

2021

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Aviation industry insights



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Welcome to INFOCUS Safety & Security 2021

It is hard to imagine how the world could have thrown more at the aviation industry over the past year. Aviation has been hit hard by the global pandemic with safety and security having to adapt and evolve at pace in order to meet new challenges that threaten to disrupt the industry. Photos of grounded aircraft might remain etched in our memory, but behind the scenes, airports, airlines and the rotorcraft community have remained open and operational with staff and passenger safety and wellbeing at the forefront as stakeholders have worked hard to cater for passenger and cargo traffic and to keep critical supply chains functioning. Across the aviation sector, stakeholders have had to adapt their services and products to mitigate the risk of disease transmission, while meeting the constantly evolving security needs of air travel. Antimicrobial technology, contactless kiosks and payment systems, cleaning robots, sanitising booths, COVID testing facilities and

physical distancing measures have all been rolled out at speed in response to the COVID-19 crisis.

It's important to remind ourselves, however, that while the global pandemic has thrown up a whole new set of safety and security challenges for aviation, terrorist strikes, geopolitical posturing, cyberattacks, mechanical faults, disruptive passengers, data breaches and airspace protection remain at large and continue to threaten to disrupt the industry. However, if the last year or couple of years has taught us anything, it is that aviation has proven itself to be a resilient, flexible and vigilant industry.

The appetite for air travel certainly hasn't waned. There is huge pent-up demand signalling that air travel will return to 2019 levels in the coming years. And as we find out in this issue, aviation's safety and security sector continues to adapt at pace to ensure that passenger confidence is restored and that aviation's recovery is as strong, safe and secure as possible.



Contents

4 In brief

Short stories and insights on safety and security across the airport, rotorcraft and airline sectors

10 Argus

Securing airborne modems from cyberattacks

12 Rapiscan Systems

Future proofing baggage screening requirements

14 Rapiscan Systems

Dr Richard Piggitt reports on airport cyber resilience

17 carbonbased aviation

Understanding human-centred flying expertise

20 Air Partner

Building safer skies through investments in training

22 Teledyne Controls

Addressing potential issues with cabin air quality

24 Spidertracks

Making flight data monitoring accessible to all

26 Avion Group

The post-pandemic role of quality upset training

30 Galgus

How MAC randomisation disrupts Wi-Fi connectivity

32 Dallmeier

Improving airport security through camera technology

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In brief

A round up of short stories and insights covering safety & security across the fixed wing, rotorcraft and airport sectors

Lithium batteries algorithm enhances cargo and baggage screening

As the primary power source for personal and portable electronic devices, consumer demand for lithium batteries is growing exponentially. However, these batteries are classified as dangerous goods posing a significant safety threat during flight because of their potential to ignite. Since January 2006, a total of 310 incidents of smoke, heat, fire or explosion involving lithium batteries in air cargo or hold baggage have been recorded. In response to this concern, Smiths Detection has launched a lithium batteries algorithm for its dual-view air cargo and checked-baggage screening system – the HI-SCAN 10080 EDX-2is. The algorithm provides automatic detection of lithium batteries in all freight and baggage screened for explosives by the HI-SCAN EDX-2is, thus reducing the burden on image analysts with low false alarm rates.



“Harnessing the power of deep learning is crucial in further developing object recognition algorithms. This new technology has been developed by working with our customers to capture thousands of X-ray images to then be analysed by the new algorithm so it can learn to detect lithium batteries based on shape,” said Richard Thompson, Smiths Detection’s Global Director Aviation.

Increased demand for security screening solutions

With airports starting to scale up operations following the global pandemic, Redline has noted an increased demand for its security solutions, including its X-ray threat image recognition training (TIRT) system, as well as its digital Security Management System (SeMS). Phil Forster Managing Director at Teesside International Airport, which has partnered with Redline to deploy its SeMS, commented: “Digital SeMS is a welcome enhancement that will help us to manage and improve our security performance.” And with safety and security standards at the top of aviation’s agenda, Air partner, which owns Redline, has also launched its newly branded National Safety & Security Academy (NSSA) in Doncaster. NSSA’s new name reflects the fact that the academy now also provides Baines Simmons safety training in addition to Redline’s security courses.

To find out more, turn to page 20.

Strengthening commitment to FBO safety



Cementing its position as a leader in advancing safety within the fixed-base operator (FBO) industry, the Paragon Aviation Group has committed to funding a safety programme for all 100 FBOs in its global network. The Online Safety Officer (OSO) Programme provides industry-leading safety communication, training and regulatory compliance through their monthly safety meetings and is being

offered free to all Paragon Aviation’s FBOs throughout 2021. Describing safety as “far more than a buzzword for a Paragon member FBO,” Megan Barnes, President of Paragon Aviation Group, added that the “Paragon Network’s emphasis on safety is an investment in our members’ success, and the consistent, safe handling of customers and their assets when visiting a Paragon FBO location.”

Changi Airport Group upgrades security system project



Genetec, a leading technology provider of unified security, public safety, operations and business intelligence solutions has been tasked with enhancing and upgrading Singapore's Changi Airport Group's security system. The three-year project, which was announced in early 2021 is expected to be complete by the end of 2023. It will see Genetec Security Center, a unified security platform that blends IP security systems within a single intuitive interface, underpinning the airport's security operations, with a specific focus on the video surveillance system across its terminals.



Time out with...

Thomas Romig, ACI World Vice President Safety, Security & Operations, on how safety and security remains a top priority for airports despite the pandemic.

How has the global pandemic impacted safety and security operations for the global airport community?

Throughout the pandemic, the safety and security of the aviation system has remained a top priority for airport operators. Due to the lower levels of aircraft and passenger traffic, as well as the restrictions implemented by health authorities, airports have had to continuously adapt their operational practices and training processes to ensure that new requirements are reflected in operations and airport staff are adequately trained and demonstrate competence in the applicable procedures.

Even with the lower levels of operations, and in some cases staff furloughs or adapted shift plans, airports have implemented measures to manage human performance risks while returning to operations. These include measures such as increased training, communication campaigns, shift start briefings and adapted rostering.

With demand for contactless services on the rise, how have cyber risks evolved to threaten the security of airports?

The digitalisation of airport systems, initiated before the pandemic, had already moved cyber security up on the priority list for airports. In conjunction with this, the

increased number of global cyberattacks that we have seen throughout the pandemic, has more recently pushed the topic up on airports risk registers. Due to this, airports have taken numerous actions to ensure cyber resilience of their IT systems and infrastructure and avoid the potential disruptions that would occur from a cyberattack.

How does ACI's Airport Health Accreditation demonstrate that an airport is prioritising health and safety in a measurable manner?

The ACI Airport Health Accreditation provides a recognition of the application of recommended health measures by airport operators. It is based on the International Civil Aviation Organization (ICAO) Health recommendations, that have been developed by the World Health Organization (WHO), State Regulators and industry, and integrates the European Union Aviation Safety Agency (EASA)/ European Centre for Disease Prevention and Control (ECDC) Aviation Health Safety protocols.

The programme helps airports to verify that they have applied these recommendations appropriately and is therefore providing a safe environment for the traveling public and airport staff.

The risk of bird strike

While the risk of bird strike is not new to either fixed-wing aircraft or rotorcraft, the reduction in flying activity in some areas has led to an increase in the number of birds in certain locations where helicopters regularly operate. Both the European Aviation Safety Agency (EASA) and the Federal Aviation Administration (FAA) have observed an increased reporting of bird strike occurrences on helicopters, elevating the risk of serious or fatal injuries to occupants as well as substantial damage to rotorcraft. To address this concern, EASA has published an updated safety information bulletin to address bird strike risk mitigation in rotorcraft operations. The bulletin recommends: a robust Safety Management System whereby bird species living on or near an airfield are identified and their behavioural habits monitored; rotorcraft flight manual's should also be revised to include a section dedicated to "Operations in areas with high bird concentration"; pre-flight planning should take into account regional or seasonal migratory patterns, as well as feeding and roosting habits and aircrew should plan flights at the highest level practicable and at a minimum of 2,500 feet; transits over areas of wetlands and inland water areas such as lakes and ponds should be avoided and coastlines should not be crossed at 90 degrees. However, where helicopters are obliged to operate in areas of bird concentration, crew are advised to use taxi and/ or landing lights in a continuous mode during sunny conditions and at night. They should also utilise personal protective equipment consisting of a helmet and visor and if operating at low level, pilots should reduce airspeed when practical.



Reliable ATC communications integral to airspace safety

While the chaos of COVID has turned the industry on its head and led to an increased focus on hygiene and wellbeing within the airport and the aircraft, it's all too easy to forget the effect the global pandemic has had on air traffic control and the technology that supports this sector. To help improve air traffic management (ATM) in Colombia, the Civil Aviation Authority of Colombia

(Aerocivil) has selected CERTIUM VCX from Rohde & Schwarz to be installed at 36 airports. All systems are expected to be delivered by the end of 2021 and consist of compact IP-based voice communications system (VCS) equipment and certified training, management and maintenance software. "We have a long-lasting, successful relationship with our Colombian administration," said Mauricio Samudio, General Manager, Rohde & Schwarz Colombia S.A.S, commenting on the partnership. "This allows us to support Aerocivil's digitalisation roadmap with solutions that allow them to continue safe operations and reliably meet future challenges. Covering the area from the Colombian Caribbean all the way to the Amazon rainforest, this contract is a milestone for air traffic control in the region," he added



Marking a milestone for helicopter fuelling

June 2021 marked a milestone for the helicopter community when an Airbus H145 rescue helicopter, operated by ADAC Luftrettung, flew with sustainable aviation fuel (SAF) for the first time. Supplied by TotalEnergies, the fuel used for the first rescue helicopter flight (which was refuelled in Munich) was made from

used cooking oil. Commenting on how ADAC Luftrettung wants to be a pioneer in reducing CO₂ in emergency medical services with cleaner, greener fuel, Frédéric Bruder, Managing Director, said, "Importantly, SAF is an officially approved fuel, which means that flight and patient safety remain at the highest level."





Time out with...

Peter Möller, Chairman of the European Helicopter Association (EHA), shares the views of EHA members, offshore operators and OEMs on how the global pandemic has affected safety and security for the rotorcraft sector.

Do you think it's fair to say the rotorcraft industry has continued to grow despite the pandemic?

While we wouldn't say the rotorcraft sector has grown during the pandemic, it has on average held its position compared to the pre-pandemic situation and is very much diversified. Some sectors like the Helicopter Emergency Management Services (HEMS) sector have remained quite stable regarding mission numbers and in some cases have even seen an increase in numbers.

Other sectors, like training organisations, have had to close their activities for some months but are now slowly starting to pick up again. Meanwhile, in some areas, such as the construction industry, aerial work operators might have experienced an increase in business but may be afraid of a future decline due to a reduction of budgets for new infrastructure.

From an offshore perspective the industry has continued to support vital offshore work during the pandemic, both with renewable energy and oil and gas. Due to the pandemic and heavily reduced

oil prices there has been a reduction in the amount of flying hours by the energy companies and therefore a correction across the offshore fleet in the amount of assets flying. There has also been consolidation of some of the larger helicopter operators resulting in fewer flights.

As we come out of the pandemic, there appears to be a slight rebound in flying hours for oil and gas, but not uniformly across the global sector. Therefore, the oil and gas segment of the industry has not seen growth, and anecdotally will more than likely see a return to pre-pandemic flying rates by 2024. However, the renewable energy sector, i.e. windfarms, is anticipating relatively robust growth over the next five years.

As a result of COVID-19, how are helicopter manufacturers looking to adapt their aircraft to ensure safe operations for a post-pandemic landscape?

During the pandemic manufacturers provided support and information to their operators and authorities on how to better and more safely conduct operations in a pandemic scenario. Generally speaking, however, they design, build, improve their products (they have developed different means of protection between the cockpit and the cabin) and support their customers and operators with the aim to ensure safe operations regardless of the pandemic or post-pandemic scenario. This is a continuous and normal process for them.

How will the rise of electric vertical take-off and landing vehicles (eVTOLs) and unmanned aerial vehicles (UAVs) impact safety and security for the rotorcraft market going forward?

Working together with the European Union Aviation Safety Agency (EASA) on numerous activities as well as working groups, we are confident that future regulations and technology will allow the safe and secure simultaneous operation of eVTOLs and manned and unmanned aerial vehicles in the same airspace. As well as technological means this will also be achieved through the development of new regulatory requirements, including Unmanned airspace or U-space.

How is EHA committed to creating a safe and efficient operating environment that is economically viable for the rotorcraft community?

EHA fully supports the Green Deal initiative of the EU. Recently our members Airbus Helicopters and SAFRAN presented the first HEMS helicopter flying with a blend of sustainable aviation fuel (SAF). We appreciate these exciting developments and look forward to further new technologies. However, similar to other industry sectors, we need to make sure that the transition to a green sky will be supported with measures and within an acceptable timeline to allow the VTOL industry to go through this transition in a way that's economically viable, as well as safely and securely.

Airspace protection

Unmanned aerial systems (UAS) were already booming long before the pandemic. However, COVID-19 has certainly spurred on the evolution of drone delivery services. According to ANGOKA, a Belfast cybersecurity start-up, drones are poised to become ubiquitous devices, with companies such as Wing and Amazon already exploring this market. However, for drones to truly take-off there needs to be a way of ensuring that the communication crucial to controlling and flying drones is protected. Securing drone communication ensures that national infrastructure, such as airports and mobile towers, are also protected. ANGOKA has partnered with Cranfield university and Connected Places Catapult to develop the Unmanned Aircraft Systems Authentication System (UASAS)

to protect the future of drones and autonomous flying vehicles. The system will protect communications from potentially devastating cyberattacks while increasing overall confidence in drone technology. Dr. Saba Al-Rubaye, Senior Lecturer in Autonomous and Connected Systems and Project Lead at Cranfield University, explains: “We’re very pleased to be working on this exciting project to protect communication systems for controlling drones in flight and ensure they are able to safely complete their missions, while also protecting the environments around them. There is huge scope for drones and unmanned aerial vehicles to transform air transport activities and services – this project will help to harness that potential in a safe and secure way.”



Flight safety support service revolutionises flight data monitoring

Having launched its Flight Safety Support Service in June 2021 as a new offering to its advanced web-based flight data monitoring platform, L3Harris Technologies’ Flight Data Connect will provide expert analysis and investigation capability enabling airlines to focus on safe operations. Rob Holliday, former Head of Operational Safety at the International Air Transport Association (IATA), will lead the analysis provided to airlines. The data the new service will analyse will provide fast, accurate mapping of flights in graphical and 3D formats, with specific actionable insights generated by

statistical models and machine learning. All data is aligned and tailored to each customer’s defined safety operating procedures. As the launch customer for L3Harris’ new service, Norwegian start-up airline, Flyr AS, is excited to be working with L3Harris. Noting how it “can now safely and effectively coordinate the Flight Data Monitoring for its fleet,” Tom-Arild Bogstad, Director Safety & Compliance at Flyr AS, added that “L3Harris’ expert analysis and investigation capability will enable Flyr to release pilots from the office and drive our safety operations.”

Seating designed to perform and protect



While there are many contactless solutions rolling out to make the passenger journey as touch-free and hygienic as possible, there is one area of flying where contact cannot be avoided – aircraft seating. MGR Foamtex is one of several new partners using antimicrobial technology in its materials for aircraft seats, upholstery and interiors to make the cabin as safe as possible. The upholstery manufacturer, which specialises in premium cabin seating, has partnered with Addmaster Holdings (a subsidiary of Polygiene) for the use of its antimicrobial technology. Laboratory testing using MGR SafeWall and real aircraft cabin products has demonstrated efficacy of 96.8% against SARS-CoV-2. “The aircraft and airline industries are actively working to adapt to the new normal when flying will be frequent again. MGR Foamtex is one of several new partners supplying antimicrobial materials for aircraft seats, upholstery and interiors to make the cabin as safe as possible. This is an area where we anticipate an increased demand for this kind of functionality going forward,” says Ulrika Björk, CEO of Polygiene.



Time out with...

Martin Maurino, Technical Officer, Global Aviation Safety, ICAO, on the primary challenges in safety planning for the aviation community.

What is the purpose of ICAO's Global Aviation Safety Plan?

The Global Aviation Safety Plan (GASP, Doc 10004) sets forth ICAO's safety strategy, which supports the prioritisation and continuous improvement of aviation safety. Its purpose is to continuously reduce fatalities, and the risk of fatalities, by guiding the development of a harmonised safety strategy and the implementation of regional and national aviation safety plans.

How does the 2020-2022 edition differ to the previous edition?

The 2020-2022 edition of the GASP maintains some key elements from its previous edition, such as goals for States to improve their effective safety oversight capabilities and to progress in the implementation of State safety programmes (SSPs). Main changes in the plan include new goals and targets for States, regions and industry, as well as tools to measure States' safety oversight capabilities. This edition also recognises the importance of safety risk analyses at national and regional levels. It incorporates guidelines and a structure by which States, groups of States, or entities within a region identify hazards and mitigate operational

safety risks through the assistance of regional aviation safety groups as well as regional coordination. Consistent with the United Nations' 2030 Agenda for Sustainable Development, the vision of the GASP is to achieve and maintain the aspirational safety goal of zero fatalities in commercial operations by 2030 and beyond. The GASP includes the global aviation safety roadmap, which serves as an action plan to assist the aviation community in achieving its goals through a structured, common frame of reference for all relevant stakeholders.

What are the key principles of the global aviation safety roadmap?

Two key elements need to be included in aviation safety planning:

1. A strategy – What is to be achieved by a plan. This includes the analysis of challenges, the definition of goals and targets, and how to measure the achievement of these goals and targets
2. An action plan – How the goals and targets defined in the strategy will be achieved.

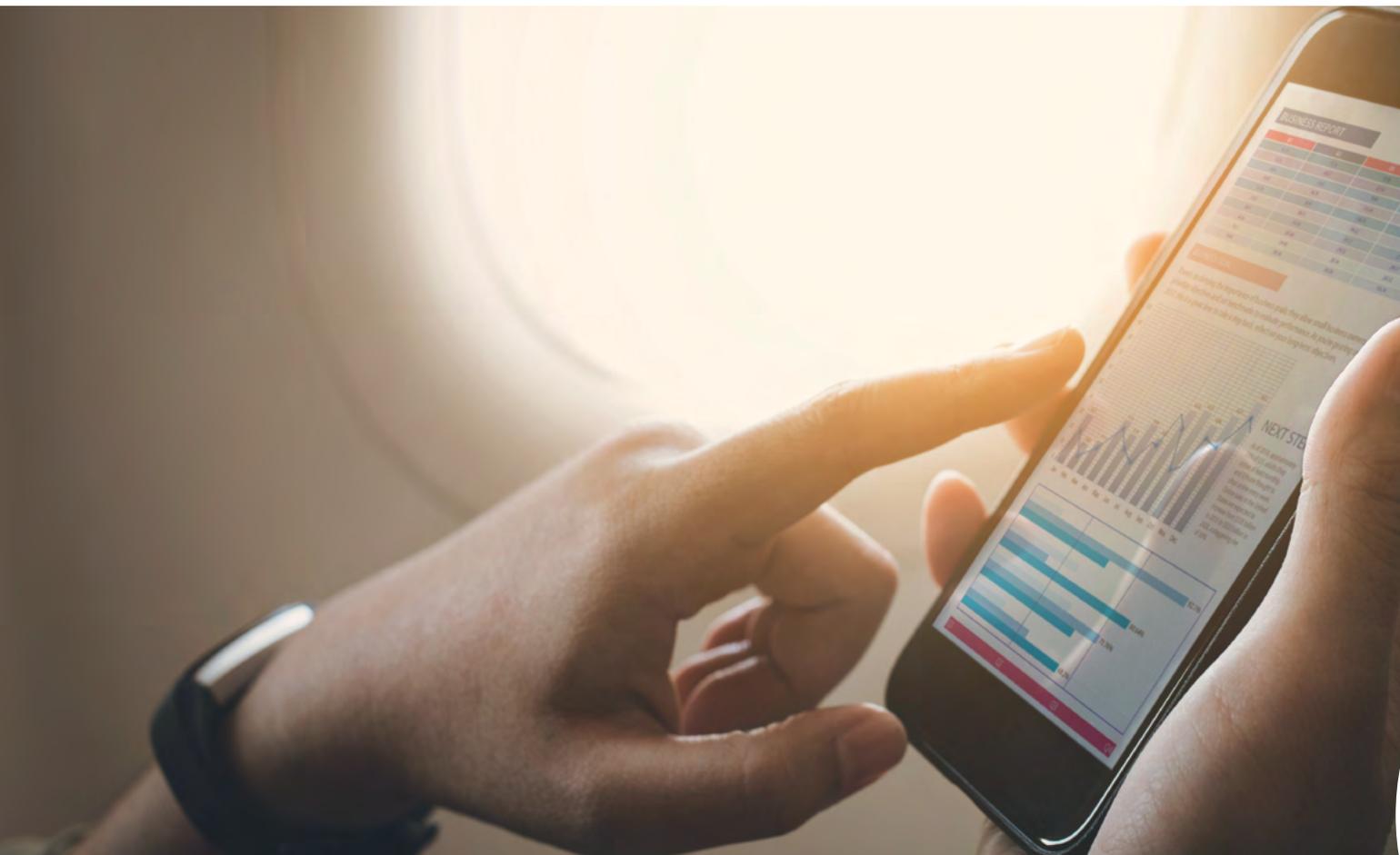
The GASP document contains the global safety strategy. The global aviation safety roadmap serves as an action plan to assist the aviation community in developing aviation safety plans, in line with the GASP goals, through a structured, common frame of reference for all relevant stakeholders. The global aviation safety roadmap outlines specific safety enhancement initiatives (SEIs) associated with the GASP goals and targets. Each SEI includes a set of actions that stakeholders may use to develop and implement specific action plans. States and regions, in collaboration with industry,

should use the roadmap to develop specific SEIs to support the strategy presented in their national and regional aviation safety plans respectively. The use of the global aviation safety roadmap as the basis for regional and national safety planning enhances coordination, thus reducing inconsistencies and duplication of effort.

What are the primary challenges and priorities in safety planning for the aviation community following the global pandemic?

The COVID-19 pandemic has highlighted the need for safety plans to consider the different impacts of disruption events on aviation. A disruption event is a rare yet very significant event at a global, regional or national level, which adversely impacts aviation. Disruption events affect operators, aerodromes, air navigation service providers, safety and security agencies and other industries dependent on aviation. Disruption events, such as the COVID-19 pandemic, are not typically aviation-centric but have significant impacts to aviation operations. During these past 18 months, we have seen the need for States to develop resiliency measures to respond effectively to disruption events. These include communication and coordination plans with various stakeholders at the national, regional and international levels. To the extent practicable, States should share and communicate hazards that may develop into disruption events.

The GASP will be updated to provide high-level guidance to assist States with responding to these events.



One step ahead: Securing airborne modems from cyber attacks

Constant connectivity while in the air has become the norm for passengers, however airborne modems as a standard component of IFC present a new threat for airlines and their passengers. Argus experts report on this easy entry point for attackers and how to mitigate this risk.

For airline passengers, the ability to browse the internet, stream content, and text while in the sky just as you would on the ground is no longer just possible; it is expected. And for airlines, as for other industries, an excellent customer experience is key to customer retention and ongoing customer value.

However, by making airborne modems a standard component of In-Flight Connectivity (IFC) systems, airlines have also introduced a new avenue for disrupting operations and

misappropriating passenger information. For example:

- Compromised modems can provide attackers with access to a passenger's private information, exposing the passenger to a myriad of problems in the future. Simultaneously, the airline is liable to GDPR fines and legal action.
- A Denial-of-Service attack can disrupt internet connectivity, disappointing passengers who expect to utilise in-flight internet service to conduct business, be

entertained, or take advantage of other internet functionality.

- Having compromised the modem, attackers can gain access to other onboard components, such as Crew Terminals or the Cabin Management System. This can invite disruption of key cabin functionality: lighting, the PA system, cooling and heating, and so on.

These are just a few ways in which a compromised airborne modem can significantly diminish the customer experience, as well as the reputation of both airlines and manufacturers.

EASY ENTRY POINT FOR ATTACKERS

Aircraft modems are an easy entry point for attackers, with significant weaknesses that leave modems largely unprotected. ^{[1][2]}



The ARGUS IFEC advantage



MULTIPLE INDEPENDENT
PROTECTION LAYERS



CUSTOMIZED TO
YOUR NEEDS



TESTED AND IN PRODUCTION
IN THE AUTOMOTIVE INDUSTRY



THREAT AGNOSTIC



ALWAYS-ON OPERABILITY



EASY TO DEPLOY

“Aircraft modems are an easy entry point for attackers, with significant weaknesses that leave modems largely unprotected”

Some of these weaknesses can be attributed to the use of Commercial Off-the-Shelf (COTS) hardware and software components, especially with regard to patch management and the aviation industry's long production and update cycles.

For example, when vulnerabilities are discovered in a COTS component, the component manufacturer must issue a patch and propagate it up the supply chain. The modem manufacturer is therefore dependent on the component manufacturer for the patch and is unable to issue a patch on its own. Additionally, given lengthy production cycles and evolving threats, design choices that were originally considered secure may become security risks by the time a product is released. And unlike the IT industry, aviation does not commonly utilise rapid, remote

over-the-air software updates. So even if the problem of patch management is resolved, the ability to rapidly deliver the patch to the end-device remains problematic.

A MULTI-FACETED APPROACH TO PROTECTING AIRBORNE MODEMS

New regulations require the aviation industry to address these issues: “manufacturers and operators seeking certification of new aircraft systems and networks, or modifications to existing ones, will be required to address threats that can lead to unauthorised access and disruption of electronic aircraft system interfaces or information. The European Aviation Safety Agency (EASA) is proposing the new amendments to address the growing presence of connectivity within modern aircraft network designs.”^{[3][4]}

Argus has determined that this can be accomplished most effectively with a multi-faceted approach:

Extend the secure boot. The ability to detect and prevent unauthorised code from running on the modem is critical. Some modem manufacturers implement a secure boot, which detects tampering with boot loaders, key operating system files, and unauthorised option ROMs by validating their digital signatures. But a more effective solution is to extend the secure boot to the entire runtime system and to validate each executed file and script, allowing only vetted code to be executed during the modem operation.

Limit user access. Restrict access to sensitive system resources by managing the Mandatory Access Control (MAC) in a supervised manner, allowing only privileged users to access them.

Collect and continuously analyse system security logs. It is vital to tunnel logs to a

ground Security Operations Center (SOC) as soon as possible, so that SOC personnel can act quickly to address security incidents. Filtering events to include only cyber-related incidents can also save bandwidth and money.

Analyse for cyber anomalies. Once security logs are tunneled to the ground SOC, they can be analysed to find cyber anomalies, like any other IT system. Smart rules engines can detect anomalies and suspicious events, facilitating effective mitigation by the manufacturer or operator.

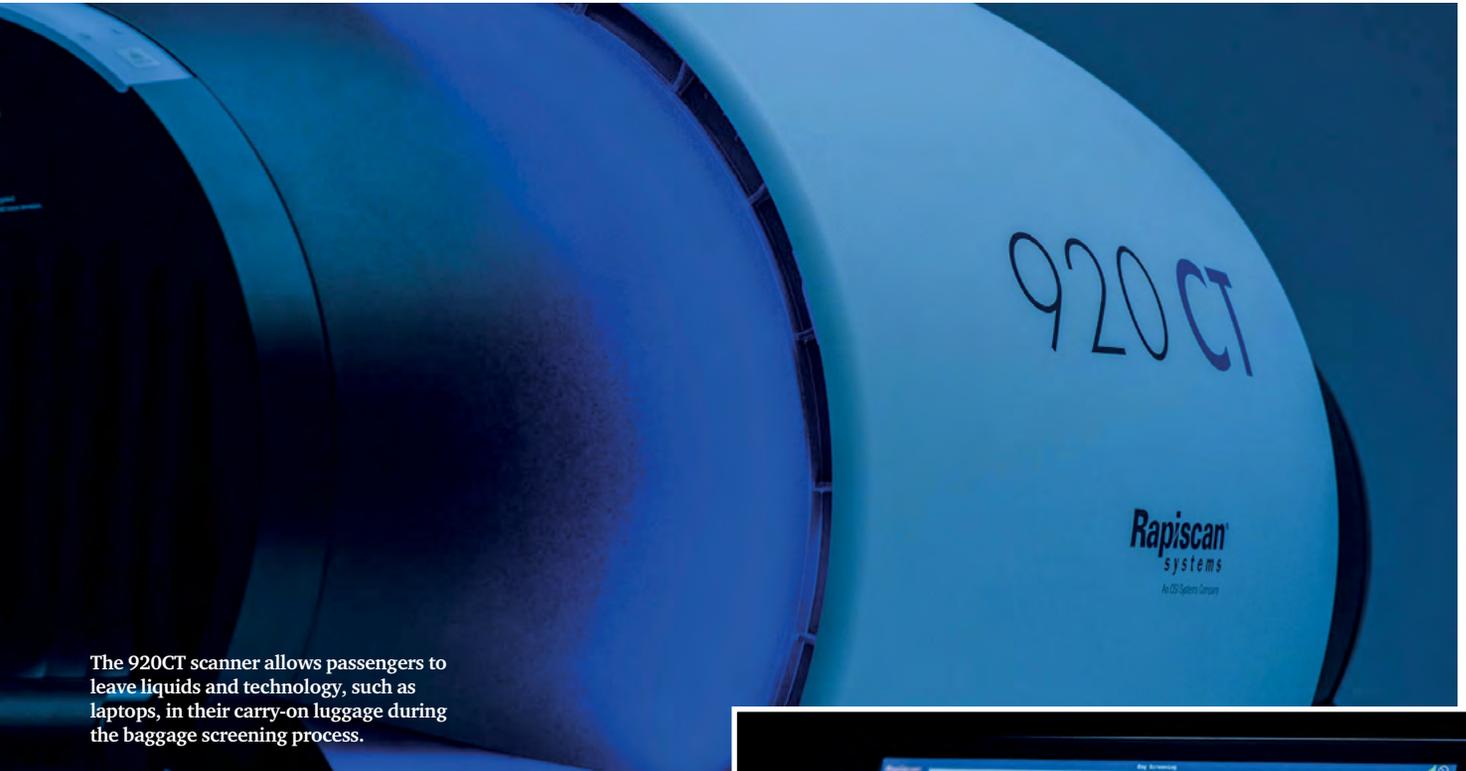
END-TO-END AIRBORNE MODEM PROTECTION

For the aviation industry, IFC systems are a key component of the customer experience. And the customer experience drives market share and competitive advantage.

But airborne modems provide a viable entry point to aircraft, exposing airlines to significant risk. In the Argus lab, we have identified a wide range of modem vulnerabilities and developed powerful solutions for mitigating these risks. Our on-board modem hardening suite and secure log collector agent, plus our off-board fleet protection system, provide end-to-end modem protection to effectively minimise the vulnerabilities that cyber attackers can exploit. At Argus, we are committed to equipping aviation with the tools needed to maximize technology, while minimising risk.

Links to sources quoted in article

- [1] <https://ioactive.com/a-wake-up-call-for-satcom-security/>
- [2] <https://ioactive.com/wp-content/uploads/2018/08/us-18-Santamarta-Last-Call-For-Satcom-Security-wp.pdf>
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The 920CT scanner allows passengers to leave liquids and technology, such as laptops, in their carry-on luggage during the baggage screening process.

It's all in the bag



Baggage screening solutions are integral to aviation safety and security. Rapiscan Systems reveals how it has worked with Avalon Airport in Australia and Oslo Airport in Norway, to adapt its technology and future-proof both airports' baggage screening requirements.

Rising to meet a challenge is what business is all about. Complex challenges are beneficial to any company, providing learning opportunities and a means to demonstrate expertise and innovation.

Rapiscan Systems is in the business of meeting such challenges, particularly in regards to security and efficiency. The 920CT scanner is no exception, allowing passengers to leave liquids and technology, such as laptops, in their carry-on luggage

during the baggage screening process. The 920CT has been installed at Avalon Airport, Melbourne, where CEO Justin Giddings said of the system, "This means that going through security is a smoother exercise with less contact."

The 920CT is equipped with advanced software and detection algorithms. It can register threats quickly and make decisions based on what it sees. The 3D volumetric imaging is superior to 2D systems as it allows for a higher degree of On-Screen

Inspection and Resolution (OSIR) for the operator, reducing the need to open and manually search bags for contraband. The complex software is fully upgradeable, effectively future-proofing the 920CT for evolving requirements.

EFFICIENT BAGGAGE SCREENING

In addition, it has been engineered to integrate seamlessly with Rapiscan's Tray Return System (TRS) solution to create a more efficient checkpoint experience for passengers and staff. The employment of Rapiscan's 920CT with the integrated TRS, Metor 6S High Sensitivity Metal Detector and Itemiser 4DX Explosive Trace Detection systems has boosted Avalon Airport's capabilities, enabling it to operate as a truly international airport.



RTT110 EDS System was adopted by the forward-thinking team at Oslo Airport. Rapiscan designed a unique water-cooling solution that would allow the RTT to align with the airport's eco-approach to operations.

“Achievement of this detection standard demonstrates our commitment to pursuing the highest regulatory approval standards to meet the needs of our customers,” says Mal Maginnis, President of Rapiscan Systems. “We look forward to bringing this innovative screening solution to more customers around the world.”

SUSTAINABLE SECURITY SCREENING

Rapiscan Systems applied a similar approach to navigating unique challenges when installing the RTT110 EDS System in partnership with Oslo Airport. The first challenge was the creation of a propriety water-cooling system that worked in conjunction with the airport's green initiatives, and the second, to provide an additional level of security screening that operated in parallel to the existing baggage screening process.

The Oslo Airport project commenced during a formative time in the RTT's history. “We had a machine that was very much in its infancy, that still had its fair share of teething problems,” explains Craig Chitty, Head of International Aviation Programmes. It was a

sizeable undertaking at an early stage of experience installing the RTT in the field. Steve Revell, Senior Director of Aviation CT at Rapiscan, reflected that the project was a key step for the RTT. “The first major airport in Western Europe to take on the RTT was Oslo Airport. It's a prestigious and forward-thinking airport, and the operators were not afraid to take pioneering risks.”

In response to Oslo Airport's commitment to environmentally responsible construction, Rapiscan designed a unique water-cooling solution that would allow the RTT to align with Oslo's eco-approach to operations.

BESPOKE SOLUTION

Rapiscan worked with its suppliers to develop a solution that met the airport's requirement to use reclaimed snow, which is melted down and pumped around the airport. A redesign to integrate this unique water-cooling concept into the RTT system created a final product that is considerably more robust than earlier iterations. Rapiscan is currently the only company that can provide the RTT as an externally water-cooled or internally cooled air-conditioned system.



Oslo Airport not only required a bespoke approach in terms of product design but also process implementation – recurrent Level 4 image analysis.

As baggage travels through an airport, it is subjected to multiple levels of security screening, both by human operators and computer algorithms. Oslo Airport required an extra level added to the normal ‘flow’ of screening. “If a Level 3 operator rejects a bag, it goes into a Level 4 area within the BHS (Baggage Handling System) of the airport,” explains Craig Chitty. “It shows up on a screen. It is a concept of operations that we don't employ in any other airport even now. It is still very unique to Oslo.”

The aviation industry thrives on partnerships, on service providers working to meet challenging requirements through innovation and cooperation. Taking a technology that was, at the time, still in its infancy and working to adapt this technology to a stringent set of requirements is a clear example of Rapiscan's dedication to working with its partners – a commitment the company makes to every project.

[More from Rapiscan Systems overleaf.](#)

“To this day, we are the only company that can provide the RTT as an externally water-cooled system, or an internally cooled air-conditioned system.”

Steve Revell Senior Director
of Aviation CT at Rapiscan



Protecting against a cyberattack

Rapiscan Systems' Cybersecurity Lead, Dr Richard Piggin, reports on airport cyber resilience and managing supply chain risk for the airport sector.

Airport safety and security have converged, with cybersecurity becoming an increasing and enduring focus. The introduction of the European Network and Information Systems (NIS) Directive underlines the necessity for airports to actively manage cybersecurity risk.

Cyber resilience involves more than security, according to the World Economic Forum. It requires focus on protecting critical functions, not just assets (WEF, 2020). What's more, it is not merely an IT issue;

Operational Technology (OT) operates critical airport functions.

Cybersecurity is the responsibility of the entire organisation, and effective cybersecurity relies upon the leadership and support of the airport's management team.

THREATS TO AIRPORTS AND IMPACT ON OPERATIONS

Cyberattacks or compromises can disrupt airport operations and interfere with systems (ACI-RASC, 2019). It is estimated

that one hour of disruption in a large airport could cost more than €1 million at peak operating times (ACI, 2019). In the UK, 75% of large organisations identified and reported a cybersecurity incident in the last 12 months (DCMS, 2020). The ACI 2020 COVID-19 pandemic report indicated that 61.5% of airports had experienced targeted attacks.

The airports' trade association Airports Council International (ACI), highlighted potential impacts to airports from a cybersecurity incident in the *Cybersecurity for Airport Executives guidance* (ACI, 2019):

- **Operational disruption** – This may include passenger-facing systems such as flight information displays; airline check-in facilities; departure-control systems; and

“ It is estimated that one hour of disruption in a large airport could cost more than €1 million at peak operating times (ACI, 2019). ”

security systems, and baggage systems or operational control systems.

- **Economic impact** – Financial information theft or fraudulent transactions are common cybersecurity crimes. FedEx's European TNT operations were disrupted by NotPetya, estimated losses and recovery expenditure were expected to exceed \$500 million (Piggin, 2018).
- **Reputational damage** – Loss of proprietary information can often have an impact on an airport's business reputation and stakeholder trust. The loss of a USB memory stick, containing over 1,000 unencrypted sensitive files, by a Heathrow airport employee in 2017 was widely reported in the press.
- **Legal consequences** – Data protection and privacy laws require management of the security of all personal data and the retention of security information. Compromising this data can have legal consequences.

The US National Security Agency (NSA) and the Cybersecurity & Infrastructure Security Agency (CISA) recently published an alert recommending critical infrastructure organisations take immediate actions to secure their operational technology assets (NSA and CISA, 2020).

The NSA and CISA alert provided details of recently observed cyber threat activities and their impact upon operational technology:

RECENTLY OBSERVED TACTICS, TECHNIQUES, AND PROCEDURES

- A highly targeted bespoke email (spear phishing) to launch malware on a victim's computer and obtain initial access to the organisation's information technology network, before transitioning to OT systems.
- Deployment of commodity ransomware to encrypt data for impact on both IT and OT networks.
- Connecting to remotely accessible systems without user account or password authentication.
- Using common network protocols to communicate with devices and download modified programs.
- Use vendor engineering software and program downloads.
- Modifying device/system programs and configurations.

IMPACTS

- A loss of availability of the system.
- Partial loss of view for human equipment operators who are unable to view performance displays or interact with a system.
- Loss of productivity and revenue.
- Adversary manipulation of control and disruption.

CRITICAL INFRASTRUCTURE & EU NETWORK AND INFORMATION SYSTEMS (NIS) DIRECTIVE

The NIS Directive has concentrated airport executives' attention on cybersecurity and resilience, with a potential maximum €20 million penalty for operators of essential services.

The Directive creates four high-level objectives:

- Appropriate organisational structures, policies, and processes to understand, assess and manage risks.
- Proportionate security measures to protect essential services and systems.
- Capabilities to ensure defences remain effective and detect cybersecurity events.
- Capabilities to minimise the impacts of a cybersecurity incident on the delivery of essential services, including the restoration of services.

The UK National Cyber Security Centre (NCSC) has produced comprehensive guidance for NIS Directive implementation and self-assessment (NCSC, 2020).

MANAGING CYBERSECURITY RISK

Cybersecurity needs to be addressed from inception, progressing through every stage of system design, development and operation until the system is retired. Airports should consider suppliers that have a similar commitment to cybersecurity.

According to ACI (ACI, 2019), supply chain risk assessment practices should include the following activities:

- Supply chain risk management processes.
- Suppliers and third-party partners identification and risk assessment.
- Ensure procurement measures meet cybersecurity programme objectives.
- Suppliers and third parties are routinely assessed and evaluated.



This article was contributed by Dr Richard Piggin EngD CEng MIET MBCS, Rapiscan's Cybersecurity Lead. Rapiscan Systems is a leading provider of security inspection solutions, with more than 100,000 products installed in more than 170 countries.



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Human-centered flying expertise

Complexity in socio-technical systems, such as aviation, has increased in the last few decades. Have the human factors, training and safety processes kept pace with the changes?

Classic causation models such as Reason's "Swiss Cheese" can be inadequate in portraying the heavy interaction and complexity of today's air transport system.

The accident report of a Boeing 737 loss of control in-flight event in Amsterdam (2009) suggests a tight coupling between technology and the human element. Socio-technical systems are inherently complex and non-

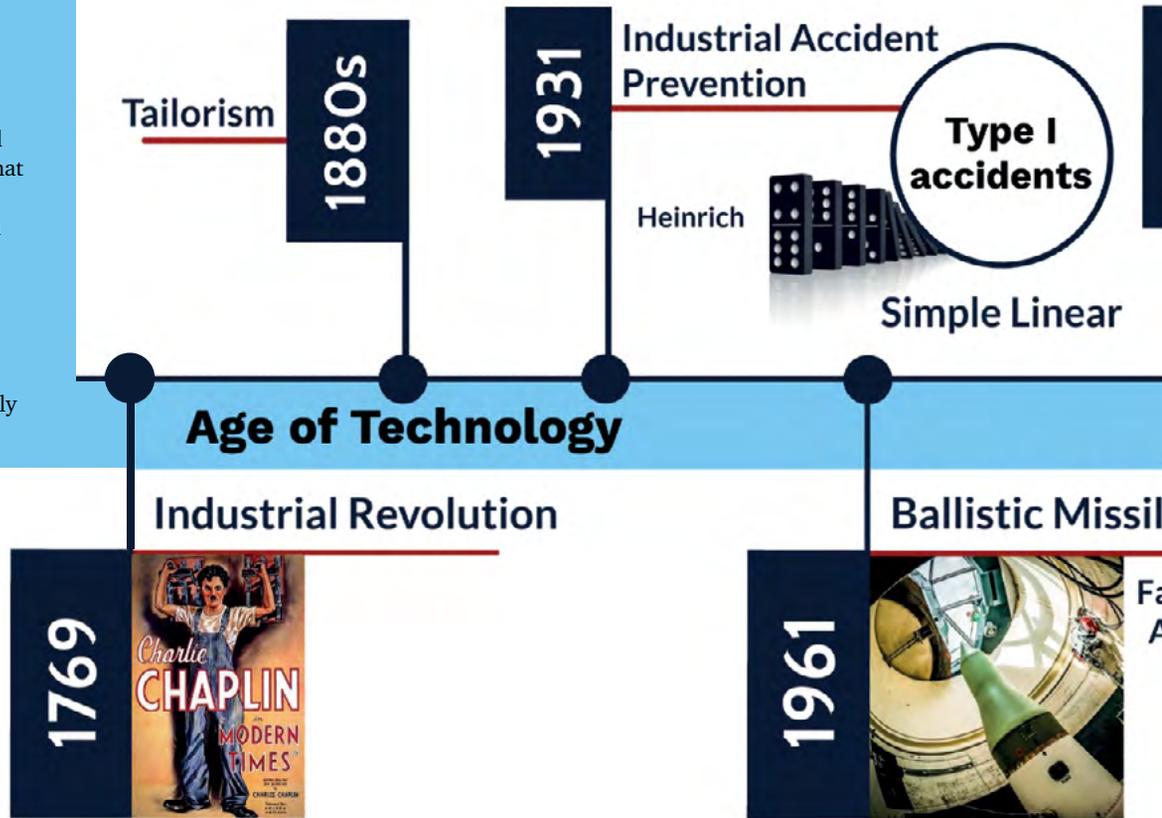
linear. Other accidents and serious events indicate that adding complex technology to a population of pilots that has been suffering a continuous deterioration of skills and airmanship, is a bad mix. Until future autonomous flying machines become an accepted reality, the human element in the cockpit remains the safety cushion, because of its huge potential to solve complex situations that have never been experienced before.

Although there is a resurgence of classic CFIT accidents, there is a noticeable rise of WEIRD events (Prof. Patrick Hudson's acronym for Wildly Erratic Incident Resulting in Disaster). They do not follow a linear progression and have a non-deterministic nature. As the industry continues to improve, these events will constitute the bulk of accident causation.

To meet these challenges, pilots may need to adapt or invent procedures when needed, by an ad hoc trial and error to solve new and unforeseen circumstances such as the Sioux City DC-10 (1989) and the A300 in Baghdad (2003), or the A330 fuel contamination event

The three ages of safety

Accident causation has evolved concurrently with the events that shaped the industry and their corresponding literature. From simple linear (Heinrich's Dominoes) to complex linear (Reason's Swiss Cheese) and Perrow's (Normal Accidents Theory) to today's Functional Resonance (Hollnagel) in tightly coupled systems.



in Hong Kong (2010). A robust set of KSA (knowledge, skills and attitudes) needs to be developed and transferred to the current and the next generations of airline pilots.

BRIDGING THE EXPERTISE GAP

The high reliability of technical systems in the aviation industry has groomed a generation of pilots that may have never experienced a serious event throughout their flying careers or, most importantly, had the chance to learn from their own experiences or from others. We have become victims of our own success and today, when a master warning is activated, surprise and a pronounced startle effect takes place.

Since "fate was the hunter" (see Ernest K. Gann for more), the seasoning of a novice crew member took place under the auspices of an experienced Captain. Together, this robust crew composition walked through the failures and situations that led to a natural and safe transfer of expertise and the development of airmanship.



There is no sound Airmanship without strong Flight Discipline foundations.

Leonardo Herman, carbonbased aviation, Founder and Advisor

CAN AIRMANSHIP BE TAUGHT?

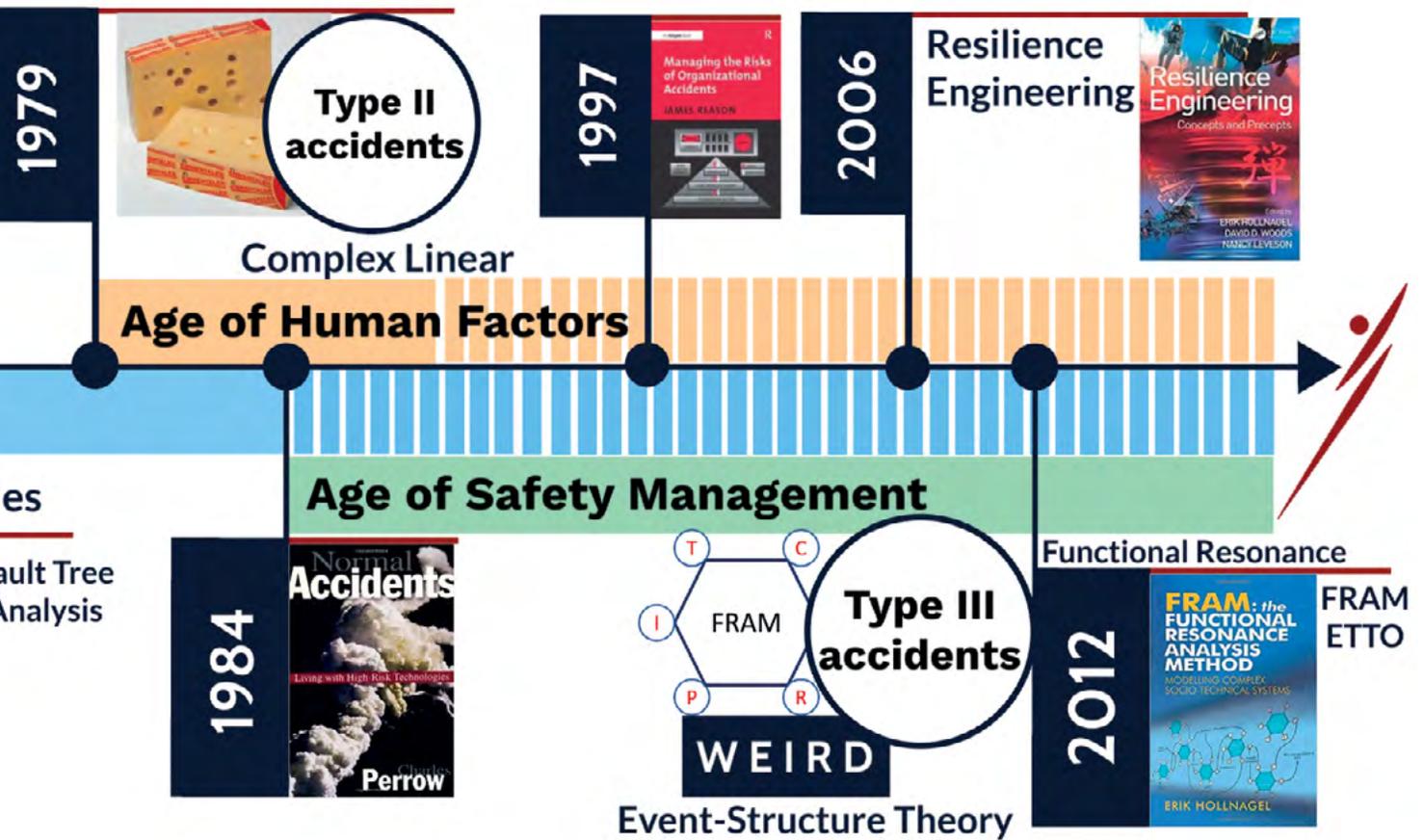
"There is no sound Airmanship without strong Flight Discipline foundations," says Leonardo Herman, carbonbased aviation's Founder and Advisor. Flight Discipline is the foundation that supports the success of a *Training for Airmanship* program.

By incorporating specific academic instruction, the Six Airmanship Traits™ entail specific behavioral markers designed to enable operators, trainers and pilots to develop important skills that support a professional

culture based on uncompromised flight discipline towards sound airmanship and high resilience capabilities.

LOOKING INSIDE AND AHEAD

Another cornerstone of a pilot's skill set is Decision Making. Normative models have been widely implemented in the last 25 years, but naturalistic researchers (Orasanu, Klein) showed that aviation is one of the safe-critical domains that utilizes naturalistic methods with high degrees of success.



*(after Hale, Hovden 1998 and Hollnagel 2014.)

Naturalistic Decision Making capitalizes on subconscious processes and rely heavily on pattern recognition and mental simulation. When there is a match, a naturalistic decision is usually the output. In a complex world, information is usually partial and incomplete and normative decision-making should be used to support a naturalistic process. Models and methods should reflect this, by catering for a wide range of experiences and expertise, leading to safer and more efficient decisions.

EXTENDED, TAILORED TRAINING PROGRAMS

Traditionally, training regulations reflected the most common and critical maneuvers that technology presented, such as the classic V1 cut. Despite the opportunities that more flexible training programs such as AQP and, more recently, EBT present, regulatory training remains an absolute minimum an operator needs to do, and the soft skills required in decision making and effective



A common saying is to go “back to basics”, but are today’s “basics” comparable to the past? There is a need to train for higher levels of airmanship that goes beyond the absolute minimum compliance required by the regulators.

Walter Schwyzer, carbonbased aviation,
Founder and Director

monitoring end up as part of “crew resource management” training.

Minimum regulatory training is usually insufficient to meet the higher levels of adaptability required for complex systems failures. “A common saying is to go “back to

basics”, but are today’s “basics” comparable to the past? There is a need to train for higher levels of airmanship that goes beyond the absolute minimum compliance required by the regulators.” describes Walter Schwyzer, carbonbased aviation’s Founder and Director.



Building safer skies

Through its recently formed safety and security division, find out how Air Partner is investing in the future of aviation safety and security training to make our skies safer.

As operations begin to restart in the aviation industry, businesses with critical training needs are considering how they can address skill fade and ensure ongoing compliance.

Throughout the pandemic, Baines Simmons, experts in aviation safety, and Redline Assured Security, an internationally acclaimed consultancy, have been supporting the industry, with a range of training (offered in-person, online and delivered onsite for clients), in addition to a comprehensive portfolio of security e-learning.

The two companies work closely together to make up Air Partner's Safety & Security division, offering an extensive range of products and services, spanning quality assurance, compliance management,

consultancy and software solutions, in addition to training.

INTRODUCING THE NATIONAL SAFETY & SECURITY ACADEMY

The disruption arising from the COVID-19 pandemic has led to a new safety and security landscape, presenting new risks and challenges from all sectors of the industry. To respond to the ever-changing needs of the industry, and in recognition of the combined capability as a division, Air Partner is proud to have launched the National Safety & Security Academy, in Doncaster, South Yorkshire. It offers an extensive portfolio of training courses, across all aspects of safety and security. Formally known as the National Security Training Centre (NSTC), run by Redline Assured Security, The National

“The National Safety & Security Academy is endorsed by ICAO as an Aviation Security Training Centre.”

Safety & Security Academy is endorsed by ICAO as an Aviation Security Training Centre (ASTC).

AVIATION SAFETY TRAINING – WHERE IS THE DEMAND?

With a full portfolio of virtual training being offered during the pandemic, over the past year, Baines Simmons has seen interest for courses including European Aviation Safety Agency (EASA) Part-145 – Understanding Requirements for Maintenance, remaining consistently popular, attended by engineers, technicians, management and compliance staff alike. Practical Skills for Investigators has also been in demand, along with EASA Part-21 courses. These courses will all be available at the National Safety & Security Academy.



Vital signs: The Recognition of Firearms and Explosives (RFX) Instructors course has been extremely popular.

virtual, in person in the National Safety & Security Academy, at London-based hubs or delivered exclusively within a client's company.

The Air Partner Safety & Security division have worked with the world's largest aviation organisations to develop and power up their management systems utilising a suite of diagnostic, advisory and training services that are recognised as world leading. As a division, they remain on hand to support clients as operations begin to resume.

AVIATION SECURITY TRAINING – SUPPORTING THE INDUSTRY'S REQUIREMENTS

Over the last year Redline has seen consistent demand for security training. The most popular courses are frequently requested to be delivered in person and include: Aviation Security Manager – Initial and Recurrent; Recognition of Firearms and Explosives Instructors; and Cargo Security. To support the learning experience, the National Safety & Security Academy provides state-of-the-art

facilities for a range of courses from X-ray screener training to quality assurance training. Each learning area provides access to the most advanced equipment, encompassing all aspects of an airport's security function from check-in through to departure.

OFFERING FLEXIBILITY AND CHOICE

As lockdown restrictions are eased, Baines Simmons and Redline are committed to delivering training courses offered to suit a customer's requirements – whether that is

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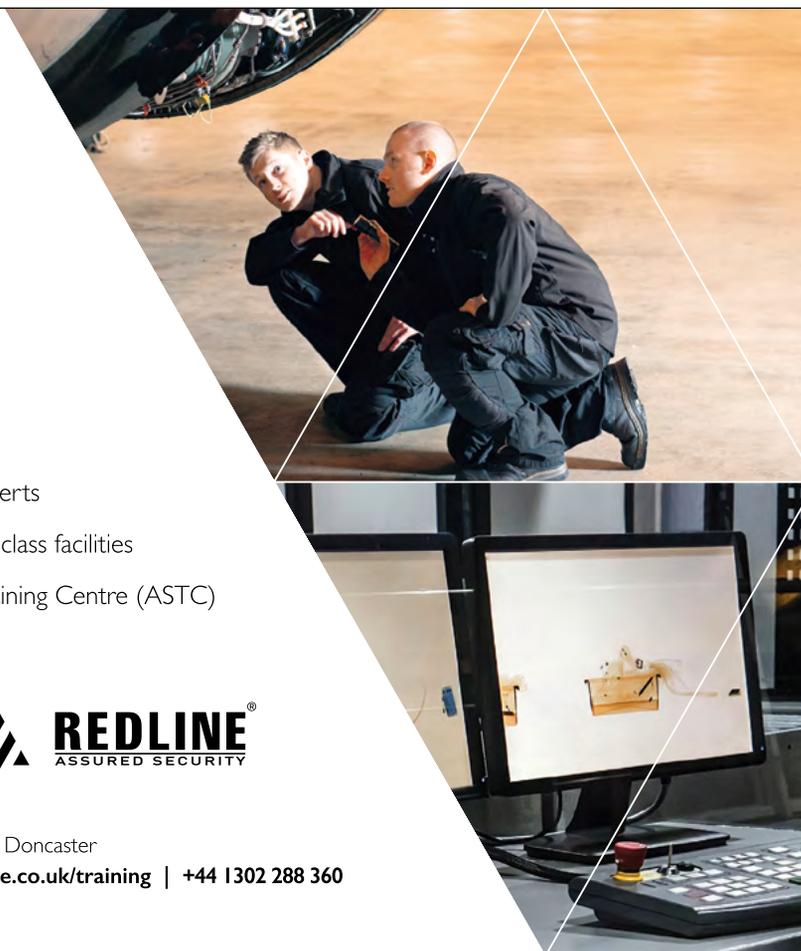
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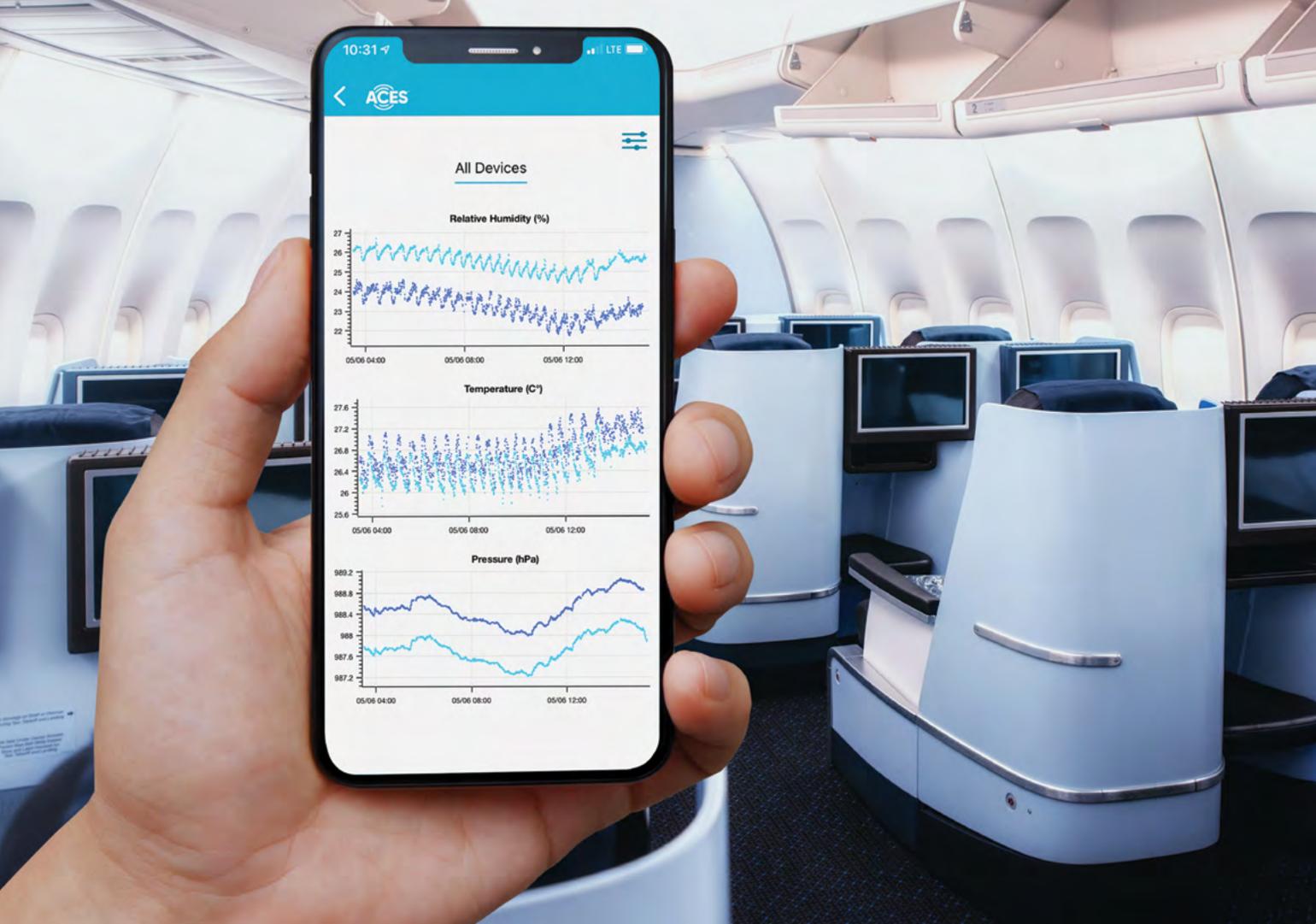
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A breath of fresh air

If cabin air quality is compromised, it can have serious repercussions for operators and their passengers. Teledyne Controls reveals how ACES has evolved to monitor and address potential air quality issues and ensure a better, safer flying experience.

Although cabin air quality on commercial aircraft is normally very good, smoke, odour and fume events do happen. When they do, the cost for the operator can be high, including medical expenses, potential legal fees, cancelled flights, maintenance time, insurance premiums and brand damage.

Interestingly though, there is no automatic equipment installed on board most aircraft today to accurately monitor and measure the air quality in both the cabin and the flight deck. When an air quality incident occurs, understanding what really happened is largely based on human perceptions. For example, the incidents reported are classified by odour type, such as oil smell, electric smell, burned smell, etc. which leaves room for subjectivity and often results in the inability for the operator to identify the root cause for the event. Moreover, events that did not exceed an established health standard to be considered harmful, but had strong smell or smoke associated with them, may be reported, whereas events involving hazardous, but invisible or odorless contaminants, such as carbon monoxide or ozone, may occur and remain undetected.

MONITORING CABIN AIR QUALITY

Teledyne ACES™ (Aircraft Cabin Environment Sensor) is the first FAA-certified solution to address this problem. The project started after hearing from multiple airlines about challenges related to cabin air quality and the lack of means to comprehensively monitor it. The solution, which was specifically designed for the aviation market, leverages extensive air quality expertise within Teledyne Technologies Incorporated, combined with Teledyne Controls' core expertise in data acquisition, wireless transfer, and analysis. ACES evolved quickly from concept to certification in just over two years and is now FAA certified on the 737 with A320 certification expected by the end of Q2 2021. The system has been installed on a major US Airline and is performing extremely well in a variety of on-aircraft and off-aircraft tests.

The ACES Mobile App provides instant access to air quality data during flight.



“ ACES evolved quickly from concept to certification in just over two years and is now FAA certified. ”

By providing continuous monitoring and accurate measurements of the air quality in the cabin and flight deck, ACES enables aircraft operators to verify the health of their cabin environment and determine if and when an air quality event occurs, its scope and severity, and the level of exposure to passengers and crew.

The ACES ecosystem includes onboard devices that are installed in the cabin and flight deck, and continuously sense and monitor potentially harmful contaminants. Those devices employ laboratory-grade sensors that record key environmental parameters, including data on airborne



The ACES Onboard Devices continuously sense and monitor the air quality in the cabin and flight deck as soon as the aircraft is powered.

particulates from 0.3 to 10 microns in size, carbon dioxide, carbon monoxide, ozone, volatile organic compounds and several other parameters. For example, many aircraft have ozone converters, and ozone has been known to be a source of concern. By measuring ozone levels, operators can monitor the performance of those systems. Another example is to verify cabin cleanliness. The recording of particulate and volatile organic compound data can help ensure the effectiveness of the aircraft's HEPA (high-efficiency particulate air) filters.

The data recorded by the ACES onboard units is automatically transmitted to an ACES cloud service portal for immediate processing and analysis. The transfer happens seamlessly upon landing, via the onboard units' built-in wireless cellular module, or continuously during flight with an available Wireless Access Point and broadband air-to-ground connectivity. Air quality data can also be accessed during flight on a mobile device.

EFFICIENT DATA ANALYSIS

Through the ACES cloud service portal, aircraft operators have secure web access to a series of comprehensive dashboards, custom alerts, and reports, so they can validate the air quality in the cabin and immediately identify unusual particulate levels. If an air quality event occurs, instead of making assumptions based on human perceptions, they have objective data at their disposal to troubleshoot and diagnose the issue. For example, by being able to differentiate between unhealthy levels of engine oil, versus exhaust or de-ice fluid, maintenance teams can narrow down their troubleshooting efforts to specific areas and more quickly and efficiently isolate and remedy an issue. Post-maintenance air quality measurements will then help verify if an issue was fully resolved. By monitoring trends on specific aircraft, operators can also identify and address potential emerging issues to help prevent future incidents, which results in more efficient operation and a better flying experience for passengers and crew.



Making flight data monitoring accessible to all

Installing new technology can be expensive and time-consuming. However, Spidertracks explains why there has never been a better time to enhance safety in general aviation by adopting its flight data monitoring solution.

Now is the right time to adopt flight data monitoring (FDM). There are often endless reasons to forgo adopting new technology. In an industry where no two days are the same, the constant juggling required while operating an aviation business makes it easy for some priorities, like updating or initiating safety management systems (SMS), to fall by the wayside.

It's easy to do when things seem to be working fine as they are. After all, installing new technology can be expensive and time-consuming.

The barriers keeping technology like FDM from general aviation are not new. Unless you're a commercial airliner, justifying a high cost across an entire fleet is enough to keep an operator away from adopting something

new – even if it would drastically change the safety of their operations.

FROM BLACK BOXES TO SENSORS

FDM has gradually increased in use across the aviation sector. It is a natural progression from the black boxes of the past, which provided a way for aircraft operators to investigate accidents. As an investigative tool,



“ FDM, or Flight Operations Quality Assurance (FOQA), has become the most highly regarded and potentially influential safety initiative to reach aviation. ”

though, it was often complex and technical. FDM of the past was a reactive approach to safety. Only after the black box was collected and the flight data downloaded could operators infer why an incident occurred.

However, the last 20 years have seen a shift, and FDM, or Flight Operations Quality Assurance (FOQA), has become the most highly regarded and potentially influential safety initiative to reach aviation.

So why isn't FDM more widely adopted? The cost and complexity of FDM programmes made it primarily accessible for top-tier airliners only.

Analysis of FDM shows its potential to act as a significant anticipatory tool for investigating root causes and risks associated with human behaviour. Instead of an ad-hoc approach to monitoring flights for safety purposes, FDM gave airliners a systematic approach to measure risk. The result? Commercial airliners continue to operate at the lowest rates of safety incidents in history.

THE RISKS ARE IN THE DATA

Despite advances in data-collecting technology, general aviation has not yet embraced the wealth of valuable insights FDM can provide. While FDM is a critical component of SMS in airliners, it is not a requirement for on-demand charters and commuter flights.

In recent years, increases in accidents across Part-135 operators have caused the National Transportation Safety Board (NTSB) to include 'Improve the Safety of Part-135 Aircraft Flight Operations' in their Most Wanted List of Transportation Safety Improvements for 2019-2020.

NTSB's decision to recommend adopting SMS and FDM in general aviation came after a 2015 accident of a chartered business jet while on the descent to a local airport. NTSB's investigation found no SMS or FDM present – two safety components that it believes would have prevented many of the incidents it has investigated over the past 20 years.

In *'Engineering a Safer World: Systems Thinking to Applied Safety'*, Nancy G. Leveson notes that aircraft operators tend to move to a higher state of risk under various performance pressures until accidents become inevitable.

With 70% of Part-135 accidents attributed to human error, risks may show up in operational data – if operators routinely took notice. The only problem is that the technology that records and relays this type of valuable information was not designed with general aviation in mind. It was never accessible enough – until now.

TURNING FLIGHT DATA INTO VISUAL DATA

When Spidertracks launched Virtual FDR™ (Flight Data Recording) in 2019, operators in general aviation had access to real-time aircraft tracking that logged every 15 seconds and was transmitted every minute through a dedicated Iridium® satellite channel.

Users could virtually watch an aircraft on its flight path, and no place was too remote.

Now, Spidertracks is extending its Virtual FDR™ technology with Insights – a visual

dashboard that collects a range of data, which is then uploaded automatically and wirelessly upon landing.

Insights empowers aircraft operators to take on a proactive, rather than reactive, approach to safety, revolutionising a sector that once relied on cumbersome, clunky, and expensive technology to understand incidents only after they occurred.

Operators can access Insights through Spider X, a sleek plug-and-play piece of hardware that is easy to install and simple to use.

Spider X gives aviators the ability to capture and see information about their flights, such as roll, pitch, and yaw. Operators can then set filters and parameters to measure this flight data. This can help mitigate future risks, enhance pilot training, see overarching safety trends and improve operational efficiencies in their business.

When risks are flagged and investigated before they become losses, it saves operators money by eliminating avoidable expenses.

At its essence, Insights is enhancing safety by turning flight data into visual data to reveal areas of improvement and areas that may require further training.

At its core, Spidertracks enables an entry to FDM for the general aviation industry. A proactive safety measure so evident that it should be accessible for all.





Avion's Instructor Operator System (IOS) is designed by instructors making it a user-friendly and highly intuitive IOS.

Quality Upset Training: Overcoming a post-pandemic hurdle

To regain passenger confidence, Dr Sunjoo K. Advani explains why pilots must be trained to manage routine as well as rare life-critical situations and how this can be achieved with Avion Group's meticulously designed training capabilities and full-motion flight simulators.



The Avion A320 Full Flight Simulator is configured with the original Airbus hardware kit on board.

During a recent routine flight, the pilots noticed a minor malfunction in the flight envelope protection systems. Having concluded it was not an immediate safety threat, they continued with their flight as planned. However, following their descent approach briefing, heavy turbulence then tripped those protection systems off. Under the intense workload, the crew did not notice that their protections were now lost. A go-around was then required. With the application of full thrust, the now vulnerable airplane pitched up before it lost airspeed and triggered a stall warning. The uncommon, unanticipated and

terrifying stall symptoms included heavy vibrations and powerful audible cues, which caused the pilots to over-react as startle reflexes took over. As a textbook example, these errors continued to pass through each layer of the “Swiss cheese” model – a theoretical model that suggests every step in a process has the potential for failure.

What happened next determined the outcome: The pilots somehow managed to apply skills learned decades ago during flight school, albeit in a late stage. Recovery by accident.

UPSET PREVENTION AND RECOVERY TRAINING

While this recent harrowing event is under investigation, the fact remains that pilots need to be trained to prevent and recover from such events. This specific paradigm is called “Upset Prevention and Recovery Training” (UPRT), which was recently introduced by the International Civil Aviation Organization (ICAO) and described in Document 10011, the Manual on Aeroplane UPRT. While some national authorities have implemented these provisions into regulation, many are still pondering how to introduce the changes.

“We have recognised that UPRT is a critical training need and an opportunity to develop pilot resilience.”
 Avion CEO Erik Varwijk

UPRT brings pilots back to the basics taught in their former flight schools, but within the cockpit and operating environment of the modern airliner. It should not come as a surprise that the handling characteristics of the flight school airplane – and the instructor who taught those skills – differ from those of modern jets. As the pilot enters the airline, most training is devoted to maintaining proficiency in the complex cockpit, operations, and crew interactions. Several events (Air France 447, Colgan Air



In Avion’s full flight simulator, the instructor is empowered with a comprehensive training program and UPRT tools developed by UPRT expert International Development of Technology b.v.

3407, AirAsia 8501, Turkish Airlines 1951, and very recently Sriwijaya Air 182) have taught us that basic flying skills must be maintained regardless of protections. Aerodynamics will always prevail.

What is equally important in UPRT is the training device. As the event described above highlights, entering into undesired aircraft states can occur rapidly. The crew must be able to process every possible cue as required for safe operations prior to entering the stall or upset. Denying them of that information during their training would be imprudent. Of equal importance is providing a training program that audaciously takes the crew back to “flying school”, delivered by an instructor who knows both the properties of the airliner and the fundamentals of flight.

METICULOUSLY DESIGNED TRAINING AND FULL-MOTION FLIGHT SIMULATORS

What does it take to create this unique training environment? While a simulator can be programmed with aerodynamics representing the edge of the flight envelope, modern jets can also demonstrate unpredictable and unpleasant behaviour

when nearing the stall. The objective of the training must be to teach recognition of the symptoms as early as possible and not permit the element of surprise to eclipse an appropriate response. For these reasons, Avion Group has meticulously designed these training capabilities and concepts into its full-motion flight simulators. The monocoque structure (whereby the aircraft’s outer shell supports all the stresses and loads applied to it), driven by the high-bandwidth electric motion system, ensures that the critical cues leading up to the stall are vibrant and accurately represent reality. Moreover, the instructor is empowered with a comprehensive training program and UPRT tools developed by UPRT expert International Development of Technology b.v., taking the pilot from “zero-to-hero”. Thereby, the instructor can apply his/her competencies to expose the trainees to real-world threats.

“A simulator is more than a training device by which the regulatory ‘box’ is ticked. It is the only place where the pilot’s competencies can be developed and validated throughout the entire flight envelope,” says Avion CEO Erik Varwijk. “We have recognised that UPRT

“A simulator is more than a training device by which the regulatory ‘box’ is ticked. It is the only place where the pilot’s competencies can be developed and validated throughout the entire flight envelope.”

Avion CEO Erik Varwijk

is a critical training need and an opportunity to develop pilot resilience.”

Last year’s *INFOCUS Safety and Security* suggested that 620,000 pilots would be needed worldwide by 2036. More than ever, the quality of that pilot training is critical and should continue to improve. To regain a sceptical flying public, pilots must be trained to manage routine as well as rare life-critical situations. UPRT is one of the most valuable tools for preventing the holes in that Swiss cheese from aligning. Giving pilots the correct simulators, training programs, and instructors to avoid stalls and upsets is a responsibility bestowed upon every training department. It also makes pilots more confident problem-solvers.

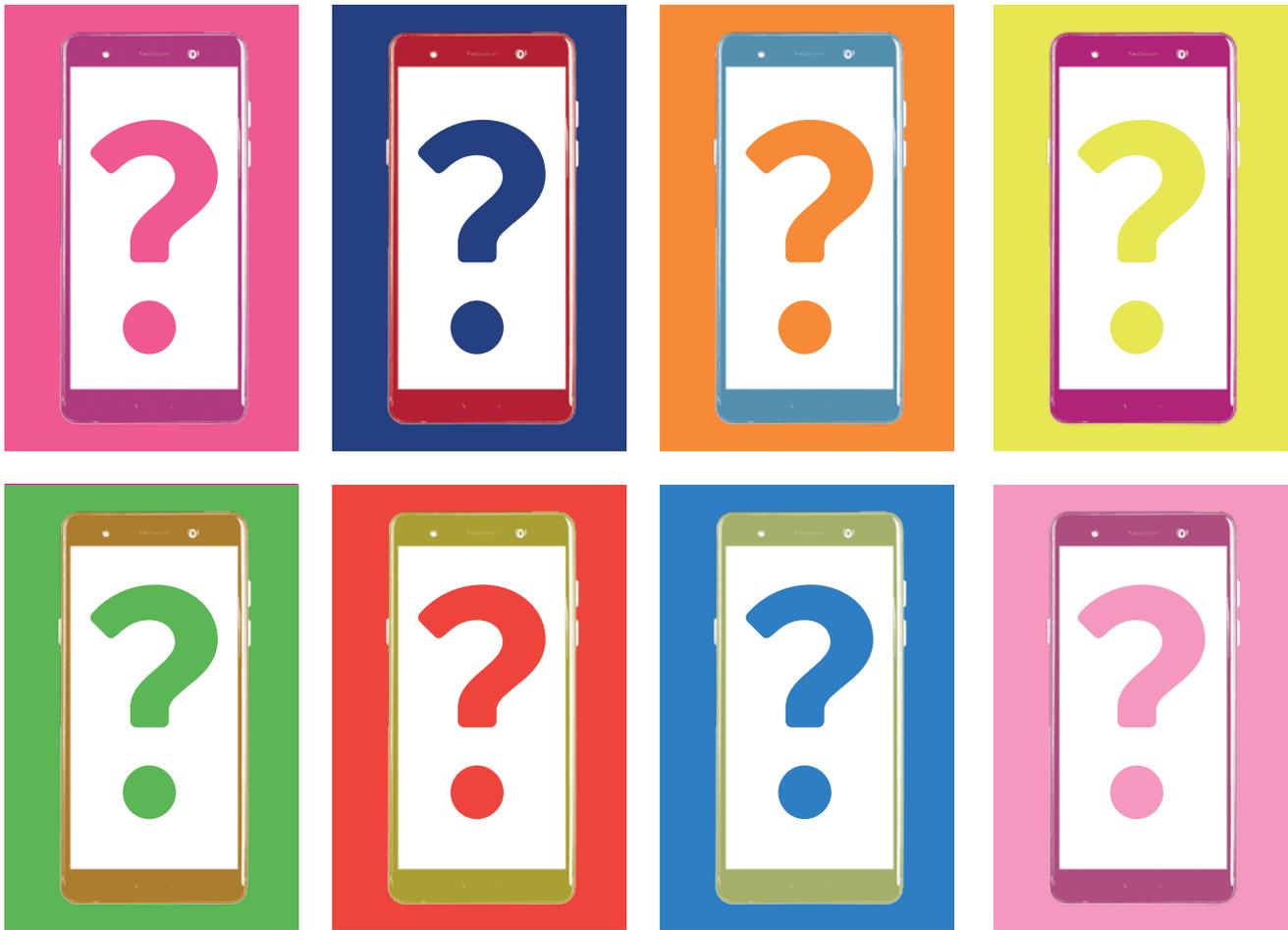
This article was written by Dr Sunjoo K. Advani, President of International Development of Technology b.v., an expert and pioneer in UPRT development and implementation.

THE FUTURE OF FLIGHT TRAINING IN LUTON

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Identity crisis?

How MAC randomisation is disrupting Wi-Fi connectivity

With passengers increasingly expecting Wi-Fi to be as efficient and secure in the air as it is on the ground, Galgus explores how to overcome the challenge of MAC randomisation so that operators can unleash the full value of their Wi-Fi network.

Fortunately for the post-pandemic landscape, Personal Electronic Devices (PEDs) were already on their way to becoming the ultimate tool for passengers to manage the journey, be entertained, and communicate with the world. Now they

offer an even greater opportunity for operators to engage further through many more touch points with their passengers, whilst reducing physical touch points and the risks and costs that go with them.

However, with modern PEDs faking their

MAC address to avoid counting and location services (a bit like a car repeatedly changing its number plate to avoid being tracked), MAC randomisation has become a fundamental problem for operators looking to leverage Wi-Fi analytics.

WHAT IS MAC RANDOMISATION?

MAC stands for Media Access Control. A MAC address is a unique identifier for each device, whether handheld, tablet or laptop. This unique code (typically made up of 12 digits) is then sent out each time the device recognises a Wi-Fi network in its vicinity.

Not surprisingly, many networks rely on this MAC address to identify the user. It enables the seamless automatic authentication for the user and allows the operator to identify each user throughout their time in the system. Such continuous identifiability around and during a passenger journey, for example, during

baggage drop, at the check-in desk, terminal landside, airside, lounge, at the gate, on the aircraft, baggage-claim, offers huge potential for airlines in terms of marketing opportunities.

However, modern devices (Android since version 7 and iPhones since iOS6) often randomise or fake their unique identifier (the MAC address) in a process known as MAC randomisation to deliberately confuse counting and location services to avoid being tracked.

Whilst there are different levels of severity of randomisation, the industry is migrating towards the highest level that has been introduced recently – one that randomises MAC addresses continuously, e.g. every few hours. This means that for a traveller on a connecting or long-haul flight signing into an airline Wi-Fi domain would still require to re-connect each time the MAC address has been changed.

Unfortunately, there is a lack of awareness of this problem amongst many operators in aviation, where the same levels of Wi-Fi connectivity are expected in the air and throughout the passenger journey as they are in our everyday lives. The impact on both the user experience and the ability to get meaningful data from the system's analytics is often misunderstood by operators, while the implications on airline investments in passenger apps are also underestimated.

TWO OPPOSING TRENDS

The problem is further compounded by efforts from the travel industry to simplify and unify the provision of Wi-Fi while enabling seamless connectivity between locations, networks and airline alliances. Various global alliances (such as WBA – Wireless Broadband Alliance and Seamless Air Alliance) promote the seamlessness and user-friendliness of Wi-Fi for all users, resulting, for example, in the definition of technical specifications like Hotspot 2.0.

That means that we are seeing two big opposing trends. On the one hand, efforts to unify the passenger connectivity experience require a reliable passenger identification tool. In parallel, airlines want to harvest the benefits from the continuous identifiability and are developing apps to become the go-to

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tool for passengers. The reliable and accurate identifier to enable all this so far has been the MAC address.

On the other hand, the manufacturers of passenger PEDs embrace MAC randomisation to not make passengers identifiable, thus negating the foundation for many of the apps airlines develop to become more engaged with passenger behaviours.

HOW DO SYSTEM HOUSES ADDRESS MAC RANDOMISATION?

In principle, there are three ways traditional Wi-Fi analytics solutions handle randomised MAC addresses. Take one of the basic functions of Wi-Fi system analytics – the counting of the passenger devices in the vicinity of an access point:

1. The system only identifies whether there are “few or many” devices.
2. The system does not count randomised MAC addresses at all. However, it should be pointed out that the system can identify whether or not any given MAC address is randomised or not.
3. The system counts all MAC addresses and thus massively overinflates the number of “detected” devices.

How can this be overcome?

An alternative to these three Wi-Fi analytics responses is exactly what Galgus has developed. It has found a way to largely reverse the distortion produced by randomised MAC addresses.

Galgus' background is the optimisation and functional enablement of onboard Wi-Fi networks through software-defined Wi-Fi, one key element of which is the separation of hardware and software. It maximises the use of each element of the existing infrastructure in coordination with all others. Galgus has four software families

(Network & Optimisation, Management & Interfacing, Analytics & Insights, Protection & Comfort) that elevate the network performance as well as the user experience.

As part of the Protection & Comfort family, Galgus offers the WPA3 standard, solutions for Wireless Intrusion Detection and Protection and the Hotspot 2.0 certification.

Most importantly, it also includes the feature for the reversal of MAC randomisation, for which Galgus holds several patents. The solution has the unique capability to detect and count PEDs even if these devices are not connected to Wi-Fi and/or if they randomise their MAC addresses. The solution also generates useful location analytics for a whole range of applications. This is a unique capability that no other vendor has, including well-known brands. Not surprisingly, Gartner included Galgus as one of the leading vendors for Indoor Location Solutions in its market guide.

It would be ironic if the Wi-Fi infrastructure in aviation, having become the perfect tool to enable passenger information, communication and entertainment as well as reducing airline costs and generating various operational benefits, couldn't then offer airlines the ability to engage continuously with their customers because passengers cannot be identified and authenticated properly.

By offering a single Wi-Fi network for everything alongside its Location Analytics tool, Galgus has created a solution to overcome precisely this problem and provide travellers with a safe, high-quality experience while enabling operators to obtain information on the behaviour of their users and visitors. And all in compliance with data protection regulations.

Through the lens

The importance of video surveillance for airport security is not to be underestimated. Find out how Yuzhno-Sakhalinsk Airport in Russia has deployed Dallmeier's Panomera camera technology to watch over everything on the apron and runway.



Keeping the apron and runway in view:
The patented multifocal sensor system
"Panomera®" from Dallmeier.

Just under 7,000km from Moscow lies the largest airport on the Russian island of Sakhalin – Yuzhno-Sakhalinsk Airport. In 1990, the air transport hub was awarded the status of International Airport by the International Civil Aviation Organization (ICAO) and with around one million passengers per year it is the largest airport on the island.

These days it is difficult to imagine an airport devoid of security measures. This is especially true for airports that are entitled through ICAO certification to call themselves ‘international’. ICAO defines principles and guidelines for civil aviation. To receive certification, airports are obliged to adopt arrangements in keeping with the ICAO statutes for maintaining measures including

“In Dallmeier we have found the right solution partner for a complete implementation of our new security solution.”

Renat Mardanov,
Project Manager

but not limited to video security – such as for the apron and runway – and to implement corresponding solutions.

ZOOMING IN ON THE RUNWAY AND APRON

Recognising that high-quality video material is essential for visual coverage of the apron as well as the runway, Yuzhno-Sakhalinsk Airport has extended video surveillance to cover these areas. While these security areas are only accessible to authorised personnel, it falls to the operator to ensure that all activities relating to aircraft, such as the presence of unauthorised persons on site, or any damage incidents can be investigated quickly and efficiently. The use of the most up-to-date security equipment is therefore intended to ensure the safe, expeditious and





“The multifocal sensor technology enables us to zoom into detail on situations at any time, even in the recorded image data, and verify any occurrences with certainty.”

Dmitry Golovanov, IT Director

orderly movement of aircraft on the airport’s apron and runway.

Visual verification of all processes is assured by a Dallmeier Security solution based on the patented Panomera® multifocal sensor technology. These special camera systems offer uninterrupted tracking of activities in large spatial relationships with uniform image quality despite the distance differences which apply for both the runway and the apron. Dallmeier’s solution enables operators to receive the overview images from the Panomera® in one image and, depending on the demands of the situation, to select one or multiple zoom areas in the overall image with just a few clicks of the mouse. These can then be examined more closely as if they were in pan-tilt-zoom camera (PTZ) mode. However, unlike traditional PTZ-cameras, with the Panomera® system, a high-resolution total overview of all other areas is always preserved both in the live mode and in the recording.

Subsequently, all processes relating to the aircraft whether it is arriving, departing, or even parked for refuelling, maintenance or

cleaning can be supervised seamlessly while being recorded permanently with high resolution imagery.

Referencing the execution of the project at Yuzhno-Sakhalinsk Airport as “flawless,” Project Manager Renat Mardanov said: “The thorough training of our installers and support during implementation and setup of the entire system on-site ensured that we could go live rapidly and without problems, and in Dallmeier we have found the right solution partner for a complete implementation of our new security solution.”

ADVANTAGES OF THE DALLMEIER SYSTEM

A single Panomera® system replaces multiple PTZ and megapixel cameras. For airport operators, this has various financial benefits as it entails considerably reduced expenditure on infrastructure, as well as a reduction in the cost of camera management, while the overall objective can be achieved with reasonable human resources. In addition, the smart operation of the Dallmeier VideoIP-Client software from the workstation, both in live mode and in

playback mode enables the operator to analyse the recordings quickly and conveniently. Another key benefit is derived from the Panomera’s capability to allow several operators to access zoom areas at the same time without ever losing the general overview. So, for example, in the event of a security alert, the police can use the camera system, but at the same time the apron controllers still retain a full view, and even service companies can continue to use the camera views undisturbed.

Expressing his enthusiasm for the Dallmeier Airport Solution, Yuzhno-Sakhalinsk Airport’s IT Director, Dmitry Golovanov, said: “An important factor was the stability and reliability of the system because we must record the entire situation permanently in order to ensure optimal loss and safety management and for investigating incidents. The multifocal sensor technology enables us to zoom into detail on situations at any time, even in the recorded image data, and verify any occurrences with certainty.”

He added that, “the Dallmeier Panomera® has already been deployed successfully in many international airports, so it was not difficult for us to reach a decision after we were able to convince ourselves of the systems’ quality. Even the considerably smaller number of cameras compared with solutions using PTZ and megapixel cameras made installation and operation much simpler for us, which in turn helps to relieve the burden on our processes and lower total costs.”

A SCALABLE AND INTEGRATED SOLUTION

Analysis tools and business process optimisation are topics which will become increasingly important for Yuzhno-Sakhalinsk Airport in the future. With Dallmeier’s solution, the airport can set their own schedule as the systems installed currently are scalable in all directions at any time and will remain fit for purpose down the line. An implementation of a wide range of tools, such as an upgrade to AI-based instrument and analysis functions is also possible at any time in the future.



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