight Ops IT, the EFB is a leading factor. Yet there is a wealth of additional benefits on offer other than fuel savings and efficient route planning; process efficiencies and greater operational reliability are recognised here. To define these wider operational drivers, real-time data, weather 'nowcasts', and ground handling / line maintenance efficiencies are explored, combined with an appreciation of Flight Ops IT in the overall enhancement of Flight Safety.

Chair: Samy Mahdi, Lkufthansa Systems

Progress in Aviation Weather delivery in industrialized formats - Martin Mezger, Weather Business Solutions Channel Sales Executive for EMEA, The Weather Company

Transforming Data into Added Value by Combining Weather and Aeronautical Information with Algorithmic Data – Arnaud Setien & Oliver Salzmann, Skyconseil

Weather App – Enabling Real-Time Weather Updates – Maitha AlHemeiri, Senior Manager Aircraft & Ground Technologies, Etihad Airways

Smart Manuals for Smart Ops: How Personalized & Relevant Content Increases Operational Performance - Gerben Bondt, flight policy & standards coordinator, Wizz Air

5.30pm Networking Reception

THURSDAY 19TH MARCH | Salle Lauragais 2

9:00am Session 4

Data – Standardisation, Management and Analysis

An airline's ability to ingest and analyse flight data efficiently, then filter effectively to pilots via a suite of EFB applications is complex but of key importance. Interfacing different applications to communicate and process data is one aspect, while assimilating various data standards, codes and formats from a mixed fleet of aircraft is another. Learn from the experiences of airlines, OEMs and software providers.

Chair: NAVBLUE

Becoming a Data Driven Airline – Ido Biger, Chief Data Officer, ELAL

The Challenges Airlines Have in Juggling Different Data Standards – Craig McNut, Fleet Program Director, Flatirons Solutions

Senior representative, Airbus*

Data - Standardization, Management and Analysis - Thorsten Wiesemann, Director Flight Deck Solutions - Smart Map Solutions, Boeing

10.30am-11am Coffee Break

11am-12.30pm Session 5

Innovations

Development and progression are vital aspects of technology. Join this session to see what is evolving to benefit flight operations, and what innovations can / will extract additional value for airlines. The capabilities offered by new and emerging aircraft types are discussed, in addition to an exploration of what other industries are doing and how this might inspire aviation's own technological endeavours.

Chair: TBC

Hype or Dare? Blockchain Applications in Flight Operations – Martin Mitev, Captain Airbus & Assistant to SVP Flight Operations, airBaltic Corporation

AI Work and its Role in Predictive Maintenance Analytics – Warren Lampitt & Keith Dugas, Air Canada

Towards a Smooth Turnaround Process with AI – Manuel van Esch, Lead Business Consultant zeroG GmbH

Safety Line – Bringing Data Science into the Cockpit for Pilot-Driven Flight Efficiency – Francois Chazelle, Chief Commercial Officer

12.30pm-2pm Lunch Break

2pm-4.00pm Session 6

Conflict Between Flight Ops and Maintenance – Able Bedfellows!

How can MRO IT and Flight Ops IT best work together for maximum efficiency and minimise turnaround times? With the advent of paperless aviation, where doe TechLogs, EFBs and CabinLogs converge and how can the supply chain best support the airlines to ensure complex decisions are made easier?

Moderator: Nick Godwin, Commssoft

Paul Boyd, Managing Director, Conduce Group Limited

Rene de Vogel, Senior Manager, Flight Deck and Data Solution, Boeing

Martin Mitev, Captain Airbus 220 and Assistant to SVP Flight Operatio, airBaltic Corporation

Robert Saunders, Digital Transformation, Ultramain Systems / Air2MRO

Matthew Tobin, Vice President, IFS Aerospace & Defense

Alexandre Beaux, Commercial Director – EMEA, GE Aviation's Digital Group

AEROSPACE TechWeek.com
18/19 Mar 2020 | Toulouse, France

GET THE EVENT APP
AerospaceTechWeek.com/APP

ANDROID APP ON Google play

Download on the App Store

Two QR codes are provided for downloading the event app.

For the latest information and programme visit aerospacetechweek.com/flight-ops-it-prog

New Testing Strategies for New Technologies

With maximum aircraft utilization a top priority for profitability at the airlines, aircraft are being worked harder than ever. And it is paying off – the airlines are seeing record profits. All well and good until you think about the usage of the asset. With every hour, every cycle, every landing added to the aircraft, comes the potential for vibration,

fatigue, cracking, metal formation in oil, structural degradation and even the eventuality of a catastrophic engine failure like the one that happened on Southwest Flight 1380 in 2018.

Even with record profits, not a single operator can afford a failure like that. And while the aviation safety record is enviable right now, there is no rest or slacking off in the inspections and testing of the equipment in operation in our fleets. Inspection and testing equipment technology is making technological leaps and bounds. Keeping up with those technological leaps is imperative to the safe operation of aircraft that begin aging as soon as they are flown away from the manufacturer.

CONFERENCE PROGRAMME

WEDNESDAY 18TH MARCH | Salon D'Honneur

9am Joint Opening Keynote

Chair: Woodrow Bellamy, Editor, Avionics Magazine

Remi Maillard, Senior Vice President, Airbus Services

Joel Otto, Head of Connected & Digital Strategy, Collins Aerospace

Bruno Stoufflet, Chief Technology Officer, Dassault Aviation

Yann Barbaux, CEO, Aerospace Valley

11am-12.30pm Session 1

Urban Air Mobility, EVTOLS and UAVs

The concept of Urban Air Mobility is rapidly developing, but with little in terms of regulations and understanding the impact on the airspace – what do we have to test for if we have hundreds in the sky? What are the requirements, how do we appropriately test a crash, what about acoustic emissions tests, how to test without autorotation, what about detect and avoid? In this session we discuss some of the requirements and implications.

Chair: Paul Hart, Curtiss Wright

Advanced Simulation Platform for Multi-Rotor UAVs – Christophe Guillon, Expert Consultant, ALTRAN

UAV Motor Characterization Testing & Analysis – Willem Ane-maat, President, DAR Corporation

Safety and Security in UAM. Key Test Challenges for Electric Propulsion, Flight Connectivity and Autonomous Air Mobility – Tobias Willuhn, Program Manager Aerospace & Defence, Rohde & Schwarz

Sky VTOL Program – Raphael Freitas, Product Development Engineer, Embraer*

12.30pm-2pm Lunch Break

2pm-3.30pm Session 2

Complex and Embedded Systems

With systems becoming more complex and the integration of systems of systems, greater use of multicore processors, how can we ensure testing and certification integrity? What are the issues with GPUs and GPGPUs with no current regulatory guidance? How can we test blockchain authentication to identify corruption? In this session we investigate the challenges in testing and calibration of complex and embedded systems.

Chair: Matt Jackson, Presagis

Multicore Timing Analysis for DO-178C Aerospace Systems – Dr Christos Evripidou, Senior Software Consultant, Rapita Systems

Validation of the Pilot – Automation – Aircraft – Operating Environment Systems Dynamics Model for Virtual Flight Test and Safety Assessment – Ivan Burdun, President, AIXTREE / Alexander Grebenkin DSc, Head of Department, Moscow Institute of Electromechanics and Automatics (MIEA), PJSC / Sergey Kostin, Deputy General Director – Business Development, SP Automatika

Considerations for Testing on GPGPUs in a Safety Critical Environment – Lucas Fryzek, Field Application Engineer, CoreAVI

TBC

3.30pm-4pm Coffee Break

4pm-5.30pm Session 3

High Level Integration and Testing

Where systems are becoming more complex, how do we successfully achieve high level testing and testing of systems at multiple levels. How can we test the integration of COTS components (especially those from other industries) for safety and efficiency. What's the impact on multicore, digital twins and digital manufacturing, and what role can predictive maintenance play? How do we employ measures to ensure data security and integrity?

Chair: John McHale, Military Embedded Systems

Improving Systems Test Coverage by Automated Testing and Fault Injection with Digital Twins – James Hui, Wind River

EUROCAE WG97 VISTAS (Virtual Integrated Simulation for Tests between Airframers and Suppliers) – Olivier Fourcade, Airbus

Integration of ADAS Platforms for Automation – Senior Representative, TTTech

Introducing the Virtual Probatoem in the World of Digital Twins – Anant Sahay, Founder and CEO, Lexx Technologies

5.30pm Networking Reception

THURSDAY 19TH MARCH | Salon D'Honneur

9:00am Session 4

Space, High Altitude & EMC Testing

What are the challenges in Space, High Altitude & EMC Testing and the impact on testing of critical components? What are the results of ageing and obsolescence? How and what do we test for single event or mutli event effects? How and for what can we test smaller components miniaturised for space?

Chair: Thomas Nicolay, Rohde & Schwarz

Exploiting New Satellite Connectivity Means to Conduct Efficient Flight Test Missions: the ESA PLATIN Project – Jean-Marc Gaubert, Managing Director, ATMOSPHERE

How Automatic Electrical Bond, Loop and Joint Testing Must Be the Future of Aerospace: Improving Safety, Lightning Strike Protection and Productivity – Jason Evans, Director, MK Test Systems

Senior Representative, Rohde & Schwarz*

10.30am-11am Coffee Break

11am-12.30pm Session 5

Electrification, Aerostructures, Materials

With more new materials in aerostructures, new processes are required to successfully test from birth to death. How do we standardise testing for 3D printing, conductive inks, graphine, ALM for temperature, pressure, loads, corrossion, reliability, obsolescence or robustness? Electrification brings new power supply issues, providing potential problems for avionics. How can electrification develop reliable tests of electrical systems?

Chair: Jacques Gatard

Inspection 4.0 Aerostructure digital continuity – Teddy Canadas, Chief Commercial Officer, TESTIA

Automated non-destructive testing of aero-engines components – Rene Sicard, TecScan

Electrical Simulation for the More-Electric Aircraft – Pablo Romero Cumbreiras, Application Engineer, Mathworks

Reducing Power Consumption in Commercial Processors – Thomas Guillemain, Marketing & Business Development Manager, Teledyne e2v & Stephane Laffont, Product Engineer – Senior Member of Technical Staff, Teledyne e2v

12.30pm-2pm Lunch Break

2pm-4.00pm Session 6

The Future of Testing

With Machine Learning and AI the current buzz for the future of the aerospace industry, how do we approach designing and testing for automation? How do we identify what to test and to what standards, how do we ensure safety of systems and how to test new processes such as transition from automation to pilot and vice versa? In this session we take a look at what the future of testing holds.

Chair: Paul Hart, Curtiss Wright

Introducing the New ARINC Standard for Avionics Displays – Matt Jackson, Technical Product Manager, Presagis

Early Screening of Multifactorial Risk Space for Black Swan Accident Scenarios Using System Dynamics Modelling and Safety Assessment Technology – Ivan Burdun, President, AIX-TREE / Andrew Bubin, IT Engineer, AIXTREE

Virtual Testing of Aircraft Systems – Yves Saint-Upery, Senior Expert Systems Integration, Airbus Commercial Aircraft – Flight and Integration Test Center

Intermittent Fault Detection Technology – Lew Wingate, Vice President – Ground Support Test Equipment & Distribution, Barfield

Testing Safety-Critical Machine Learning – Corentin Perret-Gentil, Machine learning scientist, Daedalean

AEROSPACE TechWeek.com
18/19 Mar 2020 | Toulouse, France
GET THE EVENT APP
AerospaceTechWeek.com/APP

ANDROID APP ON Google play

Download on the App Store

Two QR codes are provided for downloading the event app.

For the latest information and programme visit aerospacetechweek.com/aerospace-testing-prog

TECHNICAL WORKSHOPS PROGRAMME

The Aerospace Technology Week Workshops deliver greater insights for engineers and technicians into specific areas of focus, for more detailed analysis. Free to Attend Workshop showcase demonstrating some of the latest technologies, solutions, ideas and innovations.

WORKSHOP ONE | Showcase Theatre – Exhibit Hall

WEDNESDAY 18TH MARCH

11:00 – 12:30

Architecture, Data, Analytics and Security

11am: Cybersecurity in Aerospace – Florent Rizzo, CEO, Cyberinflight

11:30am: ARINC 818-3: 2019 Revisions to the Avionics Digital Video Bus Specification and its Implications for Avionics Systems – Jon Alexander, CEO, Great River Technologies & Tim Keller, Director of Marketing, Great River Technologies

12pm: Cyber Robust Navigation for Connected Aircraft – Okuary Osechas, Research Engineer, German Aerospace Centre (DLR)

12:30pm: A primer on publish/subscribe architectures (e.g. VISTAS, DDS) and how they can be applied in modern, real-time I/O systems – Augusto Mandelli, Director of Sales, EMEA, United Electronic Industries, Inc. (UEI)

1pm: Why and How To Automate The Requirements Quality Analysis Using Natural Language Processing – Micaël Martins – Europe & Brasil Sales Director, Visure Solutions

1:30pm: Integrating Secure Real-Time Data with Airborne Avionics Systems and Gaming Platforms to Create Next-Generation Simulation Experiences – Chip Downing, Real-Time Innovations

WORKSHOP TWO | Showcase Theatre – Exhibit Hall

WEDNESDAY 18TH MARCH

14:00 – 16:30

Connectivity & Digital Systems

2pm: Customer expectations to future satellite communication call for better test – From Niche To Mainstream – Svend Holme Sørensen, Product Manager, Gatehouse Telecom

2:30pm: AI, Connectivity & Cybersecurity – Marc Gatti, Thales Avionics

3pm: Use of Transmitting Portable Electronic Devices aboard Aircraft – Matt Huntting, Engineer, AAC Engineering

3:30pm: A new approach to power supplies for cabin electronics and its benefits regarding weight, cost and time to market – Uwe Weigele, CEO, Weigele

4pm: From Idea to Implemented – Software Enabled MRO – Andy Hakes, AireXpert

4:30pm: NRM – Network Resource Management – Mike Pigott, Senior Vice President of Connectivity, Global Eagle

WORKSHOP THREE | Showcase Theatre – Exhibit Hall

THURSDAY 19TH MARCH

10:00 – 12:30

Flight Systems and Safety

10am: Qormino Common Computer Platform DO-254 DataPackage – Thomas Guillemain, Marketing & Business Development Manager, Teledyne e2v

10:30am: Multicore Processors for Safety Critical Avionics – Gary Gilliland, DDC-I Inc

11am: Multicore Ready to Become Airborne – Thierry Maudire, Head of Technical Sales, SYSGO SAS

11:30am: Urban Air Mobility – Vic Terry, Head of Digital Systems, Vertical Aerospace

12pm: Using prescriptive low code to solve long range planning – Joost van der Maarel, COO, Novulo

12:30pm: OnePRESS: Monitoring of Aircraft Tire Pressure wirelessly using a mobile phone or tablet – Andrew Bill, ATA32 (Landing Gear) Monitoring Systems Specialist, Airbus & Jacques Roizes, ATA32 (Landing Gear) Senior Engineer, Airbus UK

1pm: Potential Use of Software Renderer as GPU Backup – Gain Arnaud, Staff Project Manager, ENSCO Avionics

1:30pm - Predictive maintenance operationalization & planning – Gesine Varfis, Marketing Manager, APSYS

WORKSHOP FOUR | Showcase Theatre – Exhibit Hall

THURSDAY 19TH MARCH

14:00 – 16:00

Simulation and Testing, Standards & Certification

2pm: Avionics Radio Test System 7000 – ARTS7000 – Thibault de La Grandville, Accounts Manager, Airlines & OEMs, Laversab

2:30pm: Avionics Radio Testing: Adding Efficiency, Increasing Revenue – Laurent Gauthier, CEO, airplus Maintenance GmbH

3pm: How to write good functional & safety Avionics requirements in 2020 – Micaël Martins – Europe & Brasil Sales Director, Visure Solutions

3:30pm: Next-gen software defect diagnosis in test environments for mission-critical systems – Laila Lotfi, Undo



GET THE EVENT APP
AerospaceTechWeek.com/APP



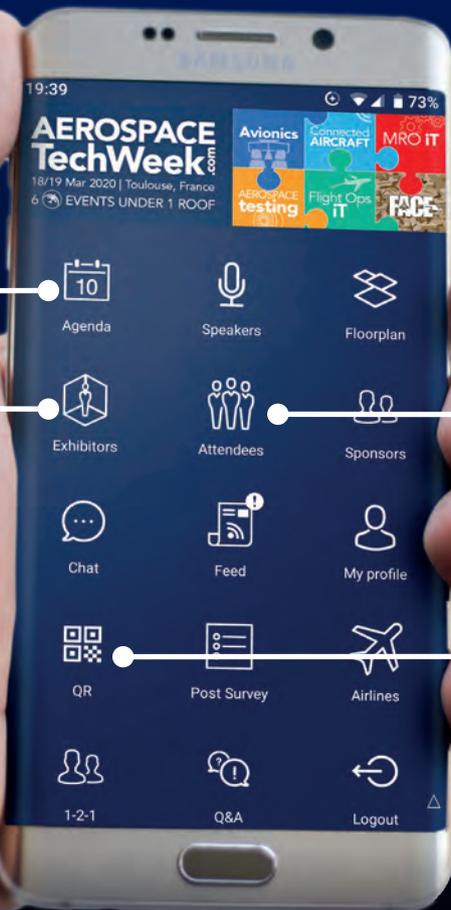
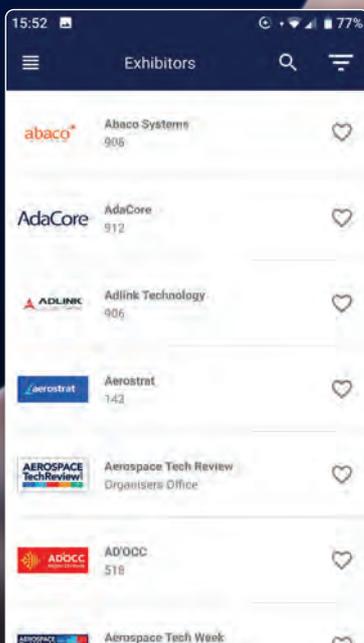
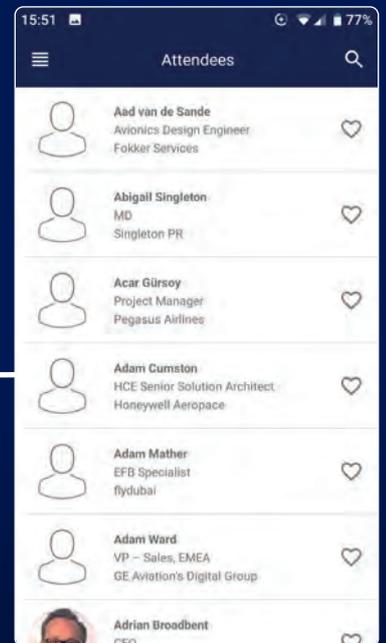
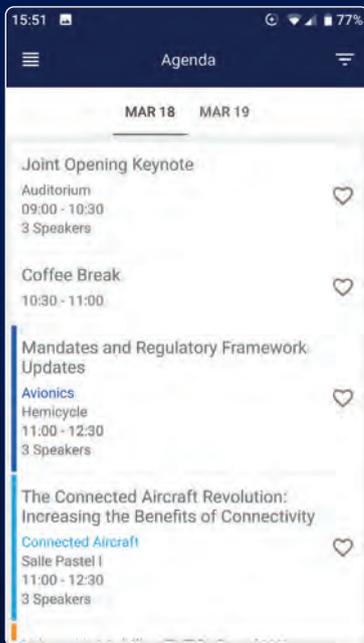
AEROSPACE TechWeek.com

18/19 Mar 2020 | Toulouse, France

6  EVENTS UNDER 1 ROOF



GET THE EVENT APP



AerospaceTechWeek.com/APP

SPONSORS AND SUPPORTERS

Aerospace Technology Week wish to thank the following sponsors and supporters:



PLATINUM SPONSOR

AIRBUS



GOLD SPONSORS



























18 MARCH



19 MARCH

















SUPPORTING ORGANISATIONS










MEDIA PARTNERS

FLAGSHIP MEDIA PARTNER























CERTIFIED TRAINING COURSES

The Certified Training Programme, delivered by AFuzion, leading training providers in safety-critical systems, software, and hardware engineering in the aerospace industry:

WEDNESDAY 18TH MARCH

Introduction to the Emerging & Required DO-326/ED-202-Set: Aviation-Cyber-Security Regulation for Safety (Room: Salon Occitanie)

Aviation Security: understanding what is required for new avionics/aircraft development and operations via the new mandatory DO-326A/ED-202A documents. In this introduction, attendees will get a top-level review of the new "DO-326/ED-202 ecosystem" of emerging regulation.

Optimizing DO-178C/DO-254 Avionics Software & Hardware Development Guidelines (Room: Ellipse)

In this fast-paced AEE course, experienced avionics engineers learn how to optimize DO-178C & DO-254 to real avionics. Not just theory, but practical examples to develop better compliance with DO-178C (ED-12C) and DO-254 (ED-80).

THURSDAY 19TH MARCH

Model Based Development (MBD) Techniques & DO-331 application for Aviation Software Development: moving from Documents to Models (Room: Salle Cocagne)

Model-Based Development (MBD) is getting more and more popular in organizations creating complex systems where it is crucial to collaborate in a multi-disciplinary environment and when the safety is crucial, like avionics projects.

The Emerging & Required DO-326/ED-202-Set Essentials: The Airworthiness Security Process, Methods & Considerations (Room: Salon Occitanie)

The DO-326/ED-202 set's guidance and recommendations are dispersed across all the documents comprising the set, but for establishing airworthiness, the "core" parts of the DO-326/ED-202 set: DO-326A/ED-202A & DO-356A/ED-203A – are to be considered.

Applying the New Mandatory Aviation Systems/Safety Regulations: ARP4754A (with ARP4761/A) (Room: Ellipse)

The now nearly-mandatory SAE-ARP4754A provides guidance for the development of aircraft and aircraft systems while taking into account the overall aircraft operating environment and functions.

**AEROSPACE
TechWeek.com**

18/19 Mar 2020 | Toulouse, France

GET THE EVENT APP
AerospaceTechWeek.com/APP





ROYAL AERONAUTICAL SOCIETY TOULOUSE BRANCH

WORKSHOP (FREE TO ATTEND)

WEDNESDAY 18TH MARCH 2020 – 11am-4.30pm | Salle Cocagne

11am-11.45am

Engineering design organizations: Why systems and processes are becoming so complex? – Bernard KRIER, Head of Systems and Propulsions, ATR

11.45am-12.30pm

Innovation in Personal Air Mobility: What alternative reliable transportation solutions? Volante Vision Concept – Ian BACON, Programme Director, Cranfield Aerospace Solutions (In Collaboration with Aston Martin & Rolls-Royce)

1.30pm-2.15pm

The connected aircraft and the distributed technology ledger (Blockchain): What strategic opportunities and key challenges for the Aerospace industry? – Babacar N. SECK, Chief Executive Officer, LEADS Aerospace

2.30pm-3.15pm

Building an Enterprise Digital Thread Platform leveraging existing digital assets – Lou PASCARELLA, Chief Technical Officer, HCL, PLM Division

3.30pm-4.15pm

Environmental impact of commercial aviation, what can be done to reduce carbon footprint – Philippe FONTA, former Airbus, Head of Sustainable Development, former WBCSD, World Business, Council for Sustainable Development. Currently CEO & Founder, SCRUM Consult.

The Royal Aeronautical Society Toulouse Branch was formed in 1991. The Branch organises a monthly lecture programme including one each year dedicated to the Branch founding chairman, the distinguished test pilot Gordon Corps.

Aerospace Technology Week is delighted the RAeS Toulouse Branch will be contributing an interesting Free to Attend Workshop during the event.



GET THE EVENT APP
[Aerospacetechweek.com/APP](https://www.aerospacetechweek.com/APP)



FACE WORKSHOP

WEDNESDAY 18TH MARCH

Salle Pastel 2

11am-12.30pm

Driving Interoperability with the FACE Business Approach and Technical Standard

The Future Airborne Capability Environment (FACE) business approach and technical standard is creating a new higher levels of avionics design efficiency and interoperability. This session discusses a range of FACE advantages that drive faster and more efficient development and deployment of FACE solutions.

- **Intro to Future Airborne Capability Environment (FACE) Business Approach and Technical Standard for Modernizing Next-Generation Military Avionics** – RTI (Speaker: Chip Downing)
- **Developing Portable and Reusable Applications with SCADE, FACE and ARINC 661 ANSYS** (Speaker: ≈Thierry Le Sergent)
- **Interoperability to FACE Certified Conformant Systems** – RTI (Speaker: Andre Odermatt)

2pm-3.30pm

Accelerating Avionics Safety and Airworthiness Using the FACE Architecture

One of the most challenging aspects of avionics deployment is achieving airworthiness and safety certification. This session delivers explicit examples of using the FACE architecture to rapidly achieve safety certification and platform airworthiness.

- **Attaining High Assurance for FACE™ Software: a DO-178C Perspective** – AdaCore (Speaker: Ben Brosgol)
- **Compositing and the Reuse of Software in Safety Critical Graphics Applications** – CORE (Speaker: Robert Pickles)
- **Does SafeMC Multicore Face Conformant RTOS** – DDC-I (Speaker: Gary Gilliland)
- **Conforming to the FACE Technical Standard – an OS Vendor perspective** : (Speaker: Alex Wilson, Wind River)

THURSDAY 19TH MARCH

9am-10.30am

High Assurance and Security

Deploying trusted platforms in compressed time frames is a challenge both required and hard to achieve. This session will focus on creating secure compute and data delivery solutions using commercial-off-the-shelf (COTS) technologies using the FACE Technical Standard and architecture.

- **Using DDS to Secure Communication Between FACE Applications** – RTI (Speaker: Andre Odermatt)
- **LYNX – Trustworthiness in Avionics Systems** (Speaker: Tim Loveless)
- **Wolf SSL** – Speaker: Daniele Lacamera

11am-12.30pm

Accelerating FACE Applications into Next Generation Avionics Systems

The proof of any standard is the adoption and deployment of that standard into a compelling application use case. This session will demonstrate that the FACE Technical Standard and Business Approach is rapidly creating innovative applications in next generation systems.

- **Potential Use of Software Renderer as GPU Backup** – ENSCO (Speaker: Gain.Arnaud).
- **Exploit the FACE Operating System Segment when Composing Safe and/or Secure Systems** – TBC
- **Multi-Core Processor/Programmable System-On-a-Chip Monitors** – ENSCO

AEROSPACE TechWeek.com

18/19 Mar 2020 | Toulouse, France







GET THE EVENT APP

AerospaceTechWeek.com/APP

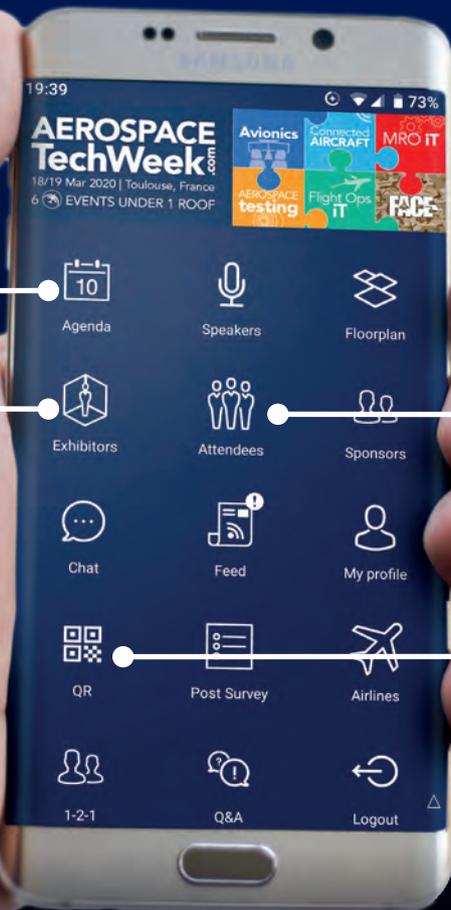
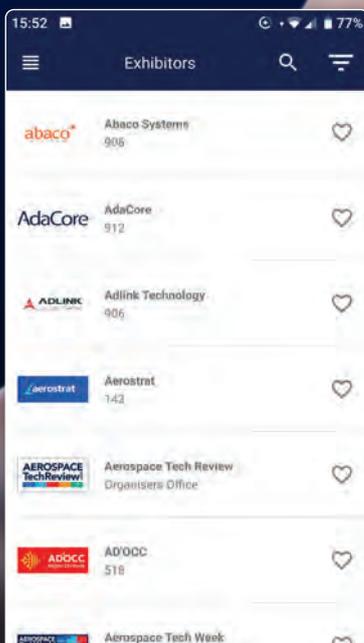
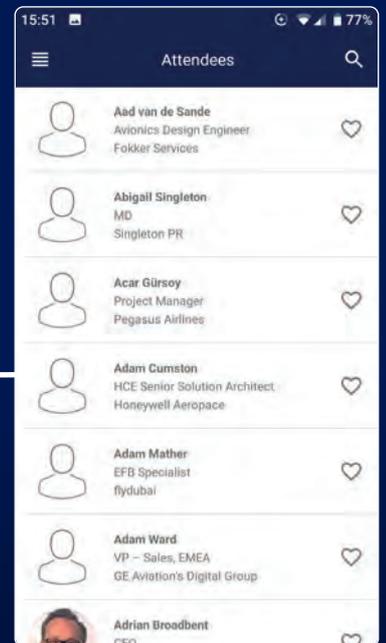
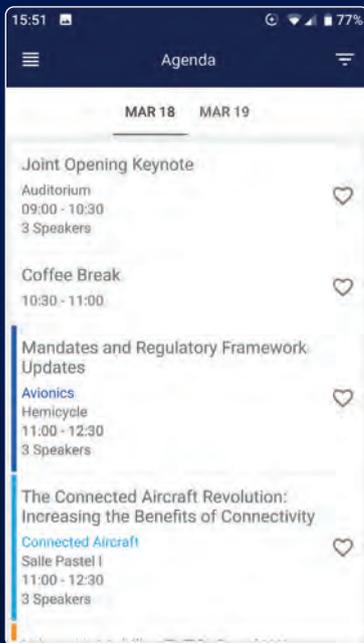
AEROSPACE TechWeek.com

18/19 Mar 2020 | Toulouse, France

6  EVENTS UNDER 1 ROOF



GET THE EVENT APP



AerospaceTechWeek.com/APP

LIST OF EXHIBITORS

Abaco Systems	908	ENSCO Avionics	903	OpenAirlines	146
AdaCore	912	EUROCONTROL	714	Orlando	136
Adlink Technology	906	EVOMESURE	500	Orolia	614
Aerostrat.	143	Exsyn Aviation Solutions	200	PACE GmbH.	415
Aerospace Tech Review	1101	FlightWatching SAS	150	Parasoft	Sponsor
AD'OCC	518	FLYHT	300	PIC Wire & Cable	715
Aerospace Tech Week	1101	Gamit Limited	134	Presagis	613
Aerospace Valley	518	GE Aviation	403	QOCO Systems	142
AES Aerospace Embedded Solutions GmbH	604	GigSky	301	Ramco	400
AIM	815	Global Eagle	414	Rapita Systems Ltd.	701
AirBorn International	711	Great River Technology	611	Royal Aeronautical Society Toulouse Branch	1104
Airbus	314	Green Hills Software	602	Real-Time Innovations	805
AirInt Services	145	HCL OneTest	816	Rohde & Schwarz GmbH	Sponsor
Aitech	712	HDG Human Design Group.	518	SAFRAN	504
Altran	115	HENSOLDT	603	Scandinavia Avionics A/S	601
iCare AMS by AMC Aviation	153	Honeywell	410	ScioTeq.	608
ANSYS Inc	1002	iBASEt, Inc.	207	Seabury Solutions	148
Argus Cyber Security Ltd.	411	IFS.	201	Sita	303
Aviation ISAC	416	Inmarsat Aviation	402	Skayl	904
Aviation Maintenance Magazine	1101	Interconsulting S.r.l.	615	STEP Lab	117
AVIOBOOK	508	Interface Concept	808	Swiss Aviation Software Ltd.	133
Avionica LLC/ GE Aviation	403	ISP System	518	SYSGO GmbH	803
Avionics Support Group	409	Invest in Toulouse.	518	Techtest (HR Smith)	810
Axinom	502	iXblue	108	TECHWAY SAS.	611
Barfield Inc.	501	JetTalk	417	Teledyne Controls	412
Becker Avionics	707	Kappa optronics GmbH.	605	Teledyne e2v	702
Boeing	506	KARL STORZ NDTec GmbH	130	Teradyne.	111
CIVITANAVI SYSTEMS SRL	510	KGS Electronics	707	Testek Solutions	119
Climats	104	KRONO-SAFE	710	Thales.	507
Cobham	413	Laversab, Inc.	607	The Open Group	1004
Collins Aerospace	296	LDRA	902	Thommen Aircraft Equipment	606
CMC Electronics.	401	Lufthansa Technik.	211	TTTech	804
Comply365.	204	Lynx Software Technologies.	706	Ubisense.	147
ConsuNova	703	MathWorks	616	Ultramain Systems	407
Core Avionics & Industrial Inc.	802	MBS Electronic Systems	505	Undo.	716
Daedalean	703	MB Electronique	815	United Electronic Industries.	100
DDC-I	900	Mentor, a Siemens Business	713	(UN)MANNED	708
DextraData GmbH.	617	Mercury Mission Systems International S.A.	812	Vector	809
Digital Avionics Systems Conference	1102	Midi Caoutchouc	717	MB Electronique	815
DynamicSource AB	509	MK Test Systems	813	Vistair	210
Eikosim	518	Muirhead Avionics - AMETEK MRO.	610	Visure Solutions, Inc.	817
Element Materials Technology	116	Nolam Embedded Systems.	800	VODEA.	518
		North Atlantic Industries	815	Weigele Aerospace	503
		Novulo	151	Wind River	704
				wolfSSL.	905

EXHIBITOR DETAILS

Abaco Systems Booth 908



With more than 30 years' experience, Abaco Systems is a global leader in open architecture computing and electronic systems for aerospace, defense and industrial applications. We create innovative, modular solutions based on open standards that are characterized by outstanding price/performance, ultimate rugged reliability and minimal SWaP. With an active presence in hundreds of national asset platforms on land, sea and in the air, Abaco Systems is trusted where it matters most. www.abaco.com

AdaCore Booth 912



Founded in 1994, AdaCore supplies software development and verification tools for mission-critical, safety-critical, and security-critical systems.

Our flagship GNAT Pro development environment supports Ada, C and C++ and is ideal for applications that demand high reliability and maintainability.

AdaCore has a long and successful history supplying products to the avionics community, including several tools and run-time libraries that have been used in systems certified at the highest levels of DO-178B/C (ED-12B/C).

Adlink Technology Booth 906



ADLINK is pleased to be exhibiting at Aerospace Tech Week in Toulouse France. We will be demonstrating our FACE Conformant TSS (Transport Service Segment) software in a live aircraft tracking system using the recently mandated ADS-B data model. Our live demo will track aircraft and visualize their locations in real-time from anywhere. We will be demonstrating interoperability with another DDS ven-

dor and their TSS. Each publishing data, through our Conformant TSS's, that the other will be visualizing. Our goal is to bring greater awareness of the OMG DDS Standard as the preferred transport for future FACE applications.

Aerostrat Booth 143



Aerostrat offers a web-based platform called Aerros that enables airlines and MRO's to manage their heavy maintenance program in one place. It enables users to quickly understand allocation, yield, compatibility, production, and budget constraints. Users can quickly create multi-year heavy maintenance scenarios within these constraints and digitally publish them for users. For MRO's, Aerros can quickly forecast customer needs, future manpower needs, and manage fluctuations in workload capacity. Aerros also enables better decision making and industry-leading flexibility with its deep scenario and data clusters features. Aerostrat also offers both airline and MRO oriented data, reporting, and software consulting services.

Aerospace Tech Review 1101



Aerospace Tech Review is a quarterly aviation magazine which covers the latest developments in aircraft connectivity (air-to-ground and nose-to-tail), airline e-Enablement, IoT, Big data, digital transformation, flight operations software, fuel efficiency, MRO software, regulatory, policy, technical and next-generation challenges for avionics. The show also includes the testing systems used in the design, construction and maintenance of all commercial and military aircraft (both hardware and software).

AD'OCC Booth 518



AD'OCC is the regional economic development agency of the Occitanie

region. As such, we offer free consulting for your corporate location or partnership projects in Southern France.

Come and visit us. Let's discuss your development plans!

The Occitanie region is the world leader for civil aeronautics, home to:

- 3 aircraft manufacturers: Airbus (world HQ), ATR (world HQ) and Daher,

- 700 companies employing over 90,000 employees.

Come and join world-class companies established in Occitanie.

Aerospace Tech Week 1101



Aerospace Tech Week is the annual show which brings together the world's leading aerospace companies to discuss and develop the systems and solutions to meet the needs of the evolving commercial airline and aerospace defence & industries. Topics discussed will include the latest developments in aircraft connectivity (air-to-ground and nose-to-tail), airline e-Enablement, IoT, Big data, digital transformation, flight operations software, fuel efficiency, MRO software, regulatory, policy, technical and next-generation challenges for avionics. The show also includes the testing systems used in the design, construction and maintenance of all commercial and military aircraft (both hardware and software).

AEROSPACE VALLEY Booth 518



Aerospace Valley is the first world competitiveness cluster for the aerospace sector, serving three strategic industries - Aeronautics, Space and Drones - and covering the Occitanie-Pyrénées-Méditerranée and Nouvelle-Aquitaine regions.

With its Ecosystems of Excellence - Embedded and Communicating

EXHIBITOR DETAILS

Systems, Structures and Mechanical Systems, Propulsion and Embedded Energy, Data and Artificial Intelligence, Products and Services for the Industry – Aerospace Valley drives a supportive, competitive and attractive community aimed at fostering innovation in order to serve growth.

Ranking in the top 3 world competitiveness clusters for the performance of its cooperative R&T projects (among which 580 have already been funded), Aerospace Valley is in charge of animating a dynamic network of international reputation, composed of 850 members (industries, research labs, training centres, universities and high schools, local authorities, structures for economic development).

Since September 2017, the Aerospace Valley association is chaired by Yann BARBAUX, Senior Vice-President of Airbus and former Airbus Head of Innovation.

AES Aerospace Embedded Solutions GmbH Booth 604



AES Aerospace Embedded Solutions GmbH: Safety. Security, Agility. We deliver safe and secure solutions using trusted agile methods to meet your development needs for critical embedded systems.

AIM Booth 815



AIM is a leading designer and manufacturer of high performance test and simulation modules, embedded interfaces, databus analyzers, network analyzers and customized systems for MIL-STD-1553A/B, STANAG3910/EFEX, ARINC429, AFDX/ARINC664P7, ARINC825 (CAN bus), PANAVIA Serial Link, Fiber Channel/ARINC818 and MIL-STD-1760.

AIM's field proven, robust and mature product suite is unsurpassed in the

avionics test and simulation market and our pedigree is recognized throughout the world. Our products and services set the standard for the industry.

Establishing long term and trustful relationships with our customers and suppliers has been the key to our success.

AIM offers the customers a significant advantage by providing reliable 'State of the Art' hardware and software solutions for any phase of a commercial or military project.

Whatever the requirements are, during design & development, test & integration, production, trials & analysis, in service support & data loading; our customers trust in our expertise, capabilities and responsive pre and post sales technical support for the most demanding applications.

AirBorn International Booth 711



For almost 60 years AirBorn has been at the forefront of innovation, design and manufacture of high reliability interconnection technology. Our advanced products and proprietary technologies are used extensively throughout every continent of the world. Reliability comes as standard. We have manufacturing facilities in the USA and the UK, international operations in Europe and Asia and a proven network of dedicated world-wide distributors. In short, AirBorn is the global source for connector products and technical design assistance wherever they are needed.

Airbus Booth 314



The Airbus Services purpose is to further enhance safety in the aviation industry, strengthen our relationship with our customers and contribute to a more sustainable future.

Our team creates value by optimising aircraft safety and availability, streamlining flight operations and enhancing in-flight experience, with all the expertise of an aircraft designer and manufacturer. Building on Airbus' pioneering spirit, we collaborate with our aviation industry partners and deliver world leading aviation services powered by digital and new technologies. Our innovative services help operators make the best out of their aircraft, support MROs with maintenance activities and maximise lessors' assets whilst minimising impact on the environment.

From a fully integrated package including training, flight ops, maintenance, upgrades, dismantling & recycling, to a single adhoc solution, our complete services portfolio covers the entire aircraft life cycle from entry into service to end of life:

- Core Services: Assisting Customers to safely operate their Airbus fleet with highly skilled and dedicated teams around the world
- Optimised Aircraft Availability: Solutions to ensure safe and efficient maintenance throughout the aircraft life cycle
- Streamlined Flight Operations: Solutions to increase operational efficiency and minimise environmental impact
- Enhanced In-Flight Experience: On-board upgrade and digital solutions improving passenger and crew comfort, connectivity and experience

Airlnt Services Booth 145



Airlnt Services is a French aviation software provider created in 2011 and specialized in developing digital maintenance solutions for Airlines & MROs. Our headquarters are located in Bordeaux in the South of France, and we do also have sales offices in Paris to easily connect with all our customers.

EXHIBITOR DETAILS

We exclusively work in the aerospace industry because our background and our DNA is cabin maintenance. Indeed, we cumulate decades of experience in:

- Equipment removal, installation, modification and overhaul
- Spare part logistics, purchase and supply
- Shift for A & C checks in MROs, daily & weekly checks with airlines
- EASA Form 1 issue in PART 145 workshop

At AirInt Services, we strongly believe that, in a challenging environment where competitiveness and performance are always more important, having the modern and adequate tools to perform your missions are key to success.

This is why we are here. This is why we developed our softwares. And this is why we have several Airlines, MROs and OEMs trusting our solutions and daily using them to facilitate their maintenance activities.

Main Product:

“Cabin App” software, composed of a Mobile Application and a Web Reporting, is an innovative & powerful tool fully designed for mobility and developed to simplify aircraft cabin maintenance processes, boost maintenance productivity and enhance cabin quality.

Thanks to its exclusive process to list all equipment Part Numbers (P/N) according to their exact position in the cabin, Cabin App allow its users to:

- Easily identify P/N & report a cabin defect in a few clicks
- Reduce cabin maintenance time & cost by simplifying maintenance process
- Maximize cabin assets thanks to real-time data & actions traceability and monitoring

Aitech Booth 712



Established in 1983, Aitech offers commercial off-the-shelf (COTS) embedded computing products for rugged defense, aerospace, industrial and astronautics (space) applications. The company provides industry-standard, open architecture VMEbus, VPX, CompactPCI and high speed serial fabric-based boards and products including: Integrated COTS Computers and Subsystems, Single Board Computers (SBCs), Carrier Boards, Video and Graphic Boards, GPGPU Boards and embedded products, I/O Boards, Memory Boards, Ethernet Switches, Power Supplies, Rugged Enclosures, Development Platforms. Having pioneered the development of true military VMEbus products for use in mainstream defense and aerospace applications, Aitech utilizes its broad base of off-the-shelf products and technologies to also develop customer-specific solutions when so required, to deliver superior cost-performance and reliability, and expedite time to market. Applications for Aitech's products range from mission computers, fire control processors, mission control and autonomous robotic subsystems for ground vehicles and trains as well as surface and sub-surface naval platforms, to tactical and strategic fixed- and rotary-wing aircraft, and low- to high-earth orbit and deep space vehicles as the International Space Station and the future replacement of the space shuttle. Aitech's target customers are system integrators developing products for the defense, aerospace, industrial and commercial markets.

Altran Booth 115



Altran is the undisputed world leader in engineering and R&D services. The Group offers its customers a unique value proposition to meet their transformation and innovation challenges. Altran supports its customers, from concept to industrialization, to develop the products

and services of tomorrow. Altran has been working for more than 35 years with major players in many sectors: Automotive, Aeronautics, Space, Defense & Naval, Rail, Infrastructure & Transport, Industry & Consumer Products, Life Sciences, Communications, Semiconductor & Electronics, Software & Internet, Finance & Public Sector. In 2019, Capgemini, and Altran announced a merger project in the context of a friendly tender offer to create a global leader in “Intelligent Industry”. Altran generated €3.2 billion in revenue in 2019, with more than 50,000 employees in more than 30 countries. www.altran.com

iCare AMS by AMC Aviation Booth 153



iCare AMS® is a cost effective M&E, CAMO, MRO and Logistic & Purchase software solution dedicated to Airlines and Maintenance Repair Organizations.

It is entirely designed in accordance with the requirements of EASA part M sub-part G regulation and EASA part 145 and is successfully operating within several Airlines and acquired the approval of the most respective Airworthiness Authorities.

ANSYS Inc Booth 1002



If you've ever seen a rocket launch, flown on an airplane, driven a car, used a computer, touched a mobile device, crossed a bridge or put on wearable technology, chances are you've used a product where ANSYS software played a critical role in its creation. ANSYS is the global leader in engineering simulation. Through our strategy of Pervasive Engineering Simulation, we help the world's most innovative companies deliver radically better products to their customers. By offering the best and broadest portfolio of engineering simulation software, we help them solve the most complex design challenges and create products limited only by imagination. Founded

EXHIBITOR DETAILS

in 1970, ANSYS is headquartered south of Pittsburgh, Pennsylvania, U.S.A., Visit www.ansys.com for more information.

Argus Cyber Security Ltd Booth 411



The more aircraft are connected, the more vulnerable they are to cyber attacks. Today's modern, e-Enabled aircraft come with advanced ethernet and can-based network architectures which drive business, but subject airlines and passengers to cyber risks. Argus helps commercial aviation companies to prevent, understand and respond to cyber attacks on connected aircraft.

Aviation ISAC Booth 416



The Aviation ISAC is the international consortium for cybersecurity intelligence sharing to build a safe, secure, efficient, and resilient global air transportation system.

We are an international, non-profit membership association created to facilitate the timely exchange of vulnerabilities, threat intelligence, and best practices to reduce operational risks and provide the means for trusted sharing and professional exchange.

With members on five continents, the A-ISAC fosters the foundation of trust underpinning aviation-focused cyber threat intelligence and information sharing designed to better protect global aviation businesses, operations, and services. Membership in the A-ISAC is open to trusted private sector global aviation companies.

Aviation Maintenance Magazine Booth 508



Aviation Maintenance Magazine is the leading magazine to cover MRO, Upgrade and Refurbishment on Com-

mercial, Business, General Aviation and Military Aircraft Globally.

AVIOBOOK Booth 508



AVIOBOOK, a Thales Group company, supports airlines as a partner in their digital strategy. AVIOBOOK offers a comprehensive and highly integrated suite of ground and flight applications, systems and solutions that connect all stakeholders and key assets in a safe and secure manner. This, combined with expertise in data and cyber security, gives airlines an edge through greater efficiency and ultimately sustainable, profitable growth

Avionica LLC/ GE Aviation Booth 403



Based in Miami, Avionica has spent 28 years improving aviation safety and efficiency with its miniQAR, Onboard Network Server (ONS), Remote Data Concentrator (RDC), 4G Wireless GSE Module, WiFi, Iridium SATCOM and avSYNC service that automatically downloads flight data to a land-based server. Avionica is driving the industry's shift towards e-Enablement and connectivity for the cockpit and cabin services. We take pride in our products, service and customer support and strive to delight our customers.

Avionics Support Group Booth 409



Avionics Support Group, Inc. (ASG) is a premier Avionics Systems Integration & AS9100D/FAA-PMA approved Aerospace Manufacturing company. ASG's competitive advantage can provide your company with a Single Source Solution for avionics engineering, manufacturing, aircraft installation technical support, Supplemental Type Certificate (STC's), SATCOM, and much more. We lead the aerospace industry with our US patented Constant Friction Mount (cfMount™), Integrated Power Supplies,

and iPad EFB Cradles. So Contact ASG Today to learn how ASG's Single Source Solution can work for your company!

Axinom Booth 502

Axinom!

Axinom serves the aerospace industry with products focusing on management, delivery, deployment, and security of digital services and media content. Our innovative solutions have powered some of the biggest aviation companies to solve complex challenges in entertainment, on-board connectivity, IoT, crew solutions, content security, and much more.

Axinom offers a range of solutions, customized or standardized, built on core products that cover both on-ground and on-board components. Our products span in-flight services (IFS), content management (Axinom CMS), content delivery and synchronization (Axinom CDS), and content protection with multi-DRM (Axinom DRM).

With integration possibilities with the crew or passenger portals, and multiple third-party or own systems, Axinom provides many new avenues for personalization and monetization.

The solutions are widely used for wireless seatback or wireless IFE, live TV, destination services, e-commerce, connectivity, and integration of on-board IoT, predictive maintenance, and health monitoring systems.

Founded in 2001, Axinom is privately owned and operated. It employs over 160 highly-skilled personnel in Germany, Estonia, the US, and Sri Lanka.

Barfield Inc Booth 501



Founded in 1945, Barfield has six facilities located near airports in Miami (MIA), Phoenix (PHX), Louisville (SDF), Atlanta (ATL), Doral (MIA) and Medley (MIA), to

EXHIBITOR DETAILS

satisfy the needs of customers operating commercial or regional aircraft in North, Central and South America. Barfield is part of the Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) network, a major MRO provider. With a workforce of 14,000, AFI KLM E&M offers technical support for airlines, ranging from airframe maintenance to engine overhaul and repair and supply of components. Barfield is an FAA and EASA Certified Repair Station offering maintenance services to major passengers, cargo and regional airlines in the Americas. Barfield's support services are organized into the following three main activities: Adaptive services, Distribution and Ground Support Test Equipment (GSTE). Barfield is also an authorized repair facility for major European and U.S. Original Equipment Manufacturers (OEMs). More specifically, through its Airline programs division, Barfield supplies complete customized support programs for Airbus, Boeing, Regional jet and Turboprop aircraft, as well as helicopter operators. These programs support operators in need of inventory, logistics solutions, repair management programs, engineering fleet support and component reliability management. Barfield is also a GSTE manufacturer of Air Data/Pitot Static testers, RVSM Air Data testers, Cable Tensiometers testers, Fuel Quantity testers, Pressure testers, Nav/Comm Transponder test sets, Pitot/Static Adapters and Turbine Temperature testers.

Becker Avionics Booth 707



Becker Avionics is a privately held German high-tech company that develops, manufactures and distributes the latest communications, navigation, surveillance and search & rescue equipment for airborne and ground operations. The company is a leader in digital avionics technology and has a long standing history of over 60 years in providing equipment to general and corporate aviation, air traffic control, law

enforcement and military organizations around the world.

Boeing Booth 506



Boeing is the world's largest aerospace company and leading provider of commercial airplanes, defense, space and security systems, and global services. As the top U.S. exporter, the company supports commercial and government customers in more than 150 countries. Boeing employs more than 150,000 people worldwide and leverages the talents of a global supplier base. Building on a legacy of aerospace leadership, Boeing continues to lead in technology and innovation, deliver for its customers and invest in its people and future growth.

CIVITANAVI SYSTEMS SRL Booth 510



Civitanavi Systems is a High-Tech Italian company fully dedicated to design, develop and manufacture a wide range of performance-scalable and ITAR-Free geo-reference, stabilization and Inertial Navigation Systems (INS) based on Fiber Optic Gyro (FOG) designed, developed and manufactured internally.

Climats Booth 104



Climats has been a french specialist in environmental test over 45 years.

Climats designs and manufactures chambers that can simulate extreme and reproducible environments such as hot-cold-humidity chambers fast temperature variation, vibration chambers, benchtop, thermal shock, salt spray walk-in and customised products.

Cobham Booth 413



Cobham is a market leading provider of radio and satellite communication equipment at the forefront of the connected cockpit revolution, delivering avionics, connectivity and satcom solutions for the aviation sector. Cobham will be showcasing its latest tech including AVIATOR S, which provides secure segregated Cockpit Safety, IP data and voice communications over the Inmarsat SwiftBroadband-Safety (SB-S) satcom network.

Collins Aerospace Booth 296



Collins Aerospace, a unit of United Technologies Corp. (NYSE: UTX), is a leader in technologically advanced and intelligent solutions for the global aerospace and defense industry. Created in 2018 by bringing together UTC Aerospace Systems and Rockwell Collins, Collins Aerospace has the capabilities, comprehensive portfolio and expertise to solve customers' toughest challenges and to meet the demands of a rapidly evolving global market.

CMC Electronics Booth 401



CMC Electronics (www.cmcelectronics.ca) has achieved an international reputation for innovation and excellence in the design and manufacture of cutting-edge cockpit systems integration, avionics and display solutions for the military and commercial aviation markets. Based in Montreal, Canada, the company has facilities in Canada and in the USA serving its customers worldwide.

Comply365 Booth 204



Comply365 is the leading provider of enterprise SaaS and mobile solutions for content management and document

EXHIBITOR DETAILS

distribution in highly regulated industries including aviation, rail, and energy. Comply365 supports the world's most mobile and remote workforces with personalized and targeted delivery of job-critical data that enables safe, efficient, and compliant operations. Every day, hundreds of thousands of pilots, flight attendants, maintenance technicians, rail conductors and engineers, as well as energy workers, rely on Comply365 for digital delivery of operational content, including OEM and internal company manuals. Having played an instrumental role in the regulatory approval of electronic flight bags (EFB) to replace the traditional, paper-based, pilot flight bags, Comply365 partners with clients to transform their industries.

Comply365 offers a new approach to manage operational manuals and other documents that enables safe, efficient, and compliant operations in highly regulated industries such as aviation and rail.

The Comply365 content management and document distribution platform improves operational efficiency, compliance, and end-user effectiveness through an integrated solution that covers the entire document lifecycle from authoring to personalized and targeted distribution of your content.

An Integrated and End-to-End Solution

ConsuNova Booth 703



There is a name for best in class certification and compliance engineering services: ConsuNova. Practical, cost-effective and optimized solutions for the aerospace and defense industries including training, strategic compliance consultancy and certification liaison for DO-178C, DO-254, ARP 4761, ARP 4754A and other avionics standards.

Core Avionics & Industrial Inc. Booth 802



Core Avionics & Industrial Inc. ("CoreAVI") is a pioneer in the military and aerospace sector with a proven track record in providing entire software and hardware IP platform solutions that enable safety critical applications. A global leader in architecting and supplying real-time and safety critical graphics, compute, and video drivers, "program ready" embedded graphics processors, and DO-254/ED-80 certifiable COTS hardware IP, CoreAVI's suite of products enables the design and implementation of complete safety critical embedded solutions for aerospace, automotive, and industrial applications that achieve the highest levels of safety certification with long-term support. CoreAVI's solutions are deployed in commercial and military avionics systems, and support rapidly emerging compute applications in the automotive, unmanned vehicle, and internet of things markets. CoreAVI's products may be purchased with certification data kits for the most stringent levels of safety certification, including RTCA DO-254/DO-178C, EUROCAE ED-80/ED-12C, and ISO 26262. www.coreavi.com

Daedalean Booth 703



Daedalean was founded in 2016 by a team of engineers who earned their marks at companies like Google and SpaceX. Its team includes 20+ software engineers, as well as avionics specialists and pilots. Daedalean works with major eVTOL companies and leading aerospace manufacturers to specify, build, test and certify a fully autonomous sensor and autopilot system that can reliably and completely replace the human pilot. It has developed systems demonstrating crucial capabilities on a path to certification for airworthiness. Currently the company is working with EASA on an Innovation Partnership Contract to develop concepts of design assurance for neural networks.

DDC-I Booth 900



DDC-I provides DO-178C certifiable software and tools for safety critical avionics. Deos™ is a time and space partitioned RTOS, which has been certified to DO-178 Design Assurance Level A (DAL A) since 1998. Developed from day one using DAL A plans and procedures, Deos features hard real-time response, superior multicore technology, industry standard ARINC653 and FACE Safety Base APIs, and shared resource partitioning to deliver the highest CPU utilization and performance possible in the industry. Additionally, Deos' innovative SafeMC technology for multicore processors is unmatched, delivering maximum safety-critical performance across multiple cores.

Some key advantages of Deos are:

DO-178 Certification Artifact Reuse Through Software Modularity (leveraging certification credit from prior certifications)

Industry Leading SafeMC™ Technology for Safety Critical Systems on Multicore Processors

Time & Space Partitioning (allows mixed levels of criticality running on the same device)

Extensive Certification Pedigree (Certified to DAL A Since 1998)

Patented Slack Scheduling Technology (allows for full processor utilization)

Scalable from Simple LRUs to Complex IMA Systems

ARINC-653, Priority Preemptive, and/or Rate Monotonic Scheduling Available

Industry Standard Application Programming Interfaces (API's) ARINC-653 & POSIX

EXHIBITOR DETAILS

DextraData GmbH Booth 617



Following agile principles, fast and according to individual requirements – this is how we at DextraData develop our software solutions. Our clients benefit from years of experience and the broad spectrum of our portfolio. As an owner-managed IT consulting company and independent software vendor, we have been supporting our clients with IT solutions for 25 years. Our team also brings more than 15 years of experience in the aviation industry.

In 2002, Logipad, an »Electronic Flight Bag« solution developed in-house, was launched. Logipad Electronic Flight Bag is the right choice if you are looking for a highly customizable, flexible, and comprehensive information management solution. The complete solution package focuses on three main areas: Briefing, Documentation, and eForms which support your processes before, during, and after the flight. In addition, it helps you to support and enhance existing business processes.

The EFB application with its administrative environment integrates seamlessly into existing IT infrastructures. Logipad provides interoperational functionalities with homogeneous IT infrastructures such as data exchange with third-party server systems as well as data exchange with existing applications on the client side.

Providing efficient process support is our guiding principle and it is important to us to understand the business of our customers and their requirements. For these reasons, we are in regular dialogue with our customers. Our work does not end with the implementation; we accompany our customers beyond it. We continuously ask for feedback and directly optimize our solution according to the individual requirements.

Digital Avionics Systems Conference Booth 1102



The 39th Digital Avionics Systems Conference (DASC) promises to continue its rich tradition as the preeminent R&D Conference in the field of digital avionics offered. In addition to the increasingly diverse background of attendees and relevant technical topics discussed, the conference offers a conducive environment for educational and recreational opportunities for everyone to explore. We are positive that you will have a memorable and educational experience at the 39th DASC.

DynamicSource AB Booth 509



DynamicSource Performance is the next generation suite of applications for pilots, dispatchers and flight operations engineers for take-off, dispatch landing and time of arrival landing aircraft performance calculations. We have an in-depth knowledge of airline flight operations and advanced system development within EFB and Flight Operations. DynamicSource provides user centric solutions with the high reliability demanded by the aviation industry. We have supplied systems to airlines since 2009, we look forward to partner with you to meet the future demands and challenges of the industry together. The company was founded by people who themselves work in the aviation industry both on the flight deck and in the back office. With the help of a team of talented engineers and programmers they challenged an otherwise conservative industry with innovative and modern solutions.

EikoSim Booth 518



EikoSim is a start-up founded in 2016 after several years of research, by Florent MATHIEU and Renaud GRAS, two PhDs in mechanics from the LMT in Cachan, one of the most prestigious mechanical laboratories in Europe.

Since 2018, we have been developing and marketing EikoTwin, a software suite designed to reduce the gaps between tests and simulations, in particular by seeking to reduce risks within the validation phase of the design digital thread, in order to help build more predictive models. Thanks to the use of digital image correlation technology (DIC), we are able to image mechanical tests in order to measure the displacement fields of the visible surfaces directly on the finite element mesh of the tested parts.

The second step of the process is the creation of a Digital Twin, where simulation and test data are expressed on the finite element mesh. The test-simulation comparison becomes immediate, and the validation of simulations easier and faster. Calibration of the model is enabled by integrating new measured boundary conditions into the simulation model, but also by parameter identification.

Our software solution is now implemented in various industrial customers in the aeronautics, aerospace, defense and automotive sectors as well as in university research laboratories, thus validating the relevance of our offer, particularly with test & simulation teams and design offices.

Element Materials Technology Booth 116



Element delivers a comprehensive range of testing, inspection and certification services to the global Aerospace; Transportation, Fire, Oil & Gas and Infrastructure sectors.

Our team of more than 6,700 Engaged Experts operate out of more than 189 laboratories in more than 33 countries on five continents strive every day to help our customers to develop better products; get to market on time, save time and money and minimize the risk associated with their materials and product development activities.

EXHIBITOR DETAILS

We exist to help our customers to make certain that the materials and products we test and certify for them are safe, quality, compliant and fit for purpose.

That is the Certainty of Element.

ENSCO Avionics Booth 903



For more than 35 years, ENSCO Avionics has developed sophisticated airborne systems for the aerospace industry to meet DO-178C/ED-12, DO-254/ED-80, DO-278A/ED-109, DO-326A, DO-355, DO-356 and military standards including F-35 SEAL, for manned and unmanned systems. Currently, ENSCO Avionics supports regulatory organizations with developing requirements and guidelines for technology disruption to our aerospace industry including multi-core processors, and avionics cyber to maintain airworthiness for developing systems and markets such as Urban Air Mobility (UAM) and commercial space. Our focus is on safety- and mission-critical software and programmable hardware engineering solutions, display application development, tailored synthetic vision applications, integration test solutions, and the IData® Tool Suite. ENSCO Avionics, based in Endicott, N.Y., is a wholly owned subsidiary of ENSCO, Inc.

Learn more: <https://www.ensco.com/avionics>

EUROCONTROL Booth 714



EUROCONTROL is the European Organisation for the Safety of Air Navigation. Founded in 1960, it is an international organisation working for seamless, pan-European air traffic management. EUROCONTROL coordinates and plans air traffic control for all of Europe. This involves working with national authorities, air navigation service providers, civil and military airspace users, airports, and other organisations. Its activities involve all gate-to-gate air navigation service operations: strategic

and tactical flow management, controller training, regional control of airspace, safety-proofed technologies and procedures, and collection of air navigation charges.

EVOMESURE Booth 500



Supplier of Innovative Equipment:
Aerodynamic, Fluid Mecanic, Avionic.

EvoMeasure, provider of physical and consultative solutions to your measurement problems, offers electrical metrology instruments for temperature, pressure scanners and flow control. The new company is the exclusive supplier for the Scanivalve, Guildline, Vectoflow and Evolution Measurement brands.

We also provide avionic devices with DMA.

Exsyn Aviation Solutions Booth 200



EXSYN Aviation Solutions is an industry recognized partner for aircraft airworthiness management & data solutions. Driven by the purpose of supporting airlines and MRO's to adapting to an increasingly digital aviation world, EXSYN's capabilities have grown from an aviation consulting firm to an aviation IT and managed service provider. EXSYN's offering of applications and services is specialized for the fields of aircraft data management, data analytics & aircraft data processing.

Our solutions are driven out of real airline use-cases and focus on aircraft reliability management, predictive maintenance, data processing and managed services for data migration, aircraft data optimization, and robotic process automation.

AVILYTICS:

Increase fleet availability & reduce AOG with Avilytics, the reliability management and predictive software tool used by Engineering & Maintenance.

Avilytics covers the entire value chain within maintenance and engineering and includes the following suites: AOG Risk Prediction, Reliability Engineering, Logistics, E&M KPI and Engine Health Monitoring. By using Avilytics you get instant insights in your fleet status, reliability, organizational performance and aircraft risk profiles with the aim to reduce AOG's and achieve optimal fleet availability against the lowest costs.

FlightWatching SAS Booth 150



In 2013, convinced of the potential of a unique feature embedded on all aircraft types, two engineers that previously worked at the Airbus flight test department created FlightWatching, a privately owned start-up.

FlightWatching has developed a ground based software platform that interfaces with aircraft in real time during flight to identify abnormal scenarios and predict degradation. Their solution makes it possible to anticipate servicing actions to avoid the occurrence of unplanned costly alerts. Predictable outages that prevent flight delays and cancellations are avoided. They increase the lifecycle of engines, APUs and detect abnormal behaviors on systems before an alert appears in the cockpit. They control the use of planes so that they can last longer providing more flexibility to airlines.

FlightWatching screened their first aircraft in 2013 and built a preventive diagnostic software platform. Focusing at first on engines and APUs installed on Airbus and Boeing aircraft (more than 40% of direct maintenance costs), customer results exceeded all their expectations with a 20% savings on engine maintenance costs.

Engine / APU overhaul are usually imposed by manufacturers or MRO further to sensed alerts transmitted by the aircraft. Airlines are looking to postpone revisions and reduce customer notification requests that require engine removal/inspections and disrupt

EXHIBITOR DETAILS

flights. Airlines also seek to maximize the use of limited-life parts that are very expensive to replace. Flightwatching will reduce the number of revisions and thus reduce maintenance costs for both airlines and engine / MRO.

Flightwatching provide services to find the key aircraft parameters that customers would never have imagined to exist. They offer to customers: data acquisition and analysis algorithms on aircraft systems they are having trouble with so that they can predict and get alerted before anything appears in the cockpit. FlightWatching's expertise in avionics allows to identify all observable data on all in-service aircraft worldwide (old models or latest generation) and whatever their manufacturer.

They provide affordable solutions to spread on fleets without any aircraft modification: → we get the best out of what is already available →^a

→ We make your data come alive →

FLYHT Booth 300



FLYHT's unique ability to capture, process, and transmit data, coupled with real-time alerts provides airlines with direct insight into the operational status and health of their aircraft and enables them to take corrective action in order to maintain the highest standard of operational control.

Gamit Limited Booth 134



Gamit was founded in 1990 with the purpose of providing technical support to operators, MRO's and leasing companies.

The spectrum of support includes:

Digitalised airworthiness records

Spare parts

Technical support

Records auditing

On site representation

Through years of experience, Gamit developed ROAM - the aviation industry's best airworthiness records management solution. ROAM is an online enterprise solution. ROAM uses the most advanced technologies in the World to deliver the best aviation specific document management solution in the aerospace market.

GE Aviation Booth 403



GE Aviation is a world-leading provider of commercial, military and business and general aviation jet and turboprop engines and components as well as avionics, electrical power and mechanical systems for aircraft. GE has a global service network to support these offerings. GE and its customers are also working together to unlock new opportunities to grow and deliver more productivity beyond traditional services. GE Aviation is becoming a digital industrial business with its ability to harness large streams of data that are providing incredible insights and in turn, real operational value for customers.

GigSky Booth 301



GigSky provides on-demand seamless global connectivity to any mobile device anytime, anywhere needed. We deliver a best-in-class user experience for consumers, businesses and enterprises, while eliminating the high fees associated with roaming. Whether you need mobile data access for IoT, 3rd party devices or wearables, we have you covered. Our patented eSIM technology gives you access to truly global data through local connectivity. Our

innovative products include business and enterprise mobile data management solutions, IoT solutions, the GigSky global SIM card and app, and GigSky for Apple SIM. GigSky facilitates and streamlines mobile connectivity to deliver a service that is truly global, flexible, scalable and intelligent. Our vision is to be faster, better and more customer-focused than our competitors and to be the provider of choice for any person, company or entity that requires mobile connectivity.

Global Eagle Booth 414



Global Eagle is a leading provider content, connectivity and data analytics to markets across air, sea and land. Global Eagle offers a fully integrated suite of rich media content, seamless connectivity solutions and operational data analytics to airlines, cruise and yacht operators and remote land locations. With approximately 1,500 employees and 50 offices on six continents, the company delivers exceptional service and rapid support to a diverse customer base.

Find out more at: globaleagle.com.

Great River Technology Booth 611



Great River Technology is the global leader in development tools and flyable products for ARINC 818, the Avionics Digital Video Bus. Engineers in commercial and military aviation worldwide tap GRT's expertise and products to simplify design, implementation, and testing of mission-critical high-speed video and data transmission. The company was at the table when ARINC 818 was created, and its innovations drove the protocol's 2013 upgrade. GRT offers training and certification in ARINC 818.

EXHIBITOR DETAILS

Green Hills Software Booth 602



Green Hills Software is the worldwide leader in safety and security for the avionics and embedded marketplace. For 38 years, Green Hills has helped companies solve the most demanding design challenges by delivering its unmatched knowledge, cross-industry expertise, and a proven product portfolio.

Green Hills Software products include the INTEGRITY RTOS technology, MULTI Integrated Development Environment, middleware, optimizing compilers and hardware debug probes.

In combination with a suite of end-to-end embedded security and device lifecycle management products from INTEGRITY Security Services (a Green Hills Software company), Green Hills Software leverages expertise in the design of products to the world's highest levels of certified safety and security.

Avionics software architects can develop and deploy next-generation systems with confidence while reducing cost and complexity.

For more information, visit www.ghs.com.

HCL OneTest Booth 816



HCL OneTest supports functional, performance and integration testing throughout a project lifecycle. It features a script-less, wizard-driven test authoring environment and support for more than 100 technologies and protocols.

HCL OneTest belongs to the DevSecOps product domain of HCL Software which is a division of HCL Technologies (HCL) that operates its primary software business. It develops, markets, sells and supports more than 20 product families

in the areas of DevSecOps, Automation, Digital Solutions, Data Management, Marketing and Commerce, and Mainframes. HCL Software has offices and labs around the world to serve thousands of customers. Its mission is to drive ultimate customer success with their IT investments through relentless innovation of its products.

HDG Human Design Group Booth 518



We connect Human & Technologies :
Smart, Simple, Safe®

Through our expert human-centered approaches, Human Design Group helps its clients create the conditions for the success of their transformation and innovation processes through high-value usage solutions.

Human Design Group puts Humans at the heart of aeronautical performance :
Smart factory / MRO / Training / Cockpit / Cabine / ATM

Human Design Group - Key point:

- + Pioneer and French leader
- +100 human science consultants: digital ergonomics, UX design, human factor, neuro sciences
- +40 years of experience
- +30 large customer groups

Human Design Group is the missing link of your competitiveness !

HENSOLDT Booth 603



HENSOLDT is a global high-tech pioneer in the area of defence and security electronics. We are a market leader in civilian and military sensor solutions. In addition, we develop new products for data management, robotics and cyber security by crosslinking existing expertise with software solutions. With

a workforce of some 4,400 employees, HENSOLDT generates revenues of more than 1 billion euros per year.

Honeywell Booth 410



With over 100+ years of proven aviation expertise and maintenance, and deep domain knowledge, Honeywell Aerospace offers the full range of connectivity and optimization solutions. Our team of Solutions Architects will be discussing the Connected Aircraft: from cabin and cockpit connectivity solutions to our advanced data analytics platform. View a hands-on demonstration of the new Honeywell Forge for Aircrafts platform which helps airlines improve operational efficiency and aircraft performance while increasing passenger safety.

iBASEt, Inc. Booth 207



iBASEt is a leading provider of manufacturing, quality, and sustainment solutions that enable the digital enterprise. With 30+ years of experience in highly engineered, regulated industries including Aerospace and Defense, iBASEt simplifies the complex by empowering customers to gain real-time visibility, take control, and drive velocity across their operations and extended value chain.

iBASEt's Maintenance, Repair and Overhaul (MRO) optimizes the execution of scheduled and non-scheduled maintenance operations, along with detailed planning and tracking of MRO workflows. iBASEt works closely with industry-leaders, including Lockheed Martin, Northrop Grumman, Rolls Royce, Pratt & Whitney, and Belgian Engine Center. Learn more at www.ibaset.com.

IFS Booth 201



IFS is a leading software vendor to the Aerospace & Defense sector globally.

EXHIBITOR DETAILS

We provide full-spectrum enterprise, project & program-centric manufacturing software to tier 1, 2 and 3 manufacturers & vendors serving the A&D sector.

IFS has extensive knowledge of the A&D industry. Independently recognized as a leading, global supplier of enterprise software, we provide solutions for:

Aerospace and defense manufacturing

Commercial aviation

Defense

Fleet and asset management

Military logistics

Services and performance-based logistics

Our aerospace and defense industry experts are committed to ensuring the future success of our customers by providing best-in-class solutions and industry expertise to prepare them for what's next.

Inmarsat Aviation Booth 402



Inmarsat Aviation is the leading provider of global satellite communications to airlines, private jet operators, aircraft leasing companies and passengers across the globe. It offers a range of powerful aviation connectivity solutions, from vital operations and safety communications for pilots and crew, through to high-speed, reliable broadband for passengers in the cabin. With more than 25 years' experience in aviation connectivity, Inmarsat Aviation's solutions are renowned for their innovation and performance. The award-winning GX Aviation, European Aviation Network (EAN), Jet ConneX and Swift-Broadband-Safety (SB-S) offerings have become industry benchmarks in their fields.

Interconsulting S.r.l. Booth 615



Interconsulting is a System Engineering Company founded in 2001, leading in design and development of embedded systems and high-tech solutions. The combination of high profile skills, experience, and in-depth knowledge of application domains, give to this private Italian SME the ability to cover almost all Embedded Engineering markets. This makes Interconsulting a leader in the development and integration of Embedded Real Time components for Mission and Safety Critical Systems.

Interconsulting has an internal organization able to lead and manage collaborations in different research projects at national and international level, both in civil and military fields. Nowadays Interconsulting is Consortium Leader of Odessa EU Clean Sky 2 Project.

The active participation in research consortia has thus created the conditions to get in touch with prestigious universities and research centres, promoting initiatives, developing innovative ideas, and triggering a virtuous circle, able to attract the interest of important European industrial realities.

The Research & Development activity is considered strategic and strongly oriented to meet the needs of the market in terms of process but especially products.

In our constant growth, we have created and continue to create new professional opportunities, attracting resources that share our passion for innovation.

Interface Concept Booth 808



Founded in 1987, Interface Concept has been developing and manufacturing Commercial-Off-The-Shelf (COTS) Single Board Computers, FPGA boards and Ethernet switches for Industrial and Mil-Aero applications.

The company markets Commercial Off-The-Shelf (COTS) board-level products, based on industrial standards (3U/6U VPX, cPCI, VME, FMC, XMC, PMC) and high-end technologies.

ISP System Booth 518



ISP System is a specialist of electrical embedded actuators for aeronautic, space and defense markets.

ON-OFF or smart actuators, motor customized, DO160 or MIL-810 certified

Design, qualification and manufacturing services for mechanic, electronic and firmware

Invest in Toulouse Booth 518



Toulouse is the cradle of aeronautics industries with :

- * 2 aircraft manufacturers : Airbus and ATR
- * international OEMs (R&D, design and manufacturing of their equipment's)
- * and a large array of SME's

Additionally, Toulouse is also the Capital of Space with the French Space Agency (CNES), Thalès Alenia Space and Airbus Defence & Space, and fosters new kinds of transportation, which offers a large range of potential industrial partnerships.

Invest in Toulouse helps international companies to successfully set up in Toulouse since 2013. With a core of experienced consultants, the agency provides free and confidential assistance during each step of your company's local development.

Customized case-to-case guidance includes :

- provision of viable economic information and business opportunities

EXHIBITOR DETAILS

- support in recruiting, public funding, site-selection or immigration procedures
- as well as an introduction into a strong local network to boost your project launch

iXblue Booth 108



iXblue is a global high-tech company specializing in the design and manufacturing of advanced autonomy, photonics and marine technologies. The group in-house expertise includes innovative systems and solutions devoted to inertial navigation, subsea positioning, underwater imaging, as well as test & simulation. iXblue technologies support Civil and Defense customers in carrying out their space, land and sea operations with maximum safety, efficiency and reliability. Employing a workforce of 650 people worldwide, iXblue conducts its business in over 60 countries.

JetTalk Booth 417



JetTalk's In-Flight-Connectivity (IFC) solutions bring the market disruptive satellite communication technology and capabilities for various aerial narrow to wide body platforms. JetTalk's software defined antenna solutions present the optimal blend of thin form factor, lightweight, scalable size, future-proof, multibeam and multi satellite operation. JetTalk is a Joint Venture Company between SatixFy UK Limited and ST Electronics (Satcom & Sensor Systems) Pte. Ltd.

Kappa optronics GmbH Booth 605



Cameras and Vision Systems for Anything that Drives or Flies.

KAPPA has 40 years of experience with cameras and vision systems in rugged and certifiable design for anything that

drives or flies. We ensure maximum performance of higher level systems with innovative solutions for day and night operation and lightweight SWaP-C optimized cameras for indoor/outdoor use. Close collaboration with our major aviation clients sets the course for demand-oriented development.

We are not only leaders in technology. Moreover, we meet all safety requirements on design assurance procedures in hard- and software development, qualification and certification (DO-254 and DO-178 through DAL B, DO-160, MIL STD 810/704, and NATO Supplier Code C4792). KAPPA is one of very few EN/AS 9100-certified camera suppliers with 21G competencies under the supervision of a major OEM.

KARL STORZ NDTec GmbH Booth 130



KARL STORZ NDTec is an NDT solution provider offering quality products for visual inspection and maintenance of technical objects, particularly difficult-to-access cavities. Our portfolio includes videoscopes, rigid and flexible endoscopes, cameras as well as documentation and measuring systems – complete equipment for precise inspection, reliable analysis and detailed documentation, combined with high service availability. We support customers in various inspection applications in many industry segments including the aerospace industry.

KGS Electronics Booth 707



KGS Electronics has been designing and manufacturing AC and DC solid state power conversion products since 1959. Our company pioneered the application of solid state static inverters for aerospace applications and today provides advanced airborne certified AC and DC power conversion products to both civil and military aviation customers worldwide.

We have a full line of airborne 400Hz and 50/60Hz static inverters, voltage/frequency converters, DC to DC power converters, light dimming power supplies and AC to DC power supplies designed for a variety of aerospace & military applications such as cockpit, cabin, galley, navigation, radar, special mission, medical and lavatory.

KRONO-SAFE Booth 710



KRONO-SAFE develops and markets a tool chain named ASTERIOS®. The engineering tool suite ASTERIOS includes a DO-178C DAL-A certifiable real-time kernel (RTK) for safety-critical real-time embedded systems. ASTERIOS provides an IDE to simulate exhaustively the application's time behavior, to generate automatically the run-time scheduling and to deploy the runnable on any single or multi-core hardware platform. ASTERIOS can be linked to a model based design tool to offer a complete integrated environment.

KRONO-SAFE serves markets in need of a safer and more efficient solution to develop complex real-time embedded applications. These extend to both well-established markets such as aerospace, defense, automotive, industrial automation, transportation, energy, medical and new markets springing up where safety and security converge like the Industrial Internet of Things. KRONO-SAFE is currently based in France.

Laversab, Inc. Booth 607



LAVERSAB, INC. builds Air Data Test Sets and Avionics Radio Test Systems. Laversab products are reliable, affordable, and innovative, and they include exceptional support from a worldwide network of service centers.

EXHIBITOR DETAILS

LDRA Booth 902



For more than 40 years, LDRA has developed and driven the market for software that automates code analysis and software testing for safety-, mission-, security-, and business-critical markets. Working with clients to achieve early error identification and full compliance with industry standards, LDRA traces requirements through static and dynamic analysis to unit testing and verification for a wide variety of hardware and software platforms. Boasting a worldwide presence, LDRA is headquartered in the United Kingdom with subsidiaries in the United States, Germany and India coupled with an extensive distributor network. For more information on the LDRA tool suite, visit www.ldra.com

Lufthansa Technik Booth 211



The Lufthansa Technik Group, with more than 35 subsidiaries and affiliates, is the world's leading provider of technical services for the aviation industry and covers the entire process chain of the MRO (maintenance, repair & overhaul) business. Lufthansa Technik's range of products and services encompasses the entire service spectrum for commercial as well as VIP/Special Mission aircraft, engines, components and landing gear in the fields of digital fleet management, maintenance, repair, overhaul, modification, fitting out and conversion, along with the manufacture of innovative cabin products. More than 25,000 employees serve the internationally certified maintenance, production and development company. With a turnover exceeding 5.9 billion euros in 2018, the company now has more than 850 customers. In total, Lufthansa Technik currently supports more than 5,000 aircraft worldwide.

Digitalization is in the focus of Lufthansa Technik to create new business and to meet the challenges of the future MRO market. The company grasped this trend very early and is now continu-

ing its consistent progress on multiple levels in the digitalization of processes. One of the core products in this area is AVIATAR, an open, neutral and modular digital platform. In a secure web-based environment, AVIATAR serves as an integrating hub for digital fleet solutions in the aviation industry, with a focus on the technical and operational side of the airlines.

Lynx Software Technologies Booth 706



Lynx Software Technologies develops advanced kernel technology that empowers companies to create the most safe, innovative, and secure systems in the world. The LynxOS-178 RTOS is the first and only hard real-time DO-178 level A operating system to offer the interoperability benefits of native POSIX PSE53/54 and FACE APIs with support for the ARINC 653 Application EXecutive (APEX). The LynxOS-178 RTOS is also the first and only time- and space-partitioned, FAA-accepted Reusable Software Component (RSC). When the aviation-grade safety of LynxOS-178 is combined with the military-grade security of the LynxSecure Separation Kernel Hypervisor, the increased safety and security requirements of next generation avionics systems can be achieved. Lynx MOSA.ic™ is a software development framework for rapidly building robust software systems out of independent application modules. Since its announcement in 2019, the product has gained adoption in the Aerospace and Defense industries, including a public adoption for the technology refresh program on the U.S. F-35 Joint Strike Fighter.

MathWorks Booth 616



MathWorks is the world's leading software vendor for Technical Computing and Model-Based Design. Aerospace and defense companies worldwide rely on MATLAB and Simulink across

all technology readiness levels, from prototypes to their most important safety and mission critical systems (up to and including DAL-A software). MathWorks products are used in major programs across all domains, accelerating research and development in areas like autonomous systems, hypersonics, advanced wireless systems, and hybridization and electrification of aircraft.

Digital engineering with Model-Based Design helps to reduce program risks through early design simulation and code generation. Simulink's systems engineering tools also establish a digital thread, providing traceability between requirements, architecture, design, auto-generated code, and test artifacts. This ensures design completeness and eases change management of complex systems, all within the same environment, and supporting Aerospace certification requirements.

Engineers are also using MATLAB and Simulink to develop AI solutions to make earlier predictions and improve decision making, from predictive maintenance and digital twins to tasks like multimodal target identification. MathWorks tools allow teams to incorporate a variety of data sources and accelerate the implementation of machine learning, deep learning, and data science algorithms into their applications that can be deployed to hardware or the cloud.

MBS Electronic Systems GmbH Booth 505



The German MBS Electronic Systems GmbH will be exhibiting its small state-of-the-art portable data loader mini-PDL and its advanced, secure, reliable and affordable Software Management System FLS-Desk, providing many unique features which made it the data loading and fleet management system of choice of many of the world's largest and most prestigious airlines.

Since 2013, over 80 airlines and aircraft operators are benefitting from MBS'

EXHIBITOR DETAILS

e-enabled data loading solutions with more than 700 mini-PDLs and over 2000 PDL Adapters in the field. It solves the floppy disk obsolescence and brings a complete, innovative, networked system which has revolutionized aircraft configuration control, remote update, administration and data loading for ARINC 615, ARINC 615A, PCMCIA, CF, USB, EFB and IFE and is helping aircraft operators to better access, manage and utilize their data, helping them achieve higher goals in safety, performance and efficiency and reduce time and cost.

With innovative technologies and close customer support and cooperation MBS is continually improving the features and adapting its system to the changing requirements of the industry.

Also, MBS was the first company worldwide to provide interfacing of traditional military and commercial aerospace data busses to Gigabit Ethernet giving platform independent solutions many years before the so-called Internet of Things (IoT).

MB Electronique **Booth 815**



Since 1972, MB Electronique is a B2B Technology Trading Company which resells electronic systems and equipment dedicated to the T&M market. We design on demand innovative solutions for test and offer In-house Tests (HALT/HASS, SAM).

We supply exclusive services linked to the carried systems and equipment.

As a middle-man organization, we provide a customer satisfaction carrying « best-in-class » suppliers' products and integrated solutions, designing and supplying MBE support and services. We provide also a supplier satisfaction offering access to a large, segmented, targeted customer base and outsourced services.

Thanks to our technology expertise and our knowledge, we are able to

respond to various needs on several market segments: Aerospace & Defense, Automotive and Transport, Energy, Industrial manufacturers, Research and Universities, Semiconductor, Services and Telecommunications.

« Customer relationship and service delivery... on the side, it is our commitment to supporting our customers' project realization »

Mentor, a Siemens Business **Booth 713**



Mentor, a Siemens business, enables companies to develop better electronic products faster and more cost-effectively, where today's design meets tomorrow. Our innovative products and solutions empower engineers to conquer design challenges in the increasingly complex worlds of board and chip design. We are a global leader in electronic design automation, providing products, consulting services and award-winning support for the world's most successful electronics systems and semiconductor companies.

Mentor offers the broadest industry portfolio of best-in-class hardware and software design solutions focused on C-based design and hardware/software co-verification, IC design and physical verification, functional verification, FPGA/PLD, design-for-test, PCB design and embedded software

Mercury Mission Systems International S.A. **Booth 812**



Mercury Mission Systems International S.A. (also referred as "MMS Intl", previously CES Creative Electronic Systems) is a swiss legal entity part of Mercury Systems Inc. based in Chelmsford, Massachusetts, USA. MMS Intl is Mercury's Center-of-Excellence for safety-critical product development. MMS Intl designs and manufactures in Switzerland rugged embedded computers engi-

neered to meet the most demanding performance needs for optimal Size, Weight and Power (SWaP) considerations. Our Commercial Off-The-Shelf (COTS) products are made to withstand the extremes of temperature, shock and vibration associated with deployment in Aerospace & Defense as well as Rugged Industrial markets. The ability to deliver products supporting mission-critical or safety-critical functions has created a high demand for our services. With 30+ years of existence we leverage our technology expertise and know-how to solve the challenges of today in the following market segments: C4ISR, Radar / EW, Rugged Industrial, Commercial Aircraft, Unmanned Vehicles. From Single Board Computers, Signal Processors, Avionic Interfaces and Graphics Boards up to Safety Certified Mission Computers, we look forward to working with you on your next project.

Midi Caoutchouc **Booth 717**



Depuis plus de 50 ans, Midi Caoutchouc (une société du Groupe Efire) fabrique et distribue des solutions en :

Transfert de Fluides : tubes, tuyaux, gaines, flexibles sur mesure, raccords, colliers

Calage en mousse : aménagement de valises, caisses, servantes, protection en mousse, pièces trempées PVC

Protection technique : acoustiques, antivibratoires, profilés, plastiques, anti-pince doigts, protections, tapis de de sols

Étanchéité : découpe de joints en caoutchouc, graphite, fibre, PTFE, joints métalliques

For more than 50 years, Midi Caoutchouc (an Efire Group company) has been manufacturing and distributing solutions in:

Fluid transfer: tubes, pipes, ducts, custom-made hoses, fittings, clamps

EXHIBITOR DETAILS

Foam cushioning: storage of suitcases, crates, trolleys, foam protection, PVC hardened parts

Technical protection: acoustic, anti-vibration, profiles, plastic's, anti-finger pinch, protection, floor mats

Waterproofing: cutting rubber, graphite, fibre, PTFE, metal seals

MK Test Systems Booth 813



MK Test has been providing automatic and portable wire harness test systems to high performance industries throughout the world for over 28 years.

Innovation, delivery and partnership are at the heart of MK Test's approach. As a company we understand that our equipment is relied upon to keep aircraft in the sky, trains running, and industry working effectively. MK Test Systems has a responsibility to provide testing equipment so our customers can get it right first time.

MK Test's partnership philosophy focuses upon working with clients on a permanent basis so that we have a thorough understanding of their production testing requirements; and can help them improve efficiency in their electrical testing environments.

Our testing equipment is used in manufacturing facilities around the globe, with a growing base of business across the USA and Europe, and expansion opportunities in Russia, India and China.

Muirhead Avionics - AMETEK MRO Booth 610



Muirhead Avionics is a subsidiary of AMETEK Inc, a global manufacturer of electronic instruments and electromechanical devices with annual sales of approximately \$4 billion. Our facility, conveniently located near to London

Heathrow Airport, is one of the largest independent repair facilities in Europe, offering an extensive range of services including sales, repair, overhaul, modification and flight data recorder transcription capability. The breadth of the services offered by Muirhead Avionics' OEM approved repair facilities allows the company to be a major supplier to many fixed and rotary wing operators world-wide. Our capability covers radio, radar, navigation, communication, flight data and cockpit voice recorders, instrumentation and test equipment.

Nolam Embedded Systems Booth 800



Nolam Embedded Systems Designs and manufactures board level products and systems, our product portfolio includes IP Cores (MIL-STD1553, ARINC429, H264,...), FPGA Design & manufacturing, Customized Embedded Motherboards, Managed & Unmanaged Rugged Ethernet Switches, Rugged Panel PCs, Consoles and Customized Systems.

North Atlantic Industries Booth 815



Since 1955, NAI's vertically integrated design, manufacturing and verification capabilities have been built with the intense focus of an organization that defines every action and investment based on our ability to Accelerate Your Time-to-Mission™.

Offering a portfolio of rugged embedded COTS products, including over 70 pre-integrated modules, Multifunction I/O Boards, Single Board Computers (SBCs), Systems, and Power Supplies, NAI has built a reputation for supporting the world's most demanding defense, commercial aerospace and industrial applications.

The business and expertise of NAI is deeply rooted in the military industrial and commercial aerospace industries.

NAI is now present worldwide with partners in major European, American and Asian countries.

Novulo Booth 151



STARTED TO MAKE THE DIFFERENCE

From the start we believe in the fact that people in the workplace know themselves and determine what kind of software they need to streamline their business processes. Why do we waste hundreds of hours of custom work every year? Why can't people and organizations design their own software without any knowledge of programming and software development? With this in mind, we created the Architect 10 years ago. Revolutionary at that time and the basis of our success. The Architect makes it possible to 'draw' software fast and efficiently, instead of typing thousands of lines of code.

Constant and fast change

The combination of ready to implement best of breed solutions and next gen low code development enables Airlines and MROs to quickly implement change, thereby resulting in continuous optimization and innovation.

Industry know-how

Ample aviation knowledge to understand your processes and consult accordingly to maximize aircraft utilization.

Lower costs

Novulo's low code weaving approach aims to quickly replace legacy to rigorously reduce costs for licensing and maintenance while digitally transforming the organization. With Novulo, abundant functionality is banned.

EXHIBITOR DETAILS

OpenAirlines Booth 146



We help airlines to reduce their fuel consumption and CO2 emissions by treating all data located in the black boxes (and also many other sources: weather, air traffic control, maintenance, etc.) with Big Data and Artificial Intelligence algorithms.

By analyzing these data, we give recommendations targeted to companies and their pilots that reduce their consumption by 2 to 5%.

Orlando Booth 136



Orlando Suite for Tech Pubs is a cloud-based Document Management Solution designed for Airlines, MRO and Manufacturers.

It is the only solution handling company manuals, and OEM manuals (Mixed-fleet for Flight ops and M&E) in one system. It is natively compliant with OEMs' schemas and with the main aviation technical data standards (ATA Spec 2300, ATA iSpec 2200, S1000D).

Presented in 7 modules, it streamlines the manual lifecycle: Library (Cloud CMS), Editor (OEM and company manuals), Merger (Automated revision reconciliation), Analytics (reports), Dispatcher (Distribution over the air), Publisher (XML, PDF, HTML), Explorer (Web and Mobile viewer).

Orolia Booth 614



Orolia is the world leader in Resilient Positioning, Navigation and Timing (PNT) solutions that improve the reliability, performance and safety of critical, remote or high-risk operations. With locations in more than 100 countries, Orolia provides virtually failsafe GPS/GNSS and PNT solutions to support military and commercial applications

worldwide. Time and Location You Can Trust™.

PACE GmbH Booth 415



The next great advance for en-route flight optimization is multi-dimensional, combining vertical flight profile and lateral route analyses to help you reach your destination as efficiently, timely and safely as possible. And it is integrated, connecting and synching flight and dispatch teams in real time to make collaborative decisions in constantly changing operational conditions and to achieve your airline's broad company objectives.

So don't waste your time and resources on isolated, small-scale solutions – visit us at booth #415 to discover the unparalleled scope of a new generation of holistic decision-making support developed with our route optimization expert partners Route Dynamics Corp.

Step into a larger vision – we look forward to inspiring you!

PACE – a TXT company are pioneers of en-route flight profile optimization. Our flagship product Pacelab FPO is the original and market-leading onboard decision aid, relied on every day by major airlines such as Air France, Finnair, Hawaiian Airlines, Icelandair and Lufthansa Group to reduce the workload of their flight crews and to support their environmental and sustainability strategies.

Parasoft SPONSOR



Parasoft's technologies reduce the time, effort, and cost of delivering secure, reliable, and compliant software, by integrating static and runtime analysis; unit, functional, and API testing; and service virtualization.

PIC Wire & Cable Booth 715



PIC Wire and Cable - A Division of The Angelus Corporation is a global provider of high performance electronic interconnects for demanding military, corporate and commercial applications that include airplanes, helicopters, ground vehicles, and shelters.

Presagis Booth 613



PRESAGIS is a recognized leader in development tools for interactive display graphics. We offer intuitive and robust software tools to develop safe and certifiable cockpit graphics for the aerospace, defense, security, and critical infrastructure markets. Since 1985, we have been delivering first in-class cockpit graphics design tools and for the last 15 years delivering DO-178 certifiable solutions. PRESAGIS' technology, developed in conjunction with major aircraft OEMs, provides leading-edge capabilities (such as touch and gestures and video streaming) to enable the development of products that support the ARINC 661 Standard. PRESAGIS Embedded Graphics team serves hundreds of customers worldwide, including many of the world's most respected organizations such as Boeing, Airbus, Collins Aerospace, Lockheed Martin, BAE Systems, Leonardo, Thales and CAE among others. For more information, visit www.presagis.com.

QOCO Systems Booth 142



We are a young and creative software house specialised in airline tech, with a strong focus on AMOS integrations and MRO solutions. Creating new software solutions for the aviation industry is where we excel, with our software being used by thousands of professionals every day.

We do software development and offer cloud services designed to enhance

EXHIBITOR DETAILS

the inter-process relationships between maintenance and operations. We believe better usability translates to improved end-user satisfaction and supports the managing activities of any organization. With our cloud-enabled, mobile solutions we strive to deliver consumer-grade usability to our customers. Through our digitizing efforts we introduce further benefits to our customers' MRO functions by reducing operating costs and increasing business efficiency.

High level of expertise forms the foundation for everything we do: our own team, with years of IT and business experience in areas such as logistics and transportation engineering, and a strong talent network of technology specialists assist our customers to tackle the challenges and remaining ahead in the competition.

Ramco
Booth 400

ramco

With 1900+ employees spread across 24 offices, Ramco Systems is a global enterprise software provider offering HR and Global Payroll, ERP and M&E MRO for Aviation. Part of the USD 1 billion Ramco Group, Ramco focuses on innovation to differentiate itself in the marketplace. Ramco Aviation Software is trusted by over 22,000 users to manage more than 4,000 aircraft globally. Accessible on cloud and mobile, the innovation-rich aviation solution is a comprehensive software with modules for engineering and programs, maintenance, finance, compliance and quality, flight operations and integration gateway (iRIS), that comes with advanced visualization dashboard on a mobile-ready platform. Ramco is changing the paradigm of enterprise software with zero user interface (Zero UI) powered by features such as chatbots, mail bots, HUBs and cognitive solutions.

Rapita Systems Ltd
Booth 701



Rapita Systems Ltd develops on-target embedded verification software solutions for customers in the avionics and automotive electronics industries. Our tools help to reduce the cost of measuring, optimizing and verifying the timing performance and test effectiveness of their critical real-time embedded systems.

Royal Aeronautical Society
Toulouse Branch
Booth 1104



The Royal Aeronautical Society is the world's only professional body dedicated to the entire aerospace community and was established in 1866 to further the art, science and engineering of aeronautics.

The Royal Aeronautical Society Toulouse Branch was formed in 1991.

There is a place in membership for anyone in, or interested in the aeronautical or Aerospace sector. Anyone can be the branch as an Affiliate to receive membership benefits immediately.

Speakers from the Aerospace, Aviation & Space domains are invited to give lectures once a month starting from September of the calendar year until June of the following year.

Being in Toulouse, the RAeS is close relation with Airbus and other companies in Aerospace domain. This allows the members to communicate, discuss and build professional relationships with those working in the domain (a benefit for students looking to enter the sector).

All are welcome: Members, future members and Non-members.

The RAeS Toulouse Branch Workshop is taking place on 18th March 2020. Great topics and speakers on this day!

#RAeSToulouse

<https://www.aerosociety.com/toulouse/>

Real-Time Innovations
Booth 805



Real-Time Innovations (RTI) is the Industrial Internet of Things connectivity company. RTI technology and expertise are proven in over 1,000 Aerospace and Defense (A&D) applications to safely and securely integrate mission-critical systems. RTI Connex DDS supports open architecture systems by providing fast, scalable, reliable, and secure connectivity within and between land, sea, air and space-based systems, and accelerates safety certification with commercial-off-the-shelf (COTS) RTCA DO-178C and EUROCAE ED-12C DAL A certification evidence. RTI embraces A&D industry standards, like DDS and FACE, and have the first FACE Transport Service Segment (TSS) certified conformant solution. Connex DDS also meets also the stringent requirements of Modeling, Simulation and Training (MS&T) applications by providing interoperability between distributed simulation components, regardless of where they are located.

Rohde & Schwarz GmbH
Sponsor



Rohde & Schwarz Aerospace Solutions provide safety and efficiency in all domains. The company is committed to continuously researching and developing high-performance equipment to provide customers with innovative and sustainable products. Our customers benefit from operational readiness and full life cycle support for our solutions. As a proven partner of air navigation agencies, airport service providers, local authorities, armed forces and the aviation industry, Rohde & Schwarz helps keep skies safe and secure with a specific range of advanced technologies, high-performance products and reliable services. Existing customers include more than 200 airports, air navigation service providers, airlines and air forces in more than 80 countries. With innovative test solutions and high-performance T&M instruments, Rohde &

EXHIBITOR DETAILS

Schwarz contributes to the successful implementation of customers' most technologically advanced applications and systems and has established itself as a leader in test & measurement for Radar and EW, satellite technology, avionics, navigation and guidance. Rohde & Schwarz products help protect critical infrastructures. Drones that enter prohibited areas, e.g. at airports, pose a serious security risk. The drone detection and defense solution from Rohde & Schwarz detects potential threats early on and initiates appropriate counter-measures.

SAFRAN Electronics & Defense Booth 504

Every day, Safran Electronics & Defense helps airlines, operators and Original Equipment Manufacturers by collecting, processing and analysing an increasing amount of flight data. Cassiopée is a twofold offer that combines flight data management software packages and analysis solutions for all types of airplanes and helicopters. Our services enable fuel consumption reduction, maintenance costs optimization and flight safety enhancement. Our aim? Improve our clients' operational efficiency by providing an array of services that allow a better understanding of performance of their aircraft and systems.

Scandinavia Avionics A/S (SA) Booth 601

Scandinavian Avionics (SA) is the headquarters of The SA Group and provides complete turn-key avionics solutions for civil and military aircraft, helicopters and UAS. Including sales, avionics maintenance (MRO), certification (STC), design & engineering, installation, product development, production, training and consultancy services.

The SA Group consists of 12 divisions located in Europe, the Middle East, South- and Southeast Asia. The head-

quarters, which was established in 1978, is located in Billund, Denmark.

Approvals

EASA Part-145 EASA Part-21J EASA Part-21G EASA Part-147

FAA Part-145 TCCA Part-145 BCAA Part-145 | GAR Part-145 | DOT RIN N083

ScioTeq Booth 608

ScioTeq has a 35 year heritage (from Barco to Esterline to ScioTeq) of designing and manufacturing the most innovative solutions for the Avionics, Air Traffic Control and Defence & Security markets.

ScioTeq advanced visualization solutions help pilots get the best situational awareness of the aircraft, in most demanding environment. The scalability of ScioTeq products allows aircraft manufacturers and system integrator to provide unique experience to aircraft operators.

ScioTeq has been serving the Avionics market for 35 years, being now present on more than 150 aircraft types, both civil and military platforms, both fixed wing and rotor wing, cumulating millions of flight hours. Our deep visualization technology heritage combined with a unique independent positioning, allows us to provide to aircraft manufacturers and system integrators the best image quality in a scalable manner, supported by an open system solution (MOSArt™). Our scalable product portfolio, combined with unique agility allows us to adapt and solve any visualization need.

With sales, engineering and manufacturing locations throughout the world, we are able to provide solutions designed to operate in the environments you need them to.

ScioTeq, your trusted Partner for Advanced Visualization Solutions used in the World's most Demanding Environments.

Seabury Solutions Booth 148

Seabury Solutions is a leading global aviation software development and consultancy company. It was established in 2002 and forms part of the Seabury Capital. Seabury Solutions has built its reputation in the market by delivering world class aviation IT solutions from the smallest operator to the largest airlines across the world. We have built upon our decades of aviation expertise in-house, to leverage this knowledge into a suite of products that enhance the decision-making process for Airlines, Regulators, Defense Airports and MROs.

Seabury Solutions Aircraft Maintenance Software, Alkym, is an integrated MRO IT Solution specifically designed for the Management & Control of Aircrafts within Airlines and MROs.

Designed for regulatory, compliance, productivity and efficiency, eAuthority is the leading safety oversight software for Civil Aviation Authorities & Airports. Inspired by ICAO, EASA and FAA regulations, eAuthority is designed to increase efficiency of internal staff while giving real-time information to the management on a multi-platform dashboard.

The third product within the Seabury Solutions, digital transformation platform is an Enterprise Performance Analysis Tool (EPAS) designed for Route Profitability. EPAS is used by some of the worlds largest airlines such as American Airlines, Southwest, Delta, Aero Mexico to name but a few.

SITAONAIR Booth 303

SITA is the IT provider for the air transport industry, delivering solutions for air-

EXHIBITOR DETAILS

lines, airports, aircraft and governments. Our technology powers more seamless, safe and sustainable air travel.

Today, SITA's solutions drive operational efficiencies at more than 1,000 airports while delivering the promise of the connected aircraft to more than 400 customers on 18,000 aircraft globally. SITA also provides the technology solutions that help more than 40 governments strike the balance of secure borders and seamless travel. Our communications network connects every corner of the globe and bridges 60% of the air transport community's data exchange.

SITA is 100% owned by the industry and driven by its needs. It is one of the most internationally diverse companies, with a presence in 200 countries and territories.

SITA's subsidiaries and joint ventures include SITA OnAir, branded SITA FOR AIRCRAFT, CHAMP Cargosystems and Aviareto

Unlocking connected aircraft value | SITAONAIR

We empower the air transport industry through tailored 'Nose-to-Tail' connectivity solutions that deliver true value.

www.sitaonair.aero

Skayl Booth 904



Skayl is a small business providing systems, software and device interoperability solutions for large, complex environments with a need for unsurpassed integration scalability, flexibility, dependability, security and value. Skayl principals have been actively supporting the Future Airborne Capability Environment (FACETM) Consortium since 2012. We have been instrumental in shaping the discussion in the Data Architecture Working Group and are recognized as thought leaders in this realm of data architecture.

STEP Lab Booth 117



STEP Lab is specialized in the production of test systems for mechanical static, dynamic and impact tests. Our product range is divided into Electro-dynamic actuators for dynamic fatigue testing based on ballscrew or linear motor technology, drop weight towers and customized testing systems. All our systems are based on our own developed electronic platform and Test Center software.

Swiss Aviation Software Ltd Booth 133



AMOS is a comprehensive, fully-integrated software package that successfully manages the maintenance, engineering and logistics requirements of modern airlines and MRO providers by fulfilling demanding airworthiness standards.

Swiss AviationSoftware unites more than 30 years of IT experience with profound MRO expertise and offers its customers a functionally unsurpassed and technologically state-of-the art maintenance system.

Swiss-AS has succeeded in offering the market a system that meets the fast changing demands of a highly dynamic industry and has attracted more than 180 customers worldwide. The number and size of customers who newly select, or continue to place their trust in AMOS, speaks for itself.

SYSGO GmbH Booth 803



Europe's Number 1 in embedded Operating Systems

SYSGO is Europe's leading supplier of real-time operating systems for safety-critical embedded systems. Our software platform PikeOS, an RTOS with hypervisor functionality, enables the secure execution of critical and non-crit-

ical applications on the same hardware, thus reducing footprint requirements, hardware costs and energy consumption.

More information at: www.sysgo.com

Techtest (HR Smith) Booth 810



The HR Smith Group of Companies is an independent avionics manufacturing company which has been serving the aircraft industry for over 50 years. The Group consists of four companies and has capabilities in Airborne Antennas, Static Dischargers, Radomes, Emergency Locator Transmitters, Direction Finding Systems and Avionics Test Sets.

All products utilise advanced technology and are manufactured to the highest standards by a dedicated team of professionals at our UK and US factories, offering solutions for both commercial and military applications.

TECHWAY SAS Booth 611



TECHWAY pioneers advanced electronics solutions for SIGNAL and VIDEO acquisition and processing.

Our company is a recognized specialist in high-speed signals and images acquisition. Our expertise is focused on real-time processing. We simplify high-end technologies' adoption by designing ready-to-use embedded solutions that reduce R&D time and cost to system integrators. Our products are of the highest quality, designed with our know-how in the field gained over 15 years. Based on the latest FPGA technologies, our modular and versatile products are the result of engineering activities and R&D efforts carried out in close collaboration with our Defense and Avionics customers. All our solutions meet international standards and are designed to adapt to the widest range of industrial environments. Our

EXHIBITOR DETAILS

goal is to provide the industrial sectors – Defense, Avionics and Industrial Production – with advanced cost-effective solutions. We provide the highest quality of customer service and support before, during and after sales.

Avionics applications

Provider of advanced solutions for Avionics key players, TECHWAY launched in 2008, the first ARINC 818 10X10 switch – digital video bus in aircraft cockpits – for the A350 certification program. In a few years, TECHWAY has become one of the ARINC 818 protocol leaders thanks to renowned partnerships like Great River Technology, co-founder of the ARINC 818 protocol.

Teledyne Controls Booth 412



At Teledyne Controls, we built our name on intelligent solutions that collect, manage and deliver aircraft data more efficiently. Our innovative technology and collaborative customer relationships have revolutionized the way aircraft operators access, manage and utilize their data, helping them achieve higher goals in safety, performance and efficiency. Our adaptable suite of products include Data Acquisition & Management Systems, Wireless Data Transfer Systems, Flight Data Analysis & Investigation Solutions, Data Loading Solutions and Aircraft Network Systems. Combined together, these products provide comprehensive data management solutions that leverage aircraft data intelligence and create value for our customers.

Teledyne e2v Booth 702



Teledyne e2v, an aerospace qualified manufacturer of advanced semiconductors, will showcase its Qormino® line of Common Compute Platform solutions.

Qormino brings design simplifications and SWaP optimizations (Size, Weight

and Power) to Aerospace & Defense customers.

The team will be running live demonstrations of its capabilities in the ecosystem of partners, and will also present its benefits during a technical workshop (Workshop three, March 19th, 10am).

Teledyne e2v will also introduce its latest innovations related to the optimization of the power consumption in Aerospace & Defense Microprocessors; this topic will be presented in details during Testing track session “Electrification, Aerostructures, Materials Testing” (March 19th at 11am).

Teradyne Booth 111



Teradyne is the leading supplier of automatic test equipment for defense and aerospace electronics manufacturers, depots, and intermediate-level facilities. Teradyne’s test systems and instrumentation provide the performance and capabilities of full custom solutions, but with lower start-up costs, faster test program development, proven migration, and reduced obsolescence. Our products help to standardize today’s most advanced DoD-based automatic test system programs.

Testek Solutions Booth 119



Aircraft component OEMs, MRO facilities, and operators depend on Testek Solutions for highly reliable aerospace test equipment to certify hydraulics, power generation, avionics, fuel, lube, actuator, and pneumatic components. With a 50-year track record of success, Testek uniquely holds long-term OEM partnerships, provides the industry’s leading equipment warranty, and support from a dedicated worldwide team.

Thales Booth 507



Decisive moments in Aerospace, governments, airports, airlines, pilots, crews

and passengers rely on Thales to make flight safer, easier and more efficient. We do this by designing, delivering and supporting the systems that keep our skies running. From air traffic management, training and simulation solutions, nose-to-tail aircraft connectivity and in-flight services, we enable and connect all parts of the aerospace ecosystem in the air, on the ground, and in between. Whatever it takes.

The Open Group Booth 1004



Leading the development of open, vendor-neutral technology standards and certifications

The Open Group is a global consortium that enables the achievement of business objectives through technology standards. Our diverse membership includes customers, systems and solutions suppliers, tool vendors, integrators, academics, and consultants across multiple industries.

It is also an enabler for consortium participation by US Government agencies.

Further information on The Open Group can be found at: www.open-group.org

THOMMEN AIRCRAFT EQUIPMENT Booth 606



THOMMEN AIRCRAFT EQUIPMENT Ltd is a world-leading Swiss manufacturer of mission equipment, displays, air data displays and air data computers, digital clocks and chronographs for helicopters, fixed wing aircraft & UAV. THOMMEN also offers superior aviation qualified Flashlights and supplies innovative night vision compatible aircraft lighting products.

The entire product line serves both the OEM production of new aircraft as well as the retrofit market for existing fleets.

EXHIBITOR DETAILS

THOMMEN maintains the following quality Approvals and Certifications and our equipment and systems are manufactured according to the EASA Part-21 G – Production Organisation Approval Certificate, the EASA Part-145 Maintenance Organisation Approval Certificate, the EASA Part-21 O Capability for Design – the ETSO Authorization and the EN 9100:2009 / AS 9100 Rev. C – Quality Management System Aviation Certificate.

TTTech Booth 804



TTTech is a global leader in the field of robust networking and safety controls. The company's solutions improve safety and reliability of networked electronic systems in the industrial and transportation sectors.

Within the aerospace industry TTTech provides solutions based on TTP, AFDX® and TTEthernet (combining IEE 802.3, ARINC 664 p7 and SAE AS6802 standards in one product).

The embedded products are certified according to DO-178B and DO-254 Level A, providing an ideal platform for DO-297-compliant systems.

Besides aeronautics, TTTech's radiation hardened TTEthernet Controller ASICs and its full line of radiation hardened TTEthernet switches and network interface cards are offered for deep space applications.

Ubisense Booth 147



Efficient process means bringing your people, tools and assets together at the right time, in the right place to get the job done. Easy to plan, hard in reality.

Ubisense helps you optimize complex process flows by combining real-time location intelligence with business systems so your plan and reality are never out of sync. Our SmartSpace™ platform creates a real-time digital twin of your

physical environment using the best location-sensing technology and gives you the power to easily analyze, error-proof and automate great processes.

The world's leading brands rely on Ubisense to optimize their operations and deliver quality on schedule.

Ultramain Systems Booth 407



For nearly 40 years, Ultramain Systems has provided superior M&E/MRO software products and professional software implementation services to leading aviation companies worldwide. Our flagship product, ULTRAMAIN®, is a comprehensive airline maintenance and logistics solution that delivers comprehensive functionality to create a SIMPLE MOBILE PAPERLESS operation. In addition, Ultramain Systems offers a series of mobile products that work in conjunction with ULTRAMAIN M&E/MRO Suite as well as other maintenance systems. ULTRAMAIN Mobile Mechanic™, ULTRAMAIN ELB™, Mobile Inventory™, Mobile Executive™ and GATe work to provide accurate real-time data entry by pilots, flight crews, and mechanics, thereby eliminating thousands of paper records which would normally be created on a daily basis. Because ULTRAMAIN is mobile and paperless, we can help you see your aircraft data FAST, ACCURATELY and in REAL-TIME. Ultramain Systems headquarters is located in Albuquerque, New Mexico with offices in Europe, Asia and India. For more information about Ultramain Systems and our products, please visit www.ultramain.com, send an inquiry to sales@ultramain.com, or call us at 1.505.828.9000.

Undo Booth 716



Undo is the leader in software reliability solutions based on Software Flight Recording Technology. Its flagship product - LiveRecorder - helps to reduce time-to-resolution of software defects by eliminating the guesswork in bug diagnosis.

Built for mission-critical software, Undo is trusted by the world's largest technology firms to quickly resolve defects in complex applications across all phases of the software development life cycle - allowing them to accelerate software delivery and resolve customer issues faster.

With offices in Cambridge (UK) and San Francisco (CA), Undo's solutions are used by thousands of software engineers across leading technology companies including SAP, Juniper, Cadence Design Systems, Micro Focus, and Mentor (a Siemens business).

United Electronic Industries Booth 100



UEI collects real-world data for Aerospace, Energy, Defense industries so our customers can build smart systems that are reliable, flexible and rugged.

(UN)MANNED Booth 708



(UN)MANNED, located in Belgium, builds platforms and instruments for aircraft cockpits, avionics and ground stations. As its name suggests, (UN)MANNED focuses both on MANNED and UNMANNED business. Its employees have decades of relevant experience in Aerospace, Space and embedded systems.

(UN)MANNED provides CERTIFIED hardware and software on demand for manned and unmanned cockpits / groundstations with an 80% reduction in time, risk and cost by using our certified platform.

(UN)MANNED holds following certificates: ISO9001, EN9100, ISO14001, DO-178C and DO-254.

Vector Booth 809



Vector Informatik GmbH ; Developers and test engineers will benefit from Vector solutions for aerospace elec-

EXHIBITOR DETAILS

tronic networking. The focus here is on tools for E/E architecture, monitoring and analyzing the bus communications and on test tools in the form of a 'HIL for the developer's office desk.

Vistair Booth 210



Vistair provides document, safety and quality management technology solutions to support the delivery of improved safety, compliance, and operational efficiency that results in significant commercial savings to airline organisations. With a global client base, ranging from BA, BAE, easyJet, MOD, SAS and Norwegian in Europe, to Air Asia, Qantas and Tiger Air in Australasia, to Emirates, Air Arabia, and FlyDubai in the Middle East, and to Delta Air Lines and Viva Aerobus in the Americas, Vistair is focused upon supporting a safe aviation sector.

Combining technology, development expertise and service delivery, Vistair's suite of aviation technology solutions provides both airlines and ground operations with an approach that helps demonstrate a clear link between increased reporting and a change in procedures and behaviours, which fundamentally drives a safer organisation.

For more information visit stand 210 or take a look at our website <https://www.vistair.com>

Visure Solutions, Inc. Booth 817



Established in 2002, Visure Solutions is a leading requirements management ALM company providing specialized, innovative and user-friendly solutions to implement efficient requirements management processes, aimed at guaranteeing the highest quality in the development of our clients' products, systems and services. Visure's all-in-one requirements management ALM platform supports requirements management, test management, bug and issue

tracking, change management, risk management and variant management. As part of its product upgrade, Visure has also introduced a new company logo.

The company's solutions are used across various industries, including aerospace and defense, automotive, banking and finance, medical devices, energy and nuclear, oil and gas, robotics and industrial automation. Visure is also a worldwide certified IREB (International Requirements Engineering Board) trainer of CPRE (Certified Professional for Requirements Engineering) by the IREB. Please visit <https://visuresolutions.com/>.

VODEA Booth 518



VODEA, Your multimedia embedded Solutions partner :

ON BOARD EQUIPMENT SUPPLIER

Video management & processing computer for

SECURITY, SURVEILLANCE & ENTERTAINMENT

Since 2003, VODEA design and manufacture on board multimedia equipment for Security, Surveillance and Entertainment.

Especially, our FOCUS product line is dedicated to video and image processing with artificial intelligence capabilities.

More than 200 FOCUS are installed (line-fit or retrofit) in military aircraft, UAV, helicopters and commercial aircraft.

Weigele Aerospace Booth 503



Weigele Aerospace is the Inflight Power Company. We are a leading global provider of power supply products and services for aviation. We design, source

and qualify leading edge, modular power supplies that enable customizable solutions for and by our aviation partners. Our mission is to power equipment, to power efficiency and to power your future.

Wind River Booth 704



Wind River is a world leader in delivering software for the Internet of Things. The company has been pioneering computing inside embedded devices since 1981, and its technology is found in more than 2 billion products. Wind River offers the industry's most comprehensive embedded software portfolio, supported by world-class global professional services, support, and a broad partner ecosystem. Wind River delivers the technology and expertise that enables the innovation and deployment of safe, secure, and reliable intelligent systems. To learn more, visit Wind River at www.windriver.com.

wolfSSL Booth 905



wolfSSL focuses on providing lightweight and embedded security solutions with an emphasis on speed, size, portability, features, and standards compliance. With its SSL and TLS products and its crypto library, wolfSSL is supporting high security designs in the automotive, the avionic and other industries. In avionics, it has support for complete RTCA DO-178C level A certification. In automotive, it supports MISRA-C capabilities. For government consumers, wolfSSL has a strong history in FIPS 140-2, with upcoming Common Criteria support. wolfSSL supports industry standards up to the current TLS 1.3 and DTLS 1.2, is up to 20 times smaller than OpenSSL, offers a simple API, an OpenSSL compatibility layer, is backed by the robust wolfCrypt cryptography library, and much more. Our products are open source, giving customers the freedom to look under the hood.

CYBERSATCOM

May 13-15, 2020 | Hyatt Regency LAX | Los Angeles, CA

SECURITY IN CONNECTIVITY

WHY ATTEND?

Thousands of interconnected small satellites from NewSpace companies are expected to be launched within the next few years which will bring a new set of vulnerabilities for the industry. With a growing need for cybersecurity, CyberSat will launch its first CyberSatCom with a focus on tackling cybersecurity threats to small satellites and emerging technologies. With an expected attendance of 200 attendees, this is the perfect opportunity to immerse yourself in the world of digital protection while picking the brain of space and satellite industry leaders.

Titles to Expect:

- » Engineer
- » CISO
- » Technical Manager
- » Chief Engineer
- » Security Architect
- » Principal Scientist
- » Systems Engineers
- » AI Developer
- » Product Security Officer
- » and more!

COMPANIES TO EXPECT:



FEATURED SPEAKERS



JEREMY BURTON
US Air Force



WILLIAM ESHAGH
Planet



MINA MITRY
Kepler Space



CODY SCOTT
NASA

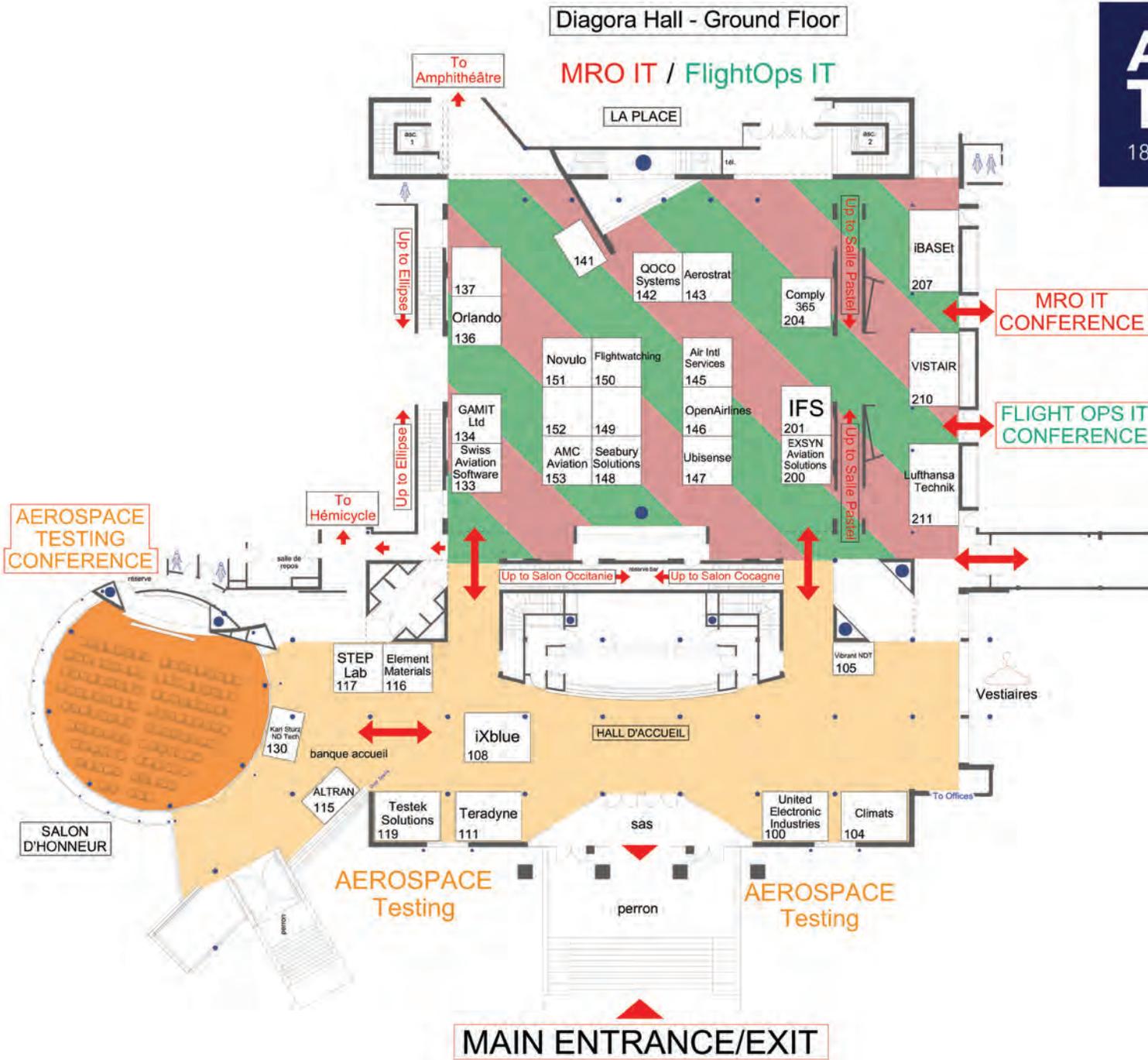
Join Classified Day on May 13, 2020 as the Intelligence Community and Space & Satellite industry leaders discuss advancements and challenges in assuring space system missions throughout the ever-increasingly cyber-contested lifecycle. **You must add Classified Day to your registration and provide your proof of clearance to attend.**

Register online at www.CyberSatSummit.com for **10% off** with **VIP Code: ASTW2020**

**Discount not valid for current registrants.*

Honeywell welcomes these airlines:





SEE EVENT APP or
AerospaceTechWeek.com/floorplan
 for **UPDATES**

<p>AEROSPACE TechWeek.com</p> <p>18/19 Mar 2020 Toulouse, France</p> <p>GET THE EVENT APP</p> <p>AerospaceTechWeek.com/APP</p>	<p>ANDROID APP ON Google play</p>	<p>Download on the App Store</p>



AEROSPACE
testing



PUSH IT TO THE LIMIT: AIRFRAME STRUCTURAL TEST

By Charlotte Adams



Before a new military or civil aircraft can take to the skies it must run a gamut of ground and flight tests to verify that it functions as intended and is safe to fly. Ground-based structural tests are an important element as material “coupons,” components, and entire airframes are subjected to forces, stresses, and conditions that simulate conditions they will encounter in flight. For this article we consulted experts in military and business aviation.

Strength and fatigue tests are key parts of the regimen. Static strength testing involves “applying intense load conditions to the structure to ensure it can withstand load[s],” explains Albert Dirkzwager, director structural integrity, test, and simulation for Textron Aviation. Fatigue testing involves “applying multiple cycles of normal flight conditions to the

airframe to simulate thousands of hours of flight time to prove the durability of the airframe,” he says.

Similarly U.S. Air Force ground testing validates that the strength, durability and damage tolerance, stiffness, and mass balance requirements have been met, says Gregory Schoeppner, chief of the Structures Branch, in the Air Force Life Cycle Management Center.

He describes a “building-block approach,” moving from testing material coupons, subelements, elements, subcomponents, components, and finally to complete airframes. This approach is “typically used to mitigate manufacturing scale-up risks while maturing design and analysis tools to accurately predict the behavior of increasing[ly] complex structures.”

The most granular level of structural testing is at the coupon level, agrees Victor Alfano, senior director of strategic

programs for NTS, a testing company with 28 labs in North America. These small material samples provide customers an understanding of fundamental material behavior under different conditions that can be applied to the design of aircraft components and structures. Coupons can be tested for characteristics such as tensile strength, fatigue, and crack propagation, and loads can be applied under extreme temperature conditions. NTS recently tested an engine cowling that required temperatures as high as 1,400-1,500 degrees F. while applying loads, Alfano says.

Test Articles

USAF full-scale strength test (FSST) and full-scale durability (fatigue) test (FSDT) require a dedicated airframe, each, Schoeppner says. These tests also require specially designed load frames that can



Scott Maher, a staff scientist at Gulfstream, says they typically dedicate one airframe, including all the associated components, to static strength testing and another airframe to fatigue and damage tolerance testing. Gulfstream images.

G500 and G600 Testing

The Gulfstream G500 aircraft was a new design with a new type certificate and a full test program. One airframe was dedicated to static strength testing, and the test article was subjected to 17 limit-load conditions and eight ultimate-load conditions, recalls staff scientist Scott Maher. Upon completion of the full set of required certification tests, the most critical load case was repeated and the load level was increased until failure. "This test was performed to collect data beyond the required load levels and verify the critical failure mode for that load case," he says.

A second G500 airframe was built for fatigue and damage tolerance testing, he says. At this writing that testing is still under way. "Enough load cycling was completed before aircraft certification and customer deliveries to ensure the fatigue test program stayed well ahead of any customer usage."

The Gulfstream G600, a variant of the G500, was certified as an amendment to the G500 baseline type certificate. It has a longer fuselage, bigger wings, and a bigger horizontal tail than the G500, but the construction details are generally similar, Maher says. It also had a dedicated airframe built for full-scale static strength testing.

Because much of the airframe was common, and the rest, similar, the scope of the testing was reduced. Test data from the G500 beyond ultimate load was also useful in limiting the new testing required. The airframe was subjected to four limit-load conditions and two ultimate-load conditions, Maher says. There was no dedicated airframe for fatigue and damage tolerance testing. The G500 fatigue test article spectrum was adjusted to cover critical details for both the G500 and G600 requirements.

apply distributed loads to the fuselage, wings, and empennage; discrete loads to the landing gear attach structure; and pressure loads to pressurized compartments in the airframe. "The load frame and facilities for each of these tests can take many months to a couple of years to design, manufacture, and set up."

The same is true for all-new bizjet designs. Typically one airframe, including all the associated components, is dedicated to static strength testing and one airframe, to fatigue and damage tolerance testing, says Scott Maher, staff scientist, Gulfstream. (Some of the miscellaneous components may be tested separately from the overall airframe for convenience, he says.) The static strength testing begins and concludes first, as a portion of it typically supports first-flight safety, and all of it must be completed before certification. Fatigue testing usually takes longer, but only a portion of the fatigue cycling needs to be complete for certification. Many of the separate test schedules overlap.

Dirkzwager says that while the number of articles depends on the program, the Citation Longitude used "multiple different test articles and full-scale airframe articles... ."

Test Gamut

In addition to basic static strength and fatigue testing, Textron lists additional tests, such as:

- Residual Strength Testing – static strength testing while simulating failed structural components to prove redundancy of the structure.
- Bird Strike Testing – FAA requirement to demonstrate the safety of the aircraft if impacted by a bird.
- Operational Tests – to demonstrate that flight control and other systems operate properly under various loading scenarios.
- Tire Burst Testing – to demonstrate reliability of the airframe in the event of a blown tire.
- Landing Gear Drop Testing – to verify that the energy absorption of the landing gear system behaves properly under landing impact.
- Impact Testing – to impact various components with possible real-world scenarios to ensure the robustness of the design.
- Extreme High/Low Temperature Testing – involving some of the preceding tests.

CHALLENGES ROOTED IN TRADITIONAL SYSTEMS ARCHITECTURE

Traditional approaches to building virtualized embedded software architectures that are robust and secure have placed much of the burden in a hypervisor and/or OS. This can create platform dependencies which impact performance, as well as cause a number of architecture challenges due to:

- Shared address space
- Shared CPU privilege
- Common arbitration points
- Global resource pools
- Compounding code branches
- Compounding control flow timing
- Large co-dependent code bases to certify

The more complexity that lies hidden between applications and hardware, the cloudier the path to system comprehensibility and robustness. Reducing software stack dependencies and minimizing the hidden complexities between independent application modules and hardware yields exponential program value over the complete development lifecycle by:

- Promoting traceable, comprehensible architectures
- Giving evaluators the ability to truly validate security and safety properties
- Reducing time to debug
- Unlocking heterogeneous design options
- Increasing the speed of system integration



LYNX MOSA.IC™

LYNX MOSA.ic is a software framework for building and integrating complex multi-core safety- or security-critical systems using independent application modules. Its elegant, modular architecture enables developers to collapse development cycles when creating, certifying and deploying robust platforms for manned and autonomous systems.

In contrast to traditional RTOS platforms—where hardware control, real-time scheduling, security, multimedia, and application runtime services are integrated into a common stack servicing all applications on all CPU cores—LYNX MOSA.ic allows system architects to subdivide systems into smaller, independent stacks which include only the dependencies required.

LYNXOS-178 & FAA RSC

A DO-178B/C Reusable Software Component is a software collection that is recognized as meeting

the requirements of RTCA/DO-178B/C and that may be used on more than one project without having to regenerate certification artifacts.

The FAA grants RSC acceptance as part of a normal certification process, provided that the applicant complies with the guidance policy defined in FAA Advisory Circular AC 20-148. The FAA has recognized our industry leadership by awarding LynxOS-178® the first and only FAA Reusable Software Component certificate for an OS.

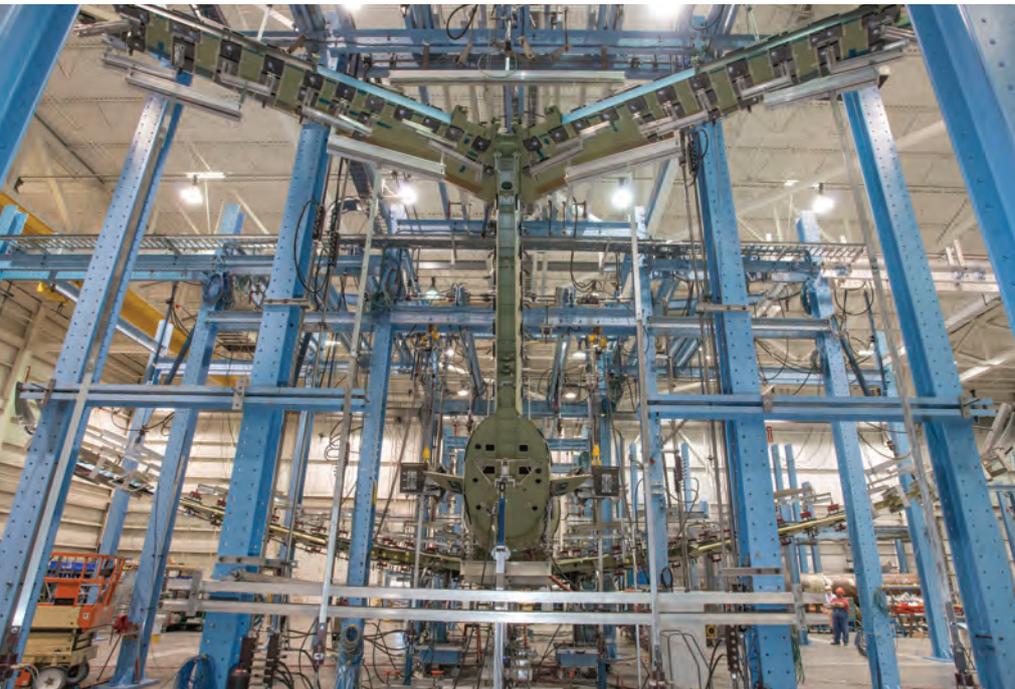
ABOUT LYNX

Since 1988, companies have entrusted Lynx Software Technologies to deliver modern platform software technologies that accelerate the development, certification and deployment of robust, safety-critical, high-availability systems for the avionics and defense industries.

The most recent public example is the F-35 Joint Strike Fighter, which is adopting the LYNX MOSA.ic software framework to support the upgrade of the mission system avionics as part of the "Technology Refresh 3" (TR3) modernization program. The TR3 program is expected to generate large reductions in production and sustainment costs at the same time as delivering significant increases in computing power. A key element of the program is the adoption of commercial-off-the-shelf (COTS) technology and an Open System Architecture to enable the flexibility to add, upgrade, and update future capabilities.

LYNX MOSA.ic will be deployed to support the development of key components of the next generation F-35 Lightning II avionics platform, including the Integrated Core Processor (ICP) being developed by L3 Harris Corporation. The ICP acts as the brains of the F-35, processing data for the aircraft's communications, sensors, electronic warfare, guidance and control, cockpit and helmet displays.





Although there are no requirements to test to failure for any component, according to Albert Dirkzwager, director structural integrity, test, and simulation for Textron Aviation, occasionally the company will intentionally test a component to failure to help refine their analytical techniques and ensure they are designing the most weight-efficient structure. Textron images.

Fatigue vs. Static Strength Testing

Fatigue testing involves more than pressurization/depressurization cycles, explains Logan McLeod, NTS director of engineering. For example, it can involve twisting and pulling structures, applying torsional loads along different axes to simulate forces that would be experienced in flight.

In a static strength airframe test you're trying to see how close you're getting to the material's yielding or breaking, he says. You may apply a load over the course of only seconds or minutes. "It's limited to a low number of cycles."

But the two categories of strength and fatigue testing are closely related and use similar setups. In a fatigue test you put an airframe or structure under a stress that is well below its expected strength but at a greater number of cycles. "You're trying to understand the relationship between a number of cycles of low stress relative to failure vs. one or two cycles at high stress."

Vibration of the wings at low load ranges, for example, may be a part of an airframe's fatigue test environment, McLeod says. Think of the way a wing vibrates in flight during turbulence, he points out. In one flight there would be thousands of cycles of loading of that wing — vibrating up and down — compared with only one pressurization cycle. NTS can do both static and fatigue tests, as directed by received and approved test plans from customers.

Analysis

"Since it is impractical to test the response of the airframe to the thousands of different load cases within the design envelope, analysis and design models are relied upon to predict the response of the airframe to the full-range of loading conditions," Schoepfner says. The main objective of the structures testing is to validate analysis and design models for the airframe loads, strength, durability and damage tolerance, and dynamics.

"Advancements in structural analysis and the ability to model individual parts with more accuracy and in greater detail have allowed us to minimize design margins and perceived design conservatism," he says. This is "particularly beneficial for reducing structural weight to meet design goals." But it makes strength and fatigue testing all the more critical in discovering design shortfalls and oversights, he adds.

Textron Aviation's external loads team analytically "flies" the aircraft through possible gusts, maneuvers, and landings which it could experience to compute the maximum forces on the airframe, Dirkzwager says. The structural analysis team narrows these cases down to a few dozen for each component and specifies the forces to be applied during the test.

"For cyclic tests, we develop typical usage profiles based on measured flight data of similar aircraft" to help "develop how often and at what load levels to flex the wings and the number of pressurization/depressurization cycles."

Extra Margins

Fatigue testing builds in wide margins. "We are required by the FAA to test three-times the number of cycles as the life of the aircraft to capture variability in the materials and flight profiles," Dirkzwager says.

For static strength, limit loads are the maximum loads to be expected in service, Gulfstream's Maher says. The regulations require a 1.5 factor of safety beyond limit loads (ultimate loads). "The structure must be shown by analysis, supported by testing, to have no detrimental permanent deformation under limit loads and to not fail under ultimate loads," he says.

Generally testing is completed to the prescribed design static load or cyclic load duration and it is not required to test until failure, Maher says. "That said, it is often advantageous to test to failure



Shown here is NTS's state-of-the-art Lightning Center of Excellence laboratory. The electrical characteristics of the different types of lightning flashes, and the resulting surges and fields from a strike, are complex. The company's engineers have studied the effects of lightning on a structure or system by isolating the components of the lightning waveforms and electrical/magnetic fields, and NTS evaluates their effects through individual simulations. The company's labs include specialized equipment to simulate the electrical characteristics of natural lightning as well as the transients it induces in electrical and electronic systems. NTS says it offers lightning testing at multiple facilities across the United States. NTS image.

to confirm failure modes and validate analysis methodologies. Also, any test data beyond the original prescribed design load is like money in the bank if future variants have higher design loads."

There are no requirements to test to failure for any component, Textron's Dirkzwager says. "Frequently bird strike tests do significant damage to the airframe that requires repair prior to running subsequent tests." And occasionally, "we will intentionally test a component to failure to help refine our analytical techniques to ensure that we are designing the most weight-efficient structure."

The design service life of an aircraft can be defined in flight hours, flight

or pressurization cycles, or years, Schoeppner says. The FSST simulates the cyclic loading that the aircraft will experience during service and demonstrates that the aircraft design is sufficient to meet the design service life. At a minimum, the durability test demonstrates that the airframe can survive two lifetimes of usage.

The requirement for the FSST test is to demonstrate that the airframe will not fail when loaded to design ultimate load (DUL). "There is no requirement that any components of the airframe be tested to failure." However, after demonstrating DUL capability, the FSST is often loaded to failure to determine the ultimate strength capability of the airframe and to provide data to further validate strength models.

Facilities

Gulfstream's building covers more than two acres – 92,252 sq. ft., with a volume under the roof of 3,690,080 cu. ft., says John Kenan, director, flight test operations. The facility has a structural floor with concrete and steel reinforcement 5 ft. thick to support the loads that are required for structural testing. Landing gear loads are on the order of 100,000 pounds. Gulfstream has tested components and coupons to loads in excess of 500,000 pounds, he says.

Gulfstream also has a negative pressure chamber for flammability tests that is vented and filtered to exhaust outside the building, he says. Burners are positioned by a robot so that personnel are not



Future of USAF Structural Test

"The two most obvious areas where our focus differs from that of commercial organizations is expendable and high-speed vehicles," says Andrew Swanson, technical advisor in the Structural Validation Branch of the Air Force Research Laboratory (AFRL). Missiles or "attritable" aircraft that will only fly one or a few flights allow the use of materials in different ways. In some cases, such a system can be allowed to deform or degrade, he says. "Simulating and measuring structural yielding, fatigue damage accumulation, oxidation, or ablation can be a challenge and is often something you don't deal with in commercial applications."

"Renewed interest in higher-speed vehicles means we need to create load conditions, such as very high structural temperatures, that aren't normally seen in commercial aviation," Swanson points out.

Two areas of recent advancement are fiber optic sensors and optical systems, he says. "Fiber optic strain sensors allow us to take measurements at much higher temperatures than conventional gauges or get many measurements over a very large area." And optical methods "have allowed us to get stress, strain, temperature, displacement, and velocity measurements over a complete surface rather than discrete points." This can dramatically reduce the effort associated with placing individual sensors on a structure, he explains. But more rugged fiber optic sensors are desired, as is higher-temperature capability for all optical or standard sensor and actuator systems.

An area that is ripe for improvement is miniaturization of these newer sensor systems so that they can be used on flight vehicles, Swanson says. "Whereas the newest fiber optic or other optical sensor systems work great in the laboratory with rack-mounted electronics, small air vehicles don't have the volume or power capacity, and miniaturization is necessary." We continue to invest resources to develop better ways to test materials and structures at high temperature, as that poses so many challenges for data gathering, heat application, load introduction, and of course safety. "Also, we recently encountered some challenges in managing very large datasets that resulted from some optical sensing systems. That is an area that will continue to be a difficulty, perhaps increasingly so." Full-field, high-speed response measurement can generate very large quantities of data and large data analysis efforts.

Digital image correlation (DIC) is also a hot topic, he says. It uses multiple high-resolution cameras to produce full-field displacement and strain measurements, thereby reducing the sensor-installation effort and adverse effects those sensors would have on lightweight or thin structures.

Analytical methods continue to advance understanding of the response and failure of aircraft structures, Swanson says. "We have ongoing research and testing to improve our ability to predict response, failure mechanisms, and life of structures for both piloted and autonomous vehicles in all types of operations: slow, fast, expendable, multi-use, research, or operational."

required to enter the chamber to move from calibration thermocouple/calorimeter to the test article and back. "We use an infrared camera to record and monitor temperatures across the entire test article in real time."

Many coupons are either conditioned and/or tested at temperatures and/or humidity other than room temperature, Kenan says. Environmental chambers vary in size from a few cu. ft. to 16 ft.x40 ft. and 8 ft. high. "We test at [temperatures] ... from -70 to +700 degrees F."

Textron Aviation's structural test facility includes about 51,000 sq. ft. of test floor to a ceiling height of 50 ft., Dirkzwager says. The building features an overhead crane hook, an integrated hydraulic supply system, and an air system. It also includes a physical test lab, instrumentation lab, and engineering offices, plus an additional 20,000-sq.-ft facility for systems testing, including environmental/bleed air testing and fuel system testing.

Equipment

Gulfstream uses Moog digital load control equipment with more than 584 channels, Kenan says. "Our transducers are monitored using 15,500 channels of HBM computer-controlled data-acquisition systems." A typical full-scale test will use over 100 actuators and 5,000 channels of data acquisition. Tests are monitored and displayed using more than a dozen HD video cameras, several at frame rates up

to several thousand frames per second.

"As we set up a test, we can choose from an inventory of 940 hydraulic actuators, 800 load transducers, and 550 deflection transducers."

Textron cites MTS and MOOG/FCS control equipment and the ability to run 20 large-scale independent tests as well as to control position, pressure, and load. The company also has "drop towers" for drop-testing landing gears. One of these handles heavier-gross-weight landing gear testing and another, lighter-weight testing, Dirkzwager says. Textron also uses multiple load frames for material and small component testing, temperature/humidity/altitude environmental chambers, birdstrike canon, hail gun with the ability to shoot 2-in. hail, and a burn test chamber.

Increasing computing power and the development of dedicated tools for life analysis and derivation of non-standard stress concentration factors make estimates more accurate, Gulfstream's Maher says. Control parameters can be changed on the fly, whereas "in the analog days, this would have been accomplished with a jeweler's screwdriver one channel at a time."

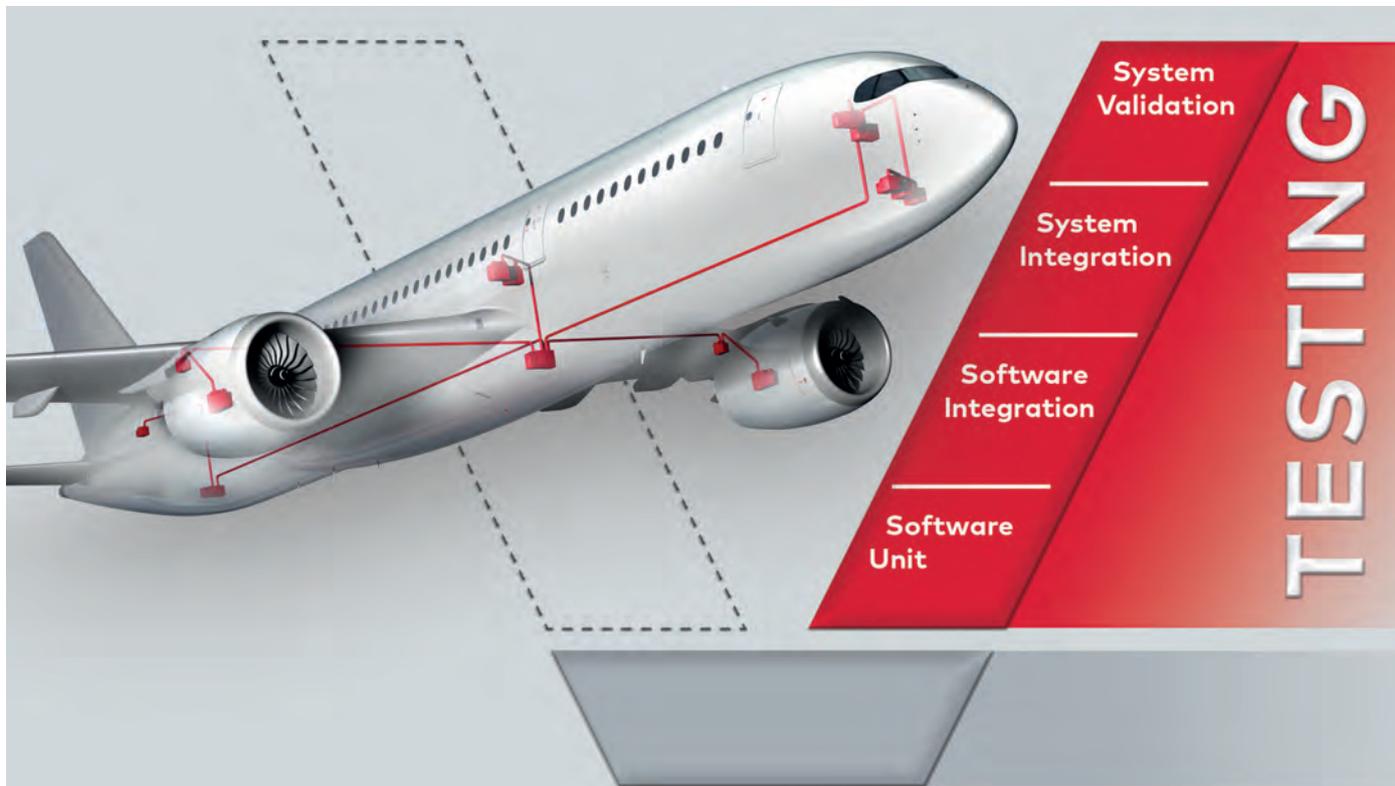
Better computing power and advanced finite element analysis allow us to model the structure with more precision and detail to eliminate high-stress areas that could result in lower-than-desired life span, Textron's Dirkzwager says.

Direct digital controllers allow the addition of features to stabilize the test

article, automatically speed the cycling rate, and tune the system, which have made a dramatic impact on the calendar time required to run tests – while at the same time enhancing accuracy and redundancies, Dirkzwager says. Test control systems can control over 100 load points with additional accuracy, and durability tests have become increasingly efficient.

"Right-sizing load cylinders, servo valves, and transducers to maximize performance and to take advantage of the improved accuracy of the test control system and data acquisition has also played into improved test performance."

The number of available channels and the reliability and performance have all increased massively, Gulfstream's Kenan says. In the mid-80s we had 32 channels of load control and 1,000 channels of data acquisition. "Due to the limited number of channels, we had to rewire the load and data systems between each test condition." During more recent test campaigns, however, "we used 115 channels of load control (with 160 available) and recorded 6,200 channels of data." Modern data acquisition systems "have allowed us to significantly increase the number of transducers, the frequency of their sampling, and the accuracy of those readings. Incidentally, all transducers can now be simultaneously sampled virtually, eliminating data slew." **ATR**



Complete Testing Solutions For Avionics

The Efficient Way to Test Your LRUs

Simplify your LRU testing by implementing a high-performance test environment with the VT System, CANoe and VectorCAST.

- > Test your software according to the requirements of DO-178C and ED-12C
- > Automate the real-time unit and integration test on your embedded hardware
- > Execute changed-based CANoe testcases with VectorCAST and measure the code coverage
- > Generate efficient test sequences with vTESTstudio and execute them with CANoe
- > Design your scalable test systems with the flexible modules of the VT System
- > Minimize DO-178C and ED-12C certification costs

Achieve maximum efficiency and quality with the testing solution from Vector.

More information: www.avionics-networking.com



ICAO and regulators are introducing location reports and tracking practices that adhere to the GADSS tracking initiative. Aerospace Tech Review is exploring global flight tracking developments and the implications for future operations.

To prevent or minimise air accidents, search and rescue organisations must locate aircraft at the earliest possible opportunity. What is learnt from historical accidents, can at the very least go towards future mitigation.

Investigations into Air France 447 and Malaysia Airlines MH370 led to an industry re-assessment of aircraft tracking and reporting capabilities. Both aircraft descended into oceanic regions (the Atlantic and Indian Ocean respectively). MH370 remains unrecovered.

The events highlighted the difficulty tracking and tracing in remote regions, and an onus on location reporting. Spearheaded by ICAO, the Global Aeronautical Distress and Safety System (GADSS) tracking initiative was developed, and has been in process since 2014.

While the traditional method of location reporting relied on radar and high frequency



(HF radio), these were methods that were often not covered in remote or oceanic areas. Today, satellite coverage means that aircraft can be tracked worldwide,

whether oceanic, polar or remote land-based areas. Space-based ADS-B or Satellite-based tracking devices can meet the Aircraft Tracking requirement. However

E-GADSS! FLIGHT TRACKING DEVELOPMENTS

By Charlotte Daniels

a blend of terrestrial ADS-B and ACARS and other messaging could also meet the recommendation.

To utilise space ADS-B, aircraft require an ADS-B Out or Mode S transponder. "These are installed on most current aircraft," explains Igor Dimnik, Director, Airline OCC and Crew Application Portfolio at SITAONAIR. "Airlines can therefore track aircraft in remote areas independent of ground-based infrastructure. It means that aircraft not equipped with SATCOM can provide position data anywhere in the world, which will allow airlines to meet mandates without additional equipment." Dimnik also notes that ADS-B Out avionics are increasingly mandatory in some regions - from January 1, 2020, aircraft operating in FAA airspace must be equipped. ADS-B Out allows aircraft to broadcast identity, location and other information to ATC via the transponder.

ADS-B Out is mandated by EASA from 7th June 2020. "Onus is on the airline to have

correct SOPs in place," advises Paul Gibson, senior product manager at NAVBLUE, an Airbus Company. "They need to ensure transponders are installed but also update SOPs for normal and abnormal operations. It goes beyond the software and hardware."

The extent to which each operator fulfils the overall GADSS initiative depends on their region of operations, and regulator. GADSS comprises three main functions; 'Normal' Aircraft Tracking (AT), Autonomous Distress Tracking (ADT), and Flight Localization & Recovery (PFLR). "Each element has different requirements," says Ruben Stepin, Director of GADSS & Airline Business Development at SKYTRAC Systems.

Regulatory Support

It is important to recognise that while ICAO is behind the development and promulgation of such initiatives, it is the regulators including the FAA and EASA that roll out mandates to ensure ICAO's

standards & recommended practices (SARPs) are implemented. Dimnik of SITAONAIR elaborates that ICAO's initiative is not the mandate itself. "Only individual civil aviation agencies with regulatory authority over respective flight information regions (FIRs) can enact these," he determines. "We see slight disparities in responses by civil aviation agencies: many civil aviation regulatory agencies across the globe, including those in China, Europe, Malaysia and Singapore had already issued mandates and published policy guidance documents for operators registered in their respective airspace back in 2018.

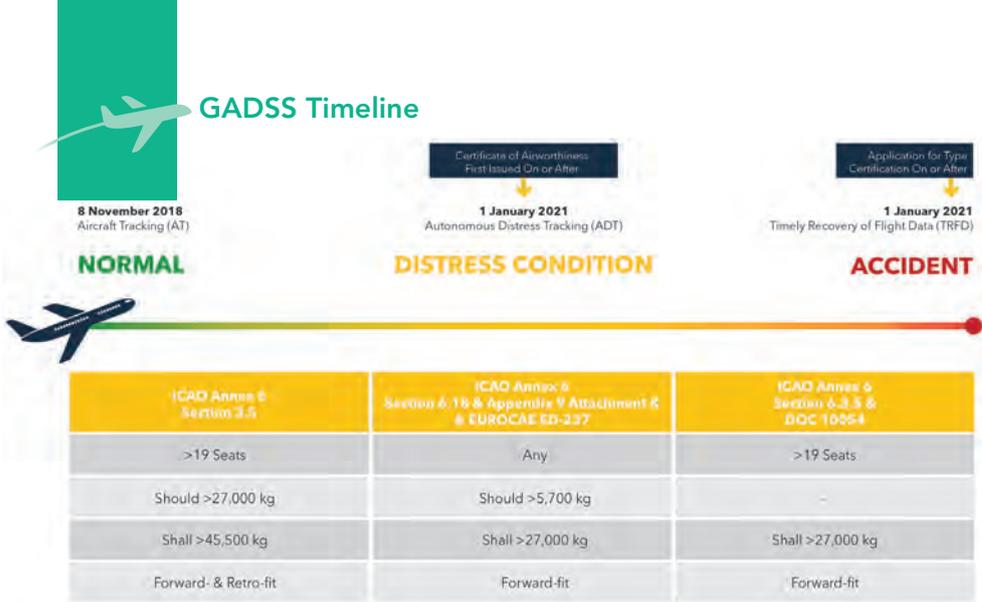
"On their side, the world's most active airline markets such as Europe and US have committed to comply, but with certain specific differences based on the availability of equipment and possibilities to upgrade equipment. As an example, FAA issued in April 2019 an InFO providing air tracking guidance including the recommendation to track the position of aircraft through automated reporting at least every 15 minutes whether in oceanic airspace or over remote continental airspace (when out of ATS tracking areas)."

GADSS Initiative

GADSS consists of several stages. "It comprises the GADSS concept of operations (CONOPS) which arose from the ICAO GADSS advisory group and outlines overall vision," says Stepin. The latest version of this, 6.0 was released in 2017.

The three components are recommendations that were developed as the result of working & advisory groups. These place the responsibility of ensuring sufficient tracking capabilities on each individual operator. "These recommendations included Normal Aircraft Tracking (AT) - which came into effect in November 2018," continues Stepin. "This suggested that operators should be capable of reporting aircraft position every 15 minutes." This is also referred to as 4D15; the 4 dimensions referring to latitude, longitude, altitude and time. ICAO explains that AT requirements typically apply to long haul aircraft due to the need to be outside of radar coverage over oceanic areas.

To discuss the idea of 'GADSS compliance' therefore, we need to differentiate between two types of operations: normal (for AT) and abnormal (for autonomous distress tracking, or ADT).



“ADT comes into force in January 2021,” adds Stepin. “This applies to forward-fit aircraft with the certificate of airworthiness first issued on or after 01 January 2021, and requires aircraft distress events to be able to report location at one minute intervals and which are resilient to failures of the aircraft’s electrical power, navigation and communication systems..

All solutions proposed as distress tracking / ADT systems will need to be available throughout the operators area of operations, according to ICAO. Satellite constellations which cover the globe are can be used for these systems. ADS-B on its own can’t fulfil all requirements for ADT.

“Last, there is a recommendation for Post Flight Localization and Recovery (also referred to as Timely recovery of flight data (TRFD)) that also comes into effect in January 2021, is also for forward-fit aircraft with the ‘application for type certification’ submitted on or after 01 JAN 2021,” summaries Stepin. “It concerns the recovery of Flight Data in a “timely manner’.”

Remote Activation

With ADT, remote activation is required. “The Flight Crew need to be able to manually activate a Distress situation from the cockpit,” explains Stepin. “Manual activation from the ground (from operational control) is not required, but is allowed and recommended, provided the necessary infrastructure on the ground and in the air are met to achieve this.

“Typically Satellite connections are required for this service to work. ELT’s will have to use the Galileo Return Link Service to achieve this,” continues Stepin. “Other Satellite based ADT systems onboard an aircraft could be activated from the ground using the contracted satellite service provision of operator’s choice.”

Operator Considerations

Achieving tracking benchmarks on a global scale requires aligning regulators

and operators. But how have SARPs and mandates affected operational procedure in recent years? ICAO has indicated that operators will need processes in place to ensure they are tracking at 15-minute intervals throughout any oceanic area where this is required, additionally the recommendation is that tracking be accomplished throughout the area of operations. Furthermore the operator will need a process to monitor the information received and take appropriate action when necessary – this is true for both AT and ADT.

As discussed, there are two separate requirements relating to ‘normal’ tracking and also tracking for aircraft in distress. There are therefore different requirements pertaining to each, relating to equipment and operational procedures. According to ICAO, normal tracking means the authority will need to determine that the operator has the relevant processes in place. ADT means that additional requirements are needed including the installation of an approved system.

ICAO indicates that typically these systems are expected to be offered by the major manufacturers as standard equipment, however other solutions exist and if an operator wished to use a third party solution they would need to obtain a supplemental type certificate (STC) for the aircraft type. The authority would then need to confirm that this met the requirements of the SARPs related to distress tracking.

“Due to ADT being only a forward-fit requirement, there is more pressure on the OEMs to deliver aircraft with systems in place that comply,” highlights Stepin. “Every OEM will do things differently, and this can be a problem for operators - particularly, those with varying fleet types.

“In addition to this the ground software will need to be able to function and display information correctly in the event of a distress and differentiate those

aircraft that are equipped with a system capable of relaying 1-min position reports to the ground and those that are not,” continues Stepin. “If the airline opts to not employ systems that relay 1-min position report information to the ground (to be visualized), such as an ELT, then they would need to have access to the ICAO proposed Distress Tracking Repository (DTR) or a means to “automatically” receive the information from Cospas-Sarsat system (through the Mission Control Centre or the Rescue Coordination Centre).”

The DTR serves as a means to securely store ADT data and make it accessible to authorized users. “This is because ICAO has recommended that the system autonomously transmit information from which a position can be determined “by the operator” at least once every minute,” adds Stepin.

Mark Duell, vice president at FlightAware has observed that for standardisation reasons some airlines voluntarily retrofit aircraft to adhere to ADT. “They’ll schedule it in the next heavy shop visit,” he says. “The idea of an incident without this capability is a strong incentive, in addition to the benefit of fleet commonality to SOPs.”

Hardware & Software

Since the new standards are performance based, there is no specific ‘one size fits all’ solution to regulatory mandates that meet its recommendations. “A safety mandate is often specific to equipment,” explains Gibson of NAVBLUE. “Because the airline is responsible, the way it’s being enforced is via IATA’s IOSA audits.” Adherence is being checked through this audit process.

The solutions that meet 4D15, ADT and TRFD vary. We know that the ADT system will need to be autonomous and meet the requirements laid out in Annex 6 by ICAO, and we know the 15 and one-minute intervals at which operators will likely need to demonstrate they can report location. Each operator will therefore be seeking solutions that complement their operations, and where possible minimise modifications to fleet.

Various hardware & software solutions are explored, to put into context evolving developments to flight tracking.

FlightAware

Software and aviation data provider FlightAware provides flight tracking via a combination of ADS-B, and multilateration ATC feeds including ATC data and ACARS data. Space-based ADS-B is provided

PRESAGIS

SOFTWARE TOOLS TO DEVELOP GRAPHICAL DISPLAY APPLICATIONS

Implement safe, interactive, real-time Human-Machine-Interfaces



ARINC 661 CDS

Embedded

Avionics Gestures Software HMI DAL-A
Graphical User Interface **GRAPHICS** Cockpit Displays
Multi-touch DO-178 VAPSXT Rapid Prototyping Simulation
Tools Safety-Critical

PRESAGIS
VAPS XT

PRESAGIS
UA Accelerator

PRESAGIS
UA Emulator

COME AND SEE US AT BOOTH 613



by Aireon, and is publicly available on its 'live flight tracker' platform. Meanwhile, ACARS is encrypted in transmit and the private property of the operator.

Today, FlightAware Global is tracking 200 airlines' commercial aircraft and 15,000 business jets and streaming data via its Firehose datafeed. FlightAware's data is also used for NAVBLUE's N-Tracking software.

"The extent to which regulators have had to adapt to ICAO's SARPs varies by region," says Mark Duell, vice president at FlightAware. "In the US there was already flight following in place, so we've not witnessed a huge change to achieve 4D15 in recent years.

"For the rest of the world including Europe and Asia, over recent years we've seen a cultural shift," Duell continues. "It's gone from crew calling on arrival to a need for constant attention throughout a flight. Rather than taking for granted the ACARS message, the recency of a location update is almost more important than the location itself." Adapting standard operating procedures (SOPs) to account for alternative procedures and building redundancies into systems to combat IT upgrades and power outages is also increasingly important for location reporting. "Operators need to show that they have the means and alternates to reliably report location in any events," says Duell.

FlightAware's GlobalBeacon was developed in part to address AT and 4D15 requirements. The only pre-requisite for hardware is the Mode S transponder. "The software can be utilised by small airlines without established IT resources, because it's available as a standalone web-based product and therefore does not require complex integration," explains Duell. 4D15 compliance – even one-minute reporting is therefore relatively inexpensive. Furthermore, the adoption of space ADS-B by well-known operators including Ryanair (an unapologetically low cost carrier) has instilled confidence in this method of global tracking.

For ADT requirements, Duell adds that if operators are using ADS-B to provide location reports every minute than they don't need to change anything specifically for a distress situation. "If the operator is using Satcom for location reports however than they will need to deploy an alternative method, because legacy pricing renders 1 minute updates too expensive." Because GADSS ADT is operator centric the carrier has to find an appropriate

service, and is responsible for relaying information in distress situations.

As 2021 approaches, Duell observes some divergence between regulatory mandates and ICAO's GADSS CONOPs. "The overall principle will be adopted, but leading regulators are forecasting 2023 for implementation," he says. "EASA advises that OEMs feel 2021 is too soon. In part this is because historically, the operator doesn't have an operational role in search and rescue. Subsequently most don't have procedures for this. EASA has voiced that location data should therefore go from aircraft straight to the organisation that is doing the search and rescue in this event."

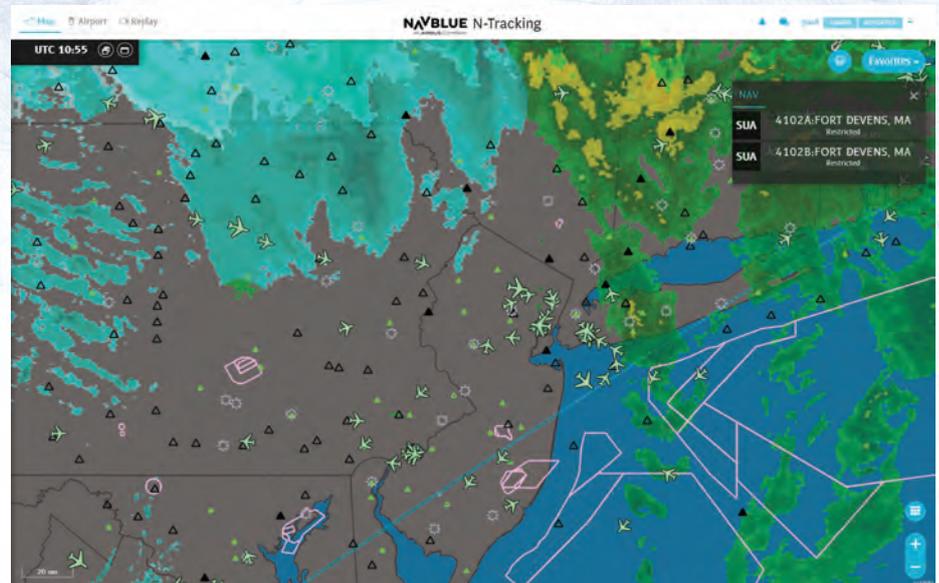
EASA is the first major regulatory body to come out with guidance. "They are still specifying what operators need to achieve," adds Duell. "That is, one-minute

intervals will still be required for ADT, so that search and rescue can obtain position within six nautical miles. EASA is actually recommending a one second intervals for 200m proximity." EASA has not incorporated any regulations yet regarding the DTR referenced in CONOPs; it remains to be seen to what extent this is adopted globally.

NAVBLUE

NAVBLUE is a subsidiary of Airbus, and formally launched its tracking solution 'N-Tracking' in August 2019. To date, 25 airlines use this browser-based global aircraft tracking solution.

N-Tracking was originally developed by Airbus and utilised ACARS position reports, before NAVBLUE incorporated the



NAVBLUE relaunched N-Tracking in 2019. The latest version boasts greater coverage due to partnerships with Aireon and FlightAware. NAVBLUE images.



To determine where space-based ADS-B is required, NAVBLUE recommends trialling N-tracking without access to this data. The provider then sets alerts when aircraft goes out of coverage.

software into its portfolio. By reassessing data sources the new version of N-Tracking achieves overall GADSS compliance. Due to new partnerships with FlightAware, AirSense and Aireon, this tracking solution now leverages ADS-B (terrestrial and space-based), ASDE-X, multilateration ATC feeds, FAA and Eurocontrol data and ACARS position data to establish real-time and global position reports. "Via Aireon's space-based ADS-B, customers can opt to subscribe to 1-minute reports," says Paul Gibson, senior product manager at NAVBLUE, an Airbus Company. "Oceanic and polar regions can also be covered using ACARS if Iridium or other SATCOM is installed on the aircraft, but this can be costly. Moreover, narrowbody aircraft don't tend to be satcom/ACARS equipped. A subscription based space-based ADS-B service is therefore ideal."

AT and abnormal tracking requirements are met by N-Tracking: 15- and 1-minute reporting intervals. But what of the autonomous aspect to ADT? "Autonomous distress tracking requires auto activation," says Gibson. "N-Tracking can autonomously trigger ADT when the aircraft deviates from operational parameters; this can be related to performance i.e. the aircraft deviates from its flight plan, flight level is too high, or it's descending too fast. ADT can also be time-triggered; for instance if the aircraft doesn't report location within the 15 minute time frame." This trigger is facilitated by ACARS and can be configured to send an alert to airline's operational control centre (OCC).

Determining the right GADSS 'fit' for each operator depends on operational network. "It's difficult to define, say, how well terrestrial ADS-B coverage will perform for their tracking, because it's hard to match to routes and coverage is constantly changing," Gibson continues. He describes a recent customer that has started to install Iridium SATCOM on its narrowbody fleet. The aircraft were flying oceanic routes to Hawaii, and the operator had determined SATCOM as the best means to achieve consistent tracking. "After a trial to incorporate N-Tracking into operations the carrier now uses a blend of Iridium and Aireon subscription-based space ADS-B." This provided a more cost-effective option.

Part of NAVBLUE's customer trial involves using N-tracking without space ADS-B, and setting alerts that trigger when aircraft goes out of coverage. The customer can therefore determine if space-based coverage is required for certain fleets due to operations.

SKYTRAC Systems

SKYTRAC Systems offers Flight Following and GADSS compliant software solutions. In addition, SKYTRAC's parent company ACR Electronics produces ELT-DT's under the ARTEX brand. SKYTRAC is primarily explored here. SKYTRAC can be installed across all fleet types and provides consistent position data globally. Today, the SKYTRAC hardware systems are installed on over 9000 aircraft and SKYTRAC's software and server tracks over 14+M position reports monthly.

Stepin advises the various measures he sees operators adopting in order to meet normal AT, ADT and TRFD requirements. AT pertains mostly to software upgrades or changes. While no additional hardware needs to be purchased for new aircraft the operator may choose to enable a space-based ADS-B service.

"While the AT recommendation is for forward- and retro-fit aircraft, we have seen that most aviation authorities have adopted this and mandated it for 19+ PAX/45.5t aircraft flying in secondary surveillance airspace (such as Oceanic airspace)," he explains. "These authorities have also recommended it for 19+ PAX / 27t aircraft, in line with ICAO's recommendation. This adoption has mainly caused operators to change internal procedures and policies on how aircraft were currently being tracked.

"Most airlines adopted methods for tracking their aircraft using as many possible existing systems onboard the aircraft, such as ACARS, ADS-B, ADS-C and other sources," continues Stepin. "This data needed to flow into their operational control centre (OCC) software to bring fleet visibility." Subsequently, most airlines have introduced tracking of their aircraft across the entire fleet, rather than only large 45.5t aircraft."

Ultimately therefore, most operators can achieve the 4D15 recommendation by ICAO. "Many are opting for space-based ADS-B which provides 1-min position reporting," adds Stepin. Because SKYTRAC aircraft tracking hardware offers configurable position reporting, operators can elect the frequency and add additional services such as voice & text communication, real-time operations, engine and airframe exceedance notifications.

However, many airlines are approaching SKYTRAC for installed aircraft tracking because the information is private; unlike terrestrial ADS-B which is largely public. "Our tracking data is secure, autonomous and maintains service for the entire duration of the flight because of Ni-Mh integral

battery back-up," says Stepin. "Also due to utilising Iridium satellites it is available from pole-to-pole. For ADT, it provides real-time alerts. Last, the operator owns the data so they can choose to make it available to third parties via secure API."

To be ADT compliant, the aircraft will need to be delivered with equipment installed that will run autonomously under its own autonomous power source and autonomous Navigation and Data sources (for instance GPS). "This is so that it will independently transmit information from which a position can be determined by the operator at least once every minute, when in distress," he adds.

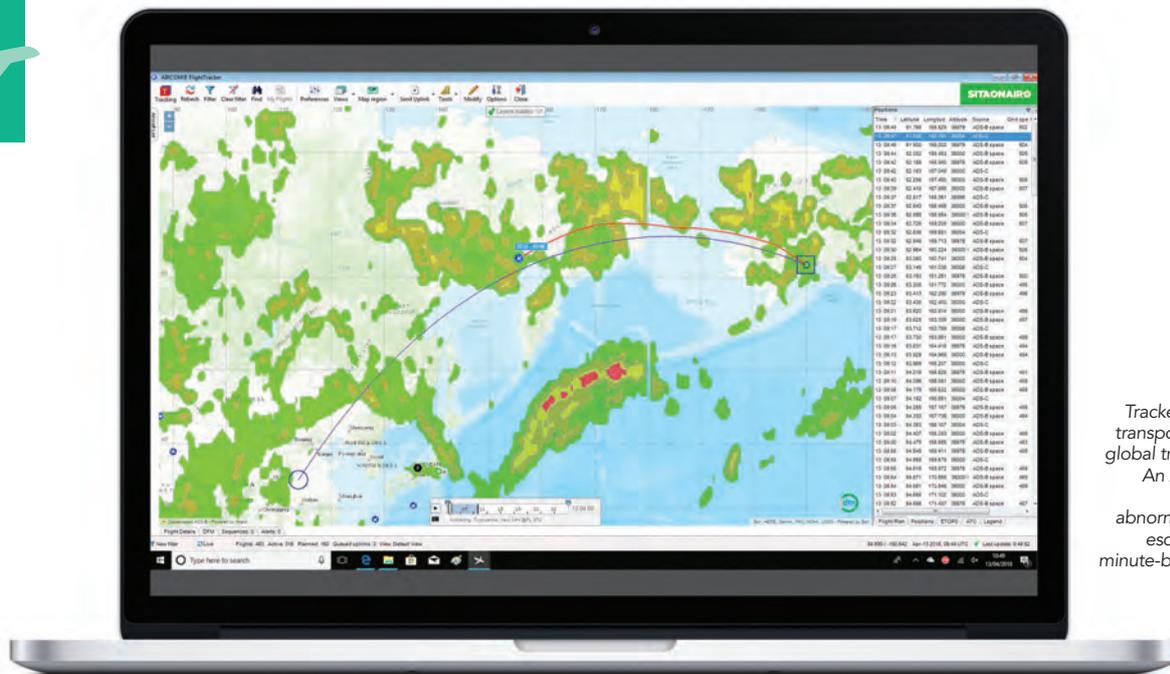
For airlines wanting to voluntarily bring fleet commonality for ADT, then hardware installation is ultimately required to achieve desired autonomy. "For ADT capability hardly any operators are complying to ICAO Annex 6 – 6.18 and Appendix 9 recommendations as they see this as a forward fit requirement only," says Stepin. "The reason being is that very few aviation authorities have adopted this into regulation yet. Instead there are recommendations out to move the effective date to 2023"

To achieve ADT, either the airline needs to decide to accept OEM specific solutions (where most are opting for ELT-DT (Distress Tracking ELTs)) which notify the Search and Rescue in the event of a distress. "Or they choose a lower cost option like SKYTRAC and retrofit their aircraft after their new purchase. The advantage is, they can install this on all their aircraft both forward-fit and retro-fit and have fleet commonality, and be able to receive the position reports directly to their OCC.

"The combination of an ADT system such as SKYTRAC using Iridium, and the ARTEX ELT-DT, ensures both operator and search and rescue get informed simultaneously."

SITAONAIR

SITAONAIR has prepared airlines for global aircraft tracking requirements, via the deployment of its ground-based AIRCOM FlightTracker solution. The software guarantees regular flight position updates without requiring any new avionics or modifications, making implementation easy. The solution relies on conventional transmissions from ADS-B Out Mode S transponders, already fitted to most commercial aircraft. "As such, aircraft don't need to be taken out of service (no cost implications) for maintenance and upgrades," says Igor Dimnik, Director, Airline OCC and Crew Application Portfolio at SITAONAIR.



AIRCOM Flight Tracker utilises Mode S transponders to provide global tracking coverage. An Alert Module can trigger actions in abnormal situations that escalates tracking to minute-by-minute reports. SITAONAIR

Today airlines, including Avianca Brazil, Azul, Norwegian Air Shuttle, Singapore Airlines and Vistara, already use AIRCOM FlightTracker, across more than 350,000 flights a month.

“Though a wide variety of technologies exist to track aircraft, they are not consistently integrated,” explains Dimnik. “AIRCOM FlightTracker focuses on connecting the air navigation service provider (ANSP) tracking, including real-time information about problematic weather and expected en route turbulence, among other route planning obstacles.”

AIRCOM FlightTracker aggregates inflight position data from myriad sources – including space-based ADS-B provided by FlightAware and Aireon using the Iridium NEXT satellite constellation – on a single aircraft position display.

“The availability of space-based ADS-B is a game-changer for airlines, and allow them to meet 4D15 and AT requirements,” says Dimnik. “With it, conventional transmissions from ADS-B Out transponders, already fitted to most commercial aircraft, are captured by receivers on new Iridium NEXT satellites, instead of ground based. Most significantly, these aircraft can be tracked from take-off to touchdown anywhere globally, including remote, oceanic or polar regions. The addition of space-based ADS-B means AIRCOM FlightTracker is also equipped to provide one-minute tracking, further enhancing operational awareness and control.”

Additionally, the Alert Module in AIRCOM FlightTracker tracks each flight automatically and generates a warning when an aircraft triggers certain defined

conditions. “Alerts can be set up to suit the airline’s needs and to trigger various actions, including uplinks to the aircraft; also messaging actions can escalate as the severity of the condition changes and, in more critical cases, AIRCOM FlightTracker can automatically set up an ADS-C contract for FANS equipped aircraft to provide an additional 1 minute position reporting option for the remainder of the flight,” continues Dimnik. All data transmitted in transit is encrypted between Iridium, Flight Aware and SITAONAIR.

In addition, airlines can trigger one-minute position reports from ADS-C using ADS-C contract requests, the same method that ANSPs use to track aircraft over respective control regions.

With the Space-based ADS-B option, AIRCOM FlightTracker is equipped to provide one-minute tracking with no additional communication charges. “Also, the airline does not need to have an Iridium contract because everything is undertaken by and handled through SITAONAIR,” adds Dimnik.

Today, there is an increase in requests for the space-based ADS-B option add-on to AIRCOM FlightTracker, in order to meet GADSS SARPs.

Going Forward

Regarding AT, ICAO indicates that today, most airlines are likely capable. “Operators just had to reconfigure systems to send more data at increased intervals,” adds Stepin. “While on the ground, software systems had the capability to include multiple data sources from various onboard systems, some having space-

based ADS-B to enable one-min position reporting.”

For ADT however, a handful of Commercial Transport Category aircraft currently have systems installed which could meet requirement, but OEMs are working to develop viable solutions for standard fit on aircraft. Standards and reports (ARINC 680) have been finalized and regulations are soon to be released by EASA and other aviation authorities. SKYTRAC is experiencing airlines wanting fleet commonality and ease of maintainance.

2020 therefore will see final milestones and goals ahead of the final stages of GADSS becoming effective in 2021. ICAO advises that operators need to establish procedures for the tracking of aircraft (AT and ADT), to be ready to implement the solutions when they become available on newly delivered aircraft. One milestone is the development of the ‘Location of an Aircraft in Distress Repository’ (LADR), which is the DTR referred to earlier. This is a central repository for all distress tracking information, giving access to ATC, search and rescue and any organizations that require it.

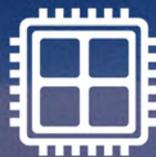
The LADR allows operators to meet the Annex 6 Requirement to ‘make position information of a flight in distress available to the appropriate organizations, as established by the State of the Operator’. The LADR was put to tender by ICAO at the end of 2019, and ICAO indicates that a supplier has been selected. Initial prototyping will be completed by April 2020 and review of the functionality will be conducted, after which time the final production version will be developed for the end of 2020. **ATR**

Software Verification Solutions

 **RVS**

On-target software verification tools for critical embedded systems

-  **RapiTime** - Timing analysis
-  **RapiTest** - Unit/system testing
-  **RapiCover** - Structural coverage analysis
-  **RapiTask** - Scheduling/event tracing



**Multicore Timing
Solution**

Solving the challenges of multicore timing analysis

DO-178C/CAST-32A evidence

Optimize code for timing

Evaluate multicore hardware

Ensure freedom from interference

GLOBAL CONNECTED AIRCRAFT SUMMIT



2020

ADVANCING IN-FLIGHT NETWORKS: AI. CYBER. DATA.

June 2-3, 2020
Hilton Denver City Center
Denver, CO

The **Global Connected Aircraft Summit** is the nose-to-tail connected aircraft event that brings together solutions providers with aircraft connectivity professionals and operators to discuss next generation technologies, security and data analytics to drive future growth.



Save \$100
with VIP
Code
ATW20!

Join us in Denver and you'll get:

- **12+ hours for networking** to connect with fellow attendees and exhibitors!
- **Two tracks instead of one** with over 17 hours of content!
- **New areas of coverage** that will expand into predictive maintenance and flight operations.
- **Deeper dive technical and business coverage** with a focus on artificial intelligence, cyber, and data.
- **Less time out of the office!** GCAS is now a two-day event!



AIRLINES ATTEND FOR FREE!

Register Now! | GCASUMMIT.COM | [#GCAS2020](https://twitter.com/GCAS2020)



SUPPORTING EUROPEAN AVIATION

EUROCONTROL is a civil-military organisation, made up of 41 European Member States and 2 Comprehensive Agreement States, committed to supporting European aviation.

We work with our aviation partners in a joint effort to make aviation in Europe safer, more efficient, more cost-effective and with a minimal environmental impact.

We provide a centre of expertise to our States and stakeholders, offering skills and knowledge across the air traffic management (ATM) and communications, navigation and surveillance (CNS) domains. To this we add access to extensive CNS/ATM data repositories and cross-domain stakeholder-focused working arrangements.

EUROCONTROL works closely with ICAO, European Commission, EASA and EUROCAE to deliver technical standards as regulatory means of compliance, to support operations and enable a harmonised implementation of new concepts and technologies.

As Network Manager, we foster the effective performance of the entire European air traffic management network, processing nearly ten

million flights per year, in cooperation with the air navigation service providers, airspace users, the military and airports.

We evolve in the context of the European Standards Framework by developing validated specifications and guidance material for our stakeholders that combine technical, operational and procedural requirements to support implementation of new concepts and technologies, and regulatory compliance.

We run a unique cross-border air traffic control centre from Maastricht, handling over 1.7 million flights annually in the upper airspace of Belgium, Luxembourg, the Netherlands and northern Germany.

We bill, collect and disburse en-route charges to Member States, providing an efficient and cost-effective service for the collection of route charges and other air navigation charges.

We are actively involved in research, development and validation activities, making a substantial contribution to the SESAR programme.

We have a unique platform for civil-military aviation coordination in Europe.



ARE YOU READY FOR THE ROARING '20s?

Taking a look at newer and emerging platforms

By Thom Patterson

It's truly an exciting time in aviation history. The convergence of ultra-efficient engines, revolutionary building materials and an increasingly global economy is creating a virtually unprecedented era.

The past decade has seen first flights for several new designs as well as significant technological improvements for variants of already existing types.

What flew for the first time in the 2010s? Here's a quick list:

Single-aisle airliners include Bombardier's CS100 and CS300, later to be acquired by Airbus and rebranded the A220-100 and A220-300, as well as

the A320neo and A321neo. Also, the 737 Max flew for the first time this past decade.

Now the world awaits word on when the grounded airliner will be certified to fly again.

Also entering service in the 2010s were several wide-body twinjets - such as the two successful main variants of the A350-XWB family and Boeing's 787-8. Eventually all three Dreamliner variants earned success during the decade.

As we roar into the '20s, the new decade promises to bring additional platforms aimed at supporting skyrocketing projections for passengers

and cargo.

Embraer will spend this year and next working to certify its E175-E2, after its maiden flight last December. 2020 has already seen the first flight of Boeing's 777-9X — a 21st century improvement on the beloved 777. Plagued with delays — the first Japanese-made commercial jetliner — Mitsubishi's SpaceJet M90 — could finally be delivered to its launch customer ANA next year.

Airbus's freakishly large Beluga XL flew its first operational flight this past January. Eventually five more of the transport airplanes are expected to be produced.

Also this year, the fate of the beleaguered 737 Max is expected to play out — an unprecedented scenario that has forced hundreds of jets to sit fallow on the ground since March of 2019.

With so much activity, it seems like a good time to take a look at how some of the newer platforms are faring. But let's also scan the horizon for what new designs and variants lay ahead.

Airbus A350-XWB

Let's start with the wide-bodies. With two years of service under its belt, the A350-



Airbus Image

1000 has gone a long way toward earning the title "king of the long haulers." Built to fly at least 350 passengers more than 19 hours without refueling, the A350-1000 has been proving itself on marathon non-stop routes like Hong Kong-Washington Dulles and between Doha and Houston, Texas.

Qantas Airlines announced last December it has tentatively chosen the A350-1000 for its Project Sunrise ultra long-haul routes in excess of 10,000 miles beginning in 2023. Possible routes could fly between Perth and London and between the Australian east coast and London or New York City.

The carrier specifically called out the A350's reliable Rolls-Royce XWB engines

as a factor in its decision.

If the final decision by Qantas gives the program a green light, Airbus plans to increase the aircraft's fuel capacity and MTOW.

No word from Airbus about whether it plans to build a stretched version of the -1000. "Airbus is always studying how we can evolve our aircraft family portfolio," said Airbus spokesman Martin Fendt. "The recent selection by Qantas of the A350-1000 — over the competing 777X — for their 'Sunrise' requirement is one of many examples that Airbus is adopting the right strategy."

The final decision, says Teal Group aviation analyst Richard Aboulafia, may come down to weight.

"The 777-8X is a good plane," Aboulafia said. "Ultimately it's got a heavier structure and greater weight than the 777-9X, so the A350-1000 probably has the advantage. But we'll see."

Boeing 777-9X

Speaking of the 777X, the program achieved an important milestone last January 25, when the jet flew for the first time.

The 777-9X variant — distinguished by its extreme length and wide wingspan



Boeing Image

— took off from Paine Field in Everett, Washington, and flew for 4 hours before landing at nearby Boeing Field in Seattle.

"The 777X flew beautifully," said chief test pilot Capt. Van Chaney shortly after touching down. Testing continued into February with typical flights clocking ground speeds around 400 mph and reaching maximum altitudes from 14,000 feet to nearly 21,000 feet.

The 777X design aims to save fuel with large, light-weight, carbon fiber wings which are produced in gigantic pressurized ovens at Boeing's Everett factory. The fuselage is aluminum, saving the 777X from steep production costs incurred by the carbon-fiber fuselage Dreamliner.

Boeing says the 777X — powered by all-new GE9X engines — will be 12% more fuel efficient and deliver 10% lower "operating economics" than its competition. It's interesting to note that General Electric has proclaimed the GE9X as the largest turbine engine in the world — with a diameter big enough to fit the fuselage of a 737.

In fact, the 777-9X is now the world's largest twinjet, seating about 425 passengers and offering a range of more than 8,200 nm.

Aboulafia is excited about the new platform. "But it's going to have fantastic

costs for that size class," he said. "Eventually the market will look again at larger planes. It's just going to take a while to play out. But when they do, that design is going to be in its own unique category."



Airbus A330-800

Another wide-body, the Airbus A330-800 is the world's newest large airliner to achieve type certification. The fuel-saving twinjet achieved a joint stamp of approval in February from the EASA and the FAA.

Expected to enter service later this year, the -800 is the second of Airbus's two A330neos (neo stands for New Engine



Airbus Image

Option), both of which sport fuel-efficient Rolls-Royce Trent 7000 engines. Overall the -800 burns 25% less fuel than older competing models. The larger A330-900 won certification in 2018.

Compared with the earlier A330 types (-200ceo and -300ceo, Current Engine Option) the A330neos offer longer range and higher seating capacity. The -800 comes with a range of up to 8,150 nm and typically seats up to 260 passengers in three classes.

Contributing to its range and efficiency, the -800 also boasts a new wing design and light-weight, super-strong carbon composite Sharklets.

While the platform is based on that of the already very efficient A330ceo wing, they are quite different internally and externally.

"The A330ceo wing contains elements carried over from the four-engine A340 airliner – in the form of provisions for the mounting of the A340's outer-wing engines and pylons," Fendt said. "In the A330neo however, these structures

were removed altogether from the design, saving considerable weight and reducing cost and complexity."

Another significant change on the A330-800, Fendt said, includes new 3D spanwise "wing twist" aerodynamic efficiency

optimization applied to the wing design.

The Sharklets add as much as four meters to the overall span compared to the A330ceo, according to Airbus.

"What's really interesting is that with this span extension, the A330neo's wing achieves an efficiency-boosting aspect-ratio of 11.3 – higher than any commercial airliner in operation today, even counting the Boeing 787," Fendt said.

Boeing 787-10 Dreamliner

Nearly a decade after Boeing's 787 Dreamliner first entered service, sales for the game-changing carbon-composite wide-body have been slowing down.

Last October Boeing announced it would reduce Dreamliner production from 14 to 12 each month and reports say the company is considering further cuts.

Nonetheless, in February, Dreamliner launch customer ANA announced new orders for nine 787-9s and 11 of the largest variant — the 787-10. Both variants are powered by GEnx engines.

The lightweight carbon-fiber fuselage and wings and the fuel-saving powerplants give these jets a range between 6,400 nm and 7,600 nm, burning 20% less fuel than older competing models. The -8 models seat around 240 passengers in two-classes. The -9 seats nearly 300 passengers while the -10 variant - manufactured in Charleston, South Carolina - seats about 330 passengers in a two-class configuration.

The airframer said it expects output to eventually bounce back in a few years, supported by projected market growth in Asia and airlines looking to replace aging wide-bodies. In Southeast Asia alone Boeing is predicting 4,500 planes will be needed over the next 20 years.

BelugaXL



Airbus Image

When you take an Airbus A330 airliner and turn it into one of the world's largest transport aircraft, people sit up and take notice.

That explains all the attention in January,

eventscase

All-In-One Event Management Software

YOUR TECHNOLOGICAL SOLUTION FOR ALL YOUR EVENTS

Congresses, meetings, product presentations, incentives...

OUR PRODUCTS



Website



Badges



1-2-1 meetings



E-Mail Marketing



Abstracts



White Label & Security



Registration



Check-in App



Onsite Box



Gamification



Exhibitors Area



Event App

Event Technology Providers of the Aerospace Tech Week 2020

LONDON - MADRID - BARCELONA - CASTELLÓN - NEW YORK - DUBAI

HEADQUARTERS

EventsCase – WeWork, 199 Bishopsgate,
Spitalfields, London EC2M 3TY, UK

www.eventscase.com

+44 (0) 20 8133 7313

enquiries@eventscase.com



when the first Airbus BelugaXL went operational.

Eventually Airbus hopes to build five additional BelugaXLs, which boast the largest cargo bay cross-section of any cargo aircraft. All six BelugaXLs are expected to be in service by 2023.

The BelugaXL is designed to ferry huge Airbus components (such as wings for the A350) from production facilities to assembly locations in Hamburg, Germany; Tianjin, China; and Toulouse.

Powered by a pair of Rolls-Royce Trent 700s, BelugaXL is the big brother of the original Belugas — the Airbus A300-600ST aka BelugaST — which entered service in 1995.

There are five BelugaSTs and Airbus says their future is “under consideration” — but the planes could continue flying for another 10-20 years.

Single-Aisle Sensations

The aviation industry continues to buzz about last June’s announcement that Airbus is taking its A321LR single-aisle airliner and adding extra fuel tanks to extend its range by up to 700 nm (1,300 km).

Expected to enter service in 2023, this new long-range variant powered by CFM International LEAP 1A engines will boast a range of up to 4,700 nm (8,700 km) while burning 30% less fuel per seat than previous generation jets built by competitors.

Passenger capacity will be 180-220 in a two-class configuration. To handle extra weight from the added fuel the XLR’s landing gear will be re-engineered to be more robust.

Airbus offered some insight about how that idea began and how it came to fruition.

“Clearly, when we first offered the A321 we engineered-in a capability for growth in the future,” Fendt said. “However, exactly how we would develop and ‘incrementally innovate’ this aircraft family, and in which direction, was something that we would reassess as the market requirements evolved over time.”

What directly led Airbus to move forward with the XLR was airline feedback that showed a market for an aircraft that could fly farther “and create more value by bringing 30% lower fuel burn per seat than the previous-generation competitor aircraft — such as the out-of-production Boeing 757,” Fendt said.

Airbus is selling the A321XLR as a lower-cost, single-aisle aircraft suited for longer and less heavily travelled routes. Many of

those routes can now only be served by larger wide-bodies, which are less efficient for those types of operations.

“We all knew the A321 had a lot of potential,” said Aboulafia. “What’s interesting about the XLR and the A321 in general is just how much more you can do to it, like new wings and new engines.”

Aboulafia points out the potential of even more development of the A321. Imagine a “220- to 240-seat jet with 5,000 nm range,” he said. “There’s just so much route development that can take place with that kind of product.”

A380 Production Ending

In fact, there’s a connection between the A321XLR and the world’s largest passenger jet, the Airbus A380.

When production ends for the A380 in 2021, its assembly line in the Lagardere production facility in Toulouse will be converted to produce the A321XLRs.

It’s hard to believe 15 years have passed since the first A380 took flight. During that time, more than 240 A380s have rolled off the assembly line.

The new A321 line at Lagardere will be “digitally enabled,” Airbus said. It’s a step toward Airbus’s goal to modernize the entire A320 production system.

Described as a “next-generation final assembly line,” it’s expected to be ready by mid-2022. Airbus says it will “optimize industrial flow” by increasing A321 production capacity as well as flexibility.

Adding the new Toulouse line will increase the number of A321 assembly plants to three, including the current German facility in Hamburg and the U.S. plant in Mobile, Alabama.

The A321XLR’s acquiring of the A380 production facility is an appropriate turn of events in light of current market trends, Aboulafia said.

Who would have thought that the development of long-range single-aisle airliners would have such industry-wide repercussions? Increased fuel efficiency and longer range are allowing for the fragmentation of larger routes that are the lifeblood of high-capacity airliners like the A380.

“Route fragmentation throughout the globe is still playing out and it’s a far more long-term and profound process than I ever would have guessed,” Aboulafia said.

“We all knew route fragmentation was bound to kill A380, right? But what’s amazing is it just keeps going down and down and down and planes just keep getting smaller and smaller. Right now of course the big beneficiaries are the 787

and A350, but you're starting to see it trickle down to the A321 a little. You could argue that the most promising aircraft right now in this environment is the A321XLR."

New Boeing Clean Sheet?

Planes like the A321XLR put pressure on Airbus's rival Boeing to embark on a new clean sheet design as a way to compete.

"At this point it's clean sheet or nothing," Aboulafia said. "In other words, do you cede the fastest growing market in aviation to Airbus? Or do you do something new? There's no third choice."

For years Boeing officials have been talking about the possibility of an "NMA" - a new midmarket airplane aimed at a 225-seat jet and a larger airliner seating 275.

This past January, Boeing's new CEO Dave Calhoun, said: "The NMA project is going to be a new clean sheet of paper."

But reports suggest the NMA project is being shelved. Instead, Boeing may be considering a new 200- to 240-seat design with a range of 4,700 nm to compete with the A321XLR, according to Aviation Week.

"If Boeing moves quick, they can offer a product that really does outflank the A321 - maybe a plane that gets 5,500 nm -- something along those lines -- with 220-250 passenger capability," said Aboulafia.

"I'm not really clear what the technological enablers are for that," he said. "Will they go with composite wings and a metal tube? Whatever they're going to do, they've got to do something. Otherwise they basically give 10 or 15 points of the market share to Airbus."

Troubles with the Boeing 737

You can't talk about Boeing now without including the airframer's unprecedented troubles with the 737 Max - which have been grounded by aviation authorities worldwide since March 2019 after two tragic crashes killed 346 people.

The idea behind the Max was to create a new line of 737 variants by augmenting existing designs with new efficient CFM International Leap-1B engines that changed the 737's traditional aerodynamic characteristics.

The 737 Max's new flying characteristics were to be offset by anti-stall software called MCAS - the Maneuvering Characteristics Augmentation System - which has been blamed for the crashes -- Lion Air Flight 610 in October 2018 and Ethiopian Airlines Flight 302 less than five months later.

This past January, Boeing said it was temporarily halting all Max production,

while the plane maker and the FAA work to fix the problems with MCAS.

A year after the historic grounding of the 737 Max - including the -8 and -9 variants - it remains unclear when the type might be re-certified by the FAA and re-enter service.

"... we are currently estimating the ungrounding of the 737 Max will begin during mid-2020," Boeing said in a statement in January. "Returning the MAX safely to service is our number one priority, and we are confident that will happen. We acknowledge and regret the continued difficulties that the grounding of the 737 MAX has presented to our customers, our regulators, our suppliers, and the flying public."

Other problems have been reported with the 737 Max during the grounding, including a wiring issue and the discovery of foreign object debris inside fuel tanks.

"I'm still bullish on at least the -8," said Aboulafia, who suggests rebranding the plane without the word "Max."

"The -9 and -10 appear to be very badly unmatched by the A321," he said. "But I think the -8 will be around for a solid dozen years in production. It'll do its job."

737 Next Generation



Boeing Image

The grounding came shortly after Boeing ended production of passenger versions of its previous 737 line - known as 737 Next Generation. 737 NGs garnered more than 7,000 orders during a 22-year run.

Then, more bad news for the 737: The discovery of hairline cracks last year in structural features called "pickle forks" prompted the FAA to order inspections of all 737 NGs.

Pickle forks connect the fuselage with wings and landing gear. So far, inspections reportedly have revealed cracks in pickle forks in only a small percentage of 737NGs.



Airbus A220

.....
Air Canada is the latest customer flying Airbus's A220-300 - the single-aisle clean-sheet designed by Bombardier. It took delivery of its first A220-300 last December, the first of 45 on order and the first carrier in North America to operate the type. JetBlue is scheduled to begin flying the first of its 70 ordered A220-300s later this year.

Before Airbus bought controlling interest in the A220 program in 2018, Bombardier had branded the plane the CSeries. The

have been beset with production delays, bureaucratic miscues and cost overruns since the program launched in 2008. Both variants are engined with Pratt & Whitney PW1200G PurePower Geared Turbofans. The M100 is expected to enter service in 2024.

"The market will definitely want another next-generation regional jet," said Aboulafia. "I think SpaceJet will have a decent future as long as Mitsubishi sticks with it."

New E-Jet E2

.....
Another new regional airliner —

working to bring products to market since 2008.

Comac has delivered more than 20 ARJ21-700 regional jets so far, exclusively to Chinese operators, including Chengdu Airlines, Genghis Khan Airlines and Jiangxi Air.

This aircraft, which seats 90 passengers in an all-economy configuration, is powered by twin, rear-mounted GE CF34 engines.

"It's incredibly relevant - for 1986," Aboulafia quipped. "It's exactly what happens when you have government-owned enterprise designing a science fair experiment."

Comac also has been working to put a larger single-aisle passenger airliner into service. The C919 — which completed its first flight test in 2017 — is designed to seat about 150 passengers. It's outfitted with wing-mounted CFM International Leap-1C engines. A Chinese-built AECC CJ-1000A high-bypass turbofan engine is also being developed for the C919.

The C919 has more than 1000 purchase commitments and more than 300 firm orders, primarily from inside China. It's expected to enter service with launch customer China Eastern Airlines as early as 2021.



Airbus Image

CS100 and CS300 were described as the first clean sheet design of a large, single-aisle airliner in nearly 30 years.

The A220's unusual wing construction process involves infusing its carbon-fiber reinforced wings with liquid resin.

Air Canada's A220-300s seat 137 passengers in two classes. The smaller A220-100 — operated by Delta Air Lines and Swiss International Air Lines — seats from 100-120 in a dual-class configuration. Both types have a range of about 3,400 nm.

Airbus says the jets are the "quietest and most eco-friendly aircraft in its category," thanks in part to efficient twin Pratt & Whitney PW1500G geared turbofans. The A220 has more than 650 orders so far. More than 100 A220s are currently in service among six operators.

Regional Jets

.....
Mitsubishi's SpaceJet M90 regional airliner — which was scheduled to enter service this year — won't be delivered to launch customer All Nippon Airways until 2021, Mitsubishi announced in February.

The 90-seat jet and a smaller SpaceJet type called the M100 which seats 76 passengers in a three-class configuration

Embraer's E175-E2 — flew for the first time last December, kicking off a 24-month testing program.

Seating 80 in a two-class configuration, the E175-E2 is the third jewel in the Brazilian plane-maker's crown of E-Jet E2s. The jet is powered by twin Pratt & Whitney PW1000G geared turbofans.

The E175 was preceded by the larger E190-E2 and the E195-E2. Embraer boasts about their lower maintenance costs and fuel-saving benefits.

Other Newcomers

.....
China's state-owned airplane manufacturer Comac (Commercial Aircraft Corporation of China) has been

Irkut MC-21

.....
After a maiden flight in 2017 and several production delays, Russia's Irkut MC-21 single-aisle twinjet is expected to enter service in 2021.

It's powered by Pratt & Whitney PW1000G high-bypass turbofans — which also fly Airbus's A220, Embraer's E-Jet E2s and Mitsubishi's SpaceJet.

Designed by Irkut, the MC-21 is manufactured by United Aircraft Corporation, which is partially owned by the Russian government.

All in all, it looks like the roaring '20s are gearing up to be a dynamic decade for the aviation industry. We'll keep you posted. **ATR**



Comac Image

INNOVATION CLUSTER

Aeronautics, Space, Drones and Embedded Systems

OCCITANIE/PYRÉNÉES-MÉDITERRANÉE
& NOUVELLE-AQUITAINE



**aerospace
valley**

146 000 industrial jobs

1 900 companies

1/3 of French aeronautics jobs

8 500 researchers

850+ members

2 French *Grandes Ecoles* specialised in aeronautics

600 certified R&T projects financed

TOULOUSE



Bâtiment B612 • 3, rue Tarfaya CS 64403 • 31405 TOULOUSE cedex 4
+33 (0)5 61 14 80 30

PAU

2, avenue Pierre Angot • Hélioparc • 64053 PAU cedex 9

BORDEAUX

Chez Arts et Métiers Paris Tech • Esplanade des Arts et Métiers • 33405 TALENCE cedex

MONTPELLIER

132, boulevard Pénélope • Bureau 3B140 • 34000 MONTPELLIER

ROCHEFORT

22, rue de l'Arsenal • 17300 ROCHEFORT



contact@aerospace-valley.com
www.aerospace-valley.com



@AerospaceValley



Aerospace Valley



BY DAVID GRASSO (BELOW) AND CHRIS BRUMITT (RIGHT),
MAINE POINTE AVIATION, AEROSPACE & DEFENSE PRACTICE



Digitization of the Aerospace & Defense Supply Chain

Industry 4.0 transformation has become the hallmark of the aerospace and defense industry. One of the most pressing components of this transformation is acquisition reform, which is a top priority for both the Department of Defense and defense contractors. The primary element behind this is the digital supply chain and what it means to a rapidly evolving acquisition process. This push has already brought significant benefits to the DoD, shortening timelines and allowing the warfighter to obtain new systems more quickly and at lower cost.

Yet despite these advances and the initiation of new programs along with an increased awareness of the necessity of supply chain digitization, the aerospace and defense industry still lags behind other industries in gaining its full benefits. This is largely due to the need for widespread cultural change throughout the aerospace and defense industry and acceptance of the need for new supply chain digitization efforts. This gap between potential benefits and actual implementation of digital supply chain transformation is puzzling since most organizations in this segment do acknowledge the benefits of and do have at least some plans in place for digital technology. Concerns often revolve around whether or not such transformations would yield short- or mid-term return on investment and the organization's readiness and ability to embrace the people/data/technology interface needed to make it work.

With a Pentagon budget for 2021 at \$740 billion (relatively flat from 2020), modernization projects in this industry have become even more essential. It is possible to get maximum benefit from existing initiatives such as optimizing supply chain and sustainment to keep shortages to a minimum and building out new capabilities without a corresponding increase in budget. However, to achieve this digitization efforts must be in place to create value, drive out cost and improve efficiency.

The next step in defense's acquisition reform must be digitization. The fact that defense is currently behind the times in modernization and digitization is evident. One example is the antiquated sustainment model and deficiencies in the end-to-end supply chain which has caused serious parts shortages, grounded aircraft and led to availability rates that cannot meet mission requirements. The results can be devastating when the warfighter effort is not as efficient as it should be. Reform in this instance not only would result in a cost benefit to the military but greater readiness as well.

The Department of Defense has taken a strong stance in rolling out modernization initiatives and demanding a higher level of digital capabilities from the entire supplier ecosystem, greater security and compliance and less risk, but there remains a gap between Defense's expectations and the slowness with which prime contractors are rolling them out. This does present a challenge in digital transformation of the supply chain ecosystem, although it is not insurmountable.

Incorporating predictive analytics will become one of the biggest trends in transforming defense acquisition and sustainment, starting at the supply chain level, and improving operations, logistics and MRO. While the need for supply chain modernization is evident throughout the aerospace and defense industry. Contractors will need to take a closer look at all options to create value within their supply chain including digitization in order to drive cost improvements and remain competitive.

The process of digital supply chain optimization does not, as one might think from the use of the term "digital," start with technology; rather, it begins with a new business model, based on strong processes and execution fundamentals. The new business model begins with an unprecedented level of collaboration across the entire aerospace and defense ecosystem.

Aerospace and defense contractors are

increasingly faced with the imperative of digital transformation, but to address it, they must identify what the digital supply chain means to them, define their business processes, expectations and goals, and take action on digitization.

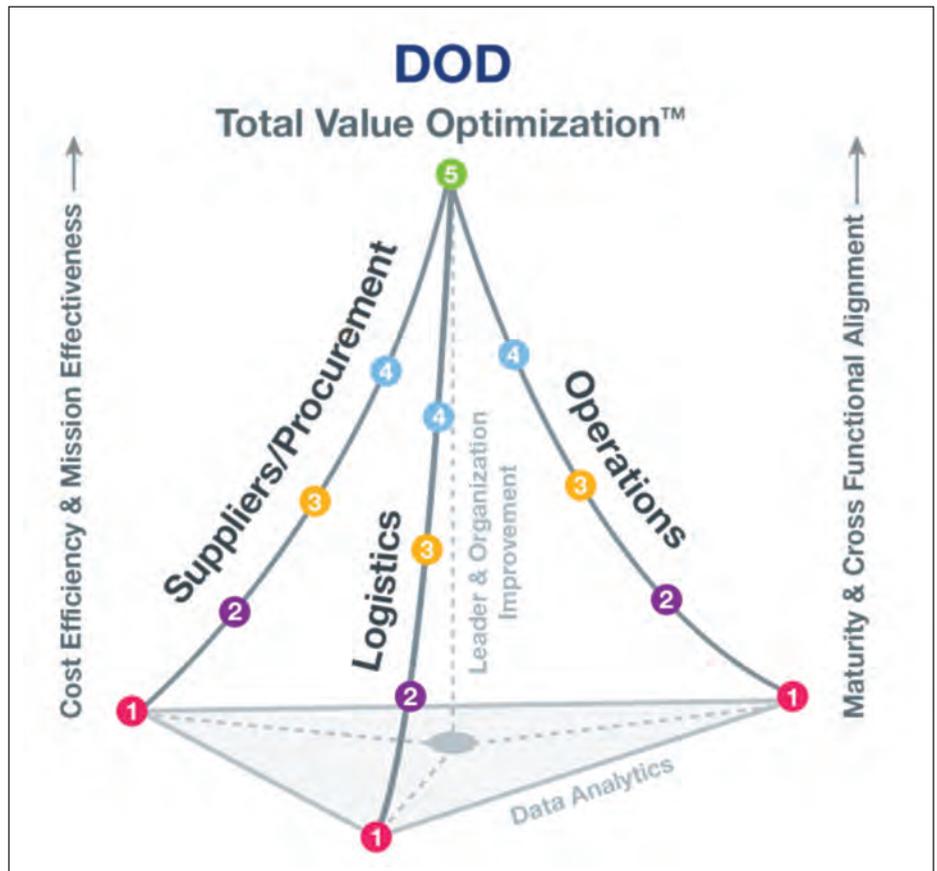
Digital transformation of the supply chain is built on two fundamental realizations: Transformations are not just about the technology, and they are not just about cost saving. In fact, driving cost savings has created a cost fatigue that the supply chain has a hard time coping with. In aerospace and defense, as is often the case in any industry, there is a "shiny objects" phenomenon, a fallacy based on the mistaken belief that digital transformation is a technology-first proposition, where the desired return will be achieved simply by virtue of putting new tech in place. The new tech is without a doubt part of the transformation – but it doesn't come first. What does come first is the strategy, the end-to-end buy in including buy in from the entire supply chain and a cultural change; the technology is layered on top of that.

More recent innovations may allow the aviation and defense industry to follow a major trend that has long been evident in other industries, and that is, consumer technology finding its way into business. Cloud technologies and platform-based innovations first made dramatic changes in how individuals store and share information. Industry was at first resistant over fears of security, the risk of data loss due to third-party management and a basic aversion to change, but cloud technologies have since become mainstream. The Department of Defense has gone a long way in implementing cloud solutions and demanding them of their suppliers, with projects like GovCloud, FedRAMP and Hybrid Cloud. Questions still remain though as to how aerospace and defense partners will effectively balance the need for cloud and

platforms against the stringent security requirements typical of Defense contracts. The solution may lie more in private cloud offerings rather than public cloud, which would serve to mitigate much of the risk.

This reality is evident in a shocking statistic from the Global Supply Chain Institute at the University of Tennessee, which states that as few as one in 50 digital transformation projects fail to provide the expected ROI. To further explain the high rate of failure, the GSCI notes the underlying reason is not a lack of technology, or even a lack of understanding how to use the technology. The biggest reason for failure of digital transformation projects is cultural. Effecting change at the people level is always the hardest part of any transformation.

A new era of digital supply chain in aerospace and defense goes far beyond the obvious benefit of cost savings. While savings is, and should be, a part of this transformation, it is not the only goal, and perhaps not even the primary one. What it is about is creating sustainable growth. This may take the form of developing new businesses in adjacent categories, for example, creating value in core businesses, transforming the organization to be more agile and responsive, better serving the organization's clients, or in the case of the Department of Defense, better serving the warfighter, improving



readiness and being a better steward of taxpayer dollars.

This digital supply chain transformation and the new model that will bring aerospace and defense into the next generation will have to be built not just on new technology but also on new

Source: Maine Pointe

methodologies that drive a different point of view of how the elements of the supply chain interact. The Total Value Optimization (TVO) framework, which is rapidly being seen as the next Lean



AEROSPACE testing

AEROSPACE TechWeek.com

18/19 Mar 2020 | Toulouse, France
6 EVENTS UNDER 1 ROOF

New Testing Strategies for New Technologies

Outline Aerospace Testing Conference Programme

- Urban Air Mobility, EVTOLS and UAVs
- Complex and Embedded Systems
- High level integration and testing
- Space, High Altitude & EMC Testing
- Electrification, Aerostructures, Materials Testing
- The Future of Testing

Bringing you more opportunities and greater connectivity...

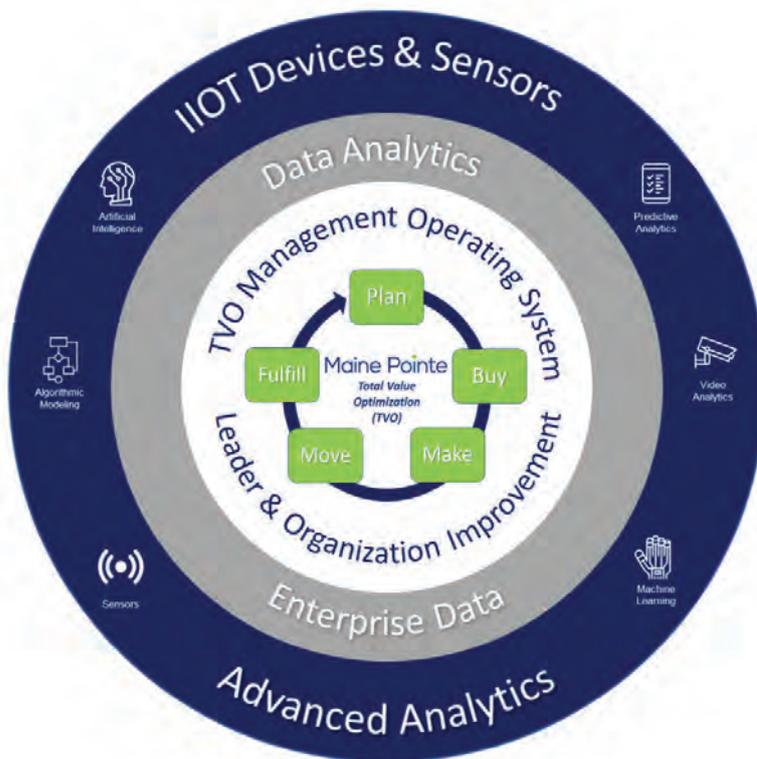
- Leading conference programmes
 - Exhibition
 - Certified Training
 - Hosted Airline Programme
 - Technical & Educational Workshops
- ...with the aerospace technology industry

For the full Aerospace Testing Conference Programme visit www.aerospacetechweek.com/aerospace-testing-prog

WWW.AEROSPACETECHWEEK.COM

Six Sigma for the supply chain, enables the sort of tighter focus, success and inclusionary practices needed. Driving a clearer vision of the value that needs to be created, TVO's strategic approach focuses equally on procurement, logistics and operations and how they are collaborative and integrated to achieve sustainable results along the entire buy-make-move-fulfill supply chain.

The importance of advanced technology, Industrial Internet of Things (IIoT) and advanced data analytics plays a major role in the TVO framework. This is demonstrated in the outer ring of the diagram below – underscoring the importance of having the fundamentals of process and leader and organization



Source: Maine Pointe

improvement in place before the advanced technology can be layered on top of it.

Digital transformation must be based on two things before technology is even sourced: Collaboration and integration throughout the entire end-to-end supply chain and measurement of results. An outstanding example is the Army Futures Command, established in 2018 with the mission of modernization and facilitating future readiness. Part of the Command acknowledges this need for collaboration with the institution of cross-functional teams designed to eliminate silos and promote joint collaboration on modernization efforts. A big part of the Command's success lies in the cultural shift it has created, not just within the Army but within

the entire supply chain ecosystem, acknowledging that, especially with innovative startups eager to serve the defense market, communication with the Pentagon has seldom been easy. The program disrupted business as usual, and has enabled the Army to obtain more disruptive technology and out-of-the-box ideas to achieve its biggest modernization priorities.

Digital supply transformation in aerospace and defense is the tip of the spear in the modernization of acquisition and sustainment. Newer levels of collaboration, and viewing the supply chain as an entire ecosystem, will encourage greater stability, a greater data-driven supply chain environment that leads to improved decision-making and transform the very culture of the entire industry. **ATR**

ABOUT THE AUTHORS

David Grasso is executive vice president Aviation, Aerospace & Defense at Maine Pointe, a global supply chain and operations consultancy. With over 30 years of experience, Grasso has worked along the entire value chain including engineering, manufacturing, supply chain and MRO in the US, Europe and Asia. He has a proven track record of successful business transformation, operational optimization and profitable growth, working collaboratively from C-suite to the factory floor.

Chris Brumitt is vice president Aviation, Aerospace & Defense at Maine Pointe, which helps military and commercial clients break through silos to accelerate improvements in costs, quality, cash and throughout across the entire value chain. Brumitt has more than 30 years of experience and has a track record of helping senior executives realize the accelerated execution of significant strategic and operational goals.

A simpler path to multi-core certification

The more layers of software complexity that live between your applications and hardware, the cloudier—and costlier—the path to CAST-32A certification.

LYNX MOSA.ic is a modular software development and integration framework founded on the LynxSecure® separation kernel that simplifies traditional platform abstraction layers, improves transparency and traceability of system designs, and reduces the time and costs associated with achieving multi-core certification.

Traditional platforms vs. LYNX MOSA.ic

Traditional RTOS platforms enforce a centralized, client-server OS model in which all applications are dependent on a single monolith composed of multiple layers of abstracted software complexity (fig 1). LYNX MOSA.ic introduces a new perspective to application development that allows developers to minimize the complexity of runtime environments by targeting only the abstraction layers required.

Design, build, and manage software systems as heterogeneous compositions of independent application modules (fig 2). Debug less at the system level, certify fewer lines of code (LOC), and meet your project requirements on time and on budget, with LYNX MOSA.ic.

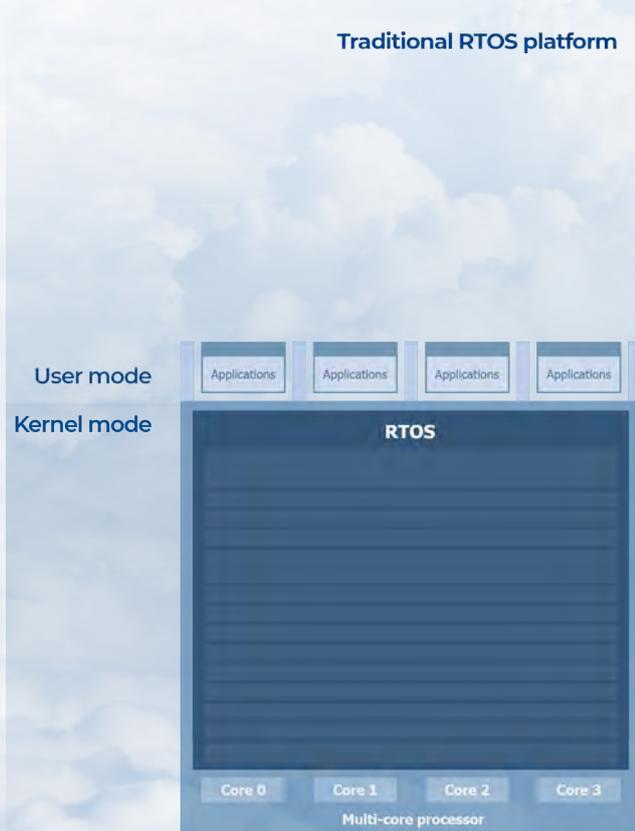


Figure 1

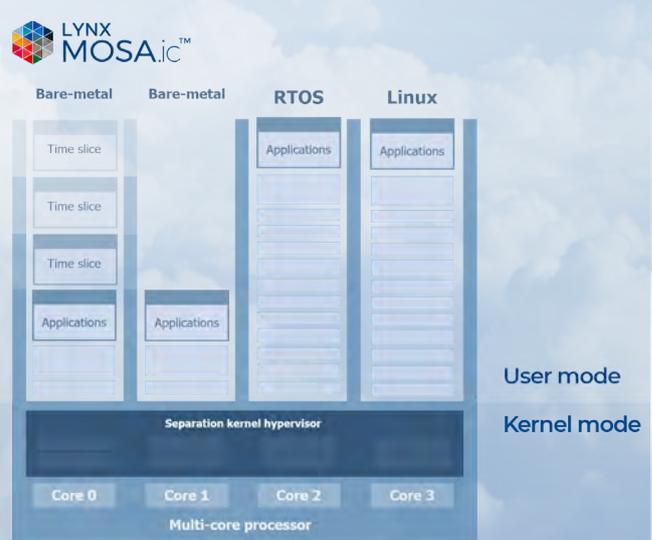


Figure 2

Lynx Software Technologies is dedicated to crafting software platforms founded on simple, elegant architectures that adapt to evolving hardware while balancing the need to preserve hosted application compatibility with open standard APIs. We aim to provide the richest set of options for efficiently realizing robust, comprehensible software systems onto modern CPUs, and our technologies are trusted by companies like Airbus, Boeing, and Lockheed Martin to address their most formidable mission-critical system challenges. To learn more, visit us at www.lynx.com.

COBHAM

Escape Entropy

With Cobham connectivity

*En-truh-peeI noun:
Lack of order or predictability;
gradual decline into disorder...*

For a chance
to WIN* a pair of
Bose 700 headphones!

PLAY OUR GAME

escapeentropy.com

#escapeentropy

Image: Bose.co.uk

Cobham AVIATOR S

Enabling revolutionary Inmarsat SB-S technology, providing real-time, secure connectivity. Giving operational advantage to **Airports, Airlines, Air Traffic Control and Aircraft** connecting securely and safely as one team from ground to air.

WWW.ESCAPEENTROPY.COM

*See terms and conditions on our website.

