ECAC NEWS #69

European Civil Aviation Conference Magazine

INNOVATION IN AVIATION

Pioneering solutions for safe, secure and sustainable air transport

ALSO IN THIS ISSUE
ICAO Council elections:
meet the European
candidates

ECAC . CEAC

CONTENTS

Fostering an innovation culture

Ingrid Cherfils
ECAC President

S afety culture is often defined as "the way safety is perceived, valued and prioritised in an organisation"[1] or a "set of enduring values and attitudes regarding safety issues, shared by every member of every level of an organisation"[2].

Significant progress has been achieved thanks to the efforts and commitment of the air transport sector, and the promotion of safety at all levels of our organisations remains a priority, whether we are a regulator, an air navigation service provider, an airline or an airport operator.

The concept of security culture is progressing and contributes to addressing the issue of insider threats to aviation in a more efficient and holistic manner. All current efforts and initiatives on security culture will lead to having the same level of priority and visibility given to safety and security, in all organisations.

But do we have an innovation culture in aviation?

Yes, to an extent, and depending on the organisation. Since its beginnings, technological innovation has been enshrined in aviation's DNA – and innovation is accelerating at a pace never seen before. Additionally, artificial intelligence is creating new opportunities, such as manufacturers of screening equipment, but also challenges for the industry, such as data integrity protection.

But cost pressure on R&D projects, regulatory constraints, and the need for individuals to adapt to constant changes are among the factors that often limit our ability to explore innovative solutions.

A few months before the ICAO Innovation fair and the 40th session of the ICAO Assembly, the articles in this edition of ECAC news provide some strong input to forthcoming discussions on innovation in various sectors of aviation.

Innovation is often driven by passion, and the aviation sector is full of very passionate people. I am confident that thanks to our collaborative creativity, we will be able to build a solid foundation for a true and sustainable innovation culture for aviation.

---

(1) EUROCONTROL
(2) EASA, European Strategic Safety Initiative, EASA ECAST SMS Working Group.

ICAO COUNCIL
ELECTIONS:
MEET THE EUROPEAN
CANDIDATES

FINLAND/NORDICAO
Samuli Vuokila

TOGETHER FOR SAFE, SECURE AND SUSTAINABLE AVIATION

ICAO's role in maintaining and promoting safe, secure and sustainable civil aviation in the world is of fundamental importance. Aircraft cross borders and bring people and goods together, all of which needs a strong global facilitator. Aviation is facing new challenges in many fields including environment, cyber security, capacity, facilitation, to name just a few, and ICAO needs to adapt to the new challenges. This work is not possible without strong commitment from the ICAO Member States.

Finland, one of the seven NORDICAO rotation group States, has been a strong supporter of ICAO's work and continues to act in that spirit. The seven NORDICAO States form an aviation family with a long history and have strongly committed to work tirelessly in various international fora for the always-needed improvements in the multifaceted global civil aviation field.

ICAO's rulemaking function will need to evolve towards a performance - and risk-based approach instead of the traditional prescriptive regulatory framework. This path has significant challenges, in particular as it relates to the varying oversight abilities of these kinds of rules. Implementation support and guidance play a very important role in this endeavour. Both of these are functions that can be done on multiple levels and new initiatives to improve need to be sought in an attempt to raise the effective implementation of ICAO provisions.

ICAO will benefit greatly from the increasing internal efficiency where Member States play a key role both as facilitators, and every now and then as role models. Sharing best practices is a very efficient way of international cooperation. Experience and examples of new ways of doing business are worth their weight in gold; everyone does not have to try to do things from the very beginning but benefits from the experience of others.

I personally remain committed to supporting ICAO's work in a collaborative, open-minded fashion. The best results in all international activities are those where everyone's opinion is taken into account and the end result is acceptable to all. Global civil aviation is not possible without the cooperation of all actors working towards the same goal. This is where ICAO has its natural place, the home of international civil aviation.

*An airline captain, **Samuli Vuokila** is the Finnish candidate for the ICAO 2019 Council elections. As a member of the NORDICAO rotation group, he has been the Alternate Representative of Sweden on the Council of ICAO since 2016. Prior to this, Mr Vuokila held several positions within the Finnish Civil Aviation Authority. He was also head of safety and quality assurance in airline management, a member of the ICAO Air Navigation Commission from 2011 to 2014, and chief adviser to the Finnish Director General of Civil Aviation.*

FRANCE
Philippe Bertoux

AMBITIONS AND VISION IN THE ICAO COUNCIL

France was at the heart of the creation of an international governance mechanism for international aviation, and Paris was its birthplace. In 2019, we are celebrating both the 75th anniversary of the Chicago Convention and the 100th anniversary of its predecessor, the *Convention internationale de la navigation aérienne* (CINA). I believe we should be proud of this history but most importantly, we must prepare ICAO for its next 75 years.

During my term as ICAO Council member, I made sure to bring the French and European expertise to the discussions in Montreal. I will continue to work with my colleagues in the Council and, with the support of the Air Navigation Commission and the Secretariat, to deliver on the priorities set by the 40th ICAO Assembly.

I will focus on three key issues that I believe are of crucial importance:

1/ Environment, to ensure the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is the success we all hope for and that aviation increases its efforts towards reducing its environmental footprint.

2/ Aviation safety, in order to maintain and further improve the exceptional results obtained over time, whilst integrating new actors and flying objects.

3/ Aviation security, which is an obvious priority not only for France and Europe but for all States, as emphasised in Security Council Resolution 2309.

The 40th ICAO Assembly will undoubtedly be a milestone for the Organisation. It will be the occasion to reflect on how to better work with the industry in order to deal with the acceleration of innovation and the digitalisation of air transport. France and Europe have an amazing experience and skillset to bring to the ICAO table. I will make sure that the ICAO Council follows on this. ICAO must remain the international reference for smart aviation regulation.

Lastly, I believe that ICAO needs to pursue the path of internal reforms. I will continue to work with my colleagues to bring fresh ideas to improve the governance of the Organisation. ICAO modernisation is essential to guide the safe, secure and sustainable expansion of the aviation sector across the globe.

Philippe Bertoux has been Ambassador, Permanent Representative of France to the ICAO Council, since August 2016. He previously held various positions within the Ministry of Europe and Foreign Affairs, in Paris and abroad. He specialises in multilateral and strategic issues, with particular expertise on the United Nations. During the 2016-2019 ICAO triennium, Mr Bertoux chaired the Committee of Unlawful Interference (UIC) and he has been an active member of the ICAO Council's Advisory Group on CORSIA. He is a graduate of the ESSEC Business School, Institut d'Études Politiques *of Paris (Sciences-Po) and* École Nationale Administration *(ENA).*

GERMANY
Ulrich Schwierczinski

ICAO and its governing body, the Council, will be faced with a number of challenges during the next triennium.

Enabling the sustainable growth of international civil aviation over the coming years continues to be a demanding challenge not only for the industry but also for the regulators. ICAO plays a pivotal role in this by setting the appropriate global standards and ensuring that no country is left behind in the implementation and continued oversight of these safety, security and environmental standards. The safe and orderly development of our fast-growing industry also requires a commitment from all stakeholders to ensure a level playing field so that airlines around the globe can have fair and equal opportunities to compete. Germany offers continued support to ICAO in these key areas based on its vast experience over decades as home to one of the world's largest aviation industries.

Sustainable growth of aviation will only be possible if the aviation sector mitigates its environmental and climate footprint. Germany fully supports the implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and the ICAO basket of measures, and in particular the efforts to produce sustainable aviation fuels on a large scale.

Emerging new technologies such as urban air mobility or unmanned aircraft systems are fascinating and open up new possibilities for aviation, considered unrealistic by many just a few years ago. These developments require the adaptation of new working methods for national regulators and ICAO alike. Given the pace of successful developments in these sectors in Germany, we would be glad to share our experiences in those areas with ICAO for the benefit of all Member States.

Germany has always supported ICAO's work in all its fields while at the same time advocating to continuously adjust its working methods to enhance the effectiveness and efficiency of the organisation. Even more so, since demand for ICAO´s resources has to be balanced with the allocated budget of the organisation. Setting the right priorities to meet the needs of all Member States, taking into account the resources available to them, continues to be an important element for Germany in the work of the ICAO Council.

Ulrich Schwierczinski has been a member of the ICAO Council since 2012. He currently serves as its first vice-president. He has over 35 years of professional experience in civil aviation as a career civil servant in a variety of progressively responsible senior-level positions within the Federal Aviation Administration of Germany. He has extensive leadership and management experience. Prior to joining the ICAO Council, Mr Schwierczinski served as president and chief executive officer of Germany's Federal Aviation Office for 12 years. He has also many years of international experience as a long-serving member of ICAO's Air Navigation Commission and Alternate Representative of Germany on the Council during that time. He worked as team leader in national and international type certification activities. Mr Schwierczinski holds a diploma (M.Sc.) from the Technical University of Braunschweig in mechanical engineering, specialising in aeronautics and space technology. He also holds a "bar exam" in technical administration (Great State Exam). He has held a private pilot licence for gliders since the age of 14, followed by single engine and motor glider licenses (PPL C, A, B).

GREECE/CERG
Katerina Nassika

After 75 years of membership and 30 years of active presence through a Permanent Representation to ICAO, Greece is proud to have been nominated for election to the Council on behalf of the Central European Rotation Group (CERG). Greece has been a faithful observer of, and a true believer in, ICAO's work during all these years and values enormously the knowledge and the inspiration thus acquired.

Having never served on the ICAO Council before now, Greece believes that it is time for the country to take up a more active role and contribute to defining and advancing, together with the other Council members, a sounder, safer, and more efficient, environmentally friendly and innovative sector. Civil aviation is a global industry and essential to all countries seeking access to the markets, economic growth, tourism and trade stimulation. An immediate involvement in the everyday work of the Council will further incentivise Greece to optimise its benefits to the fullest extent. In this new responsibility, we would spare no effort to make all members of our rotation group feel a part of the process and together committed to the development and the progress of international civil aviation through the Organisation.

Greece is willing to share the experience of a small country with a rapidly growing aviation market, large passenger and aircraft traffic and an extensive network of 44 airports, all resulting mainly from its particular geography and its position on the map at the crossroads of three continents. Thanks to our uninterrupted 30-year presence as observer to the Council, we feel ready and willing to add value apart from the substance of the matters on the agenda, and reinforce the effectiveness and efficiency of the Council's functioning.

In recognition of the importance of promoting the participation of women in the global aviation sector and particularly in leadership roles, Greece intends to be represented by a female nominee to the Council, thus supporting ICAO's continuous initiatives towards improving gender equality within the Organisation's governing and technical bodies.

Hopefully, if elected, we will be able to contribute more essentially to the diversity which actually makes ICAO a success: an international organisation that creates global standards with the involvement of all Member States, *for* all Member States.

*Ambassador **Ekaterini Nassika** is a career diplomat and the Permanent Representative of Greece to ICAO since 2015. She joined the Greek Ministry of Foreign Affairs in 1985 working at the United States Desk (Athens, Greece) and was then posted to the Greek Embassy in Washington, DC, United States (1989-1993), the Greek Embassy in Tirana, Albania (1993 – 1996), and the Permanent Representation of Greece to the European Union in Brussels, Belgium (1996 – 1999). From 1999 to 2003 she worked at the Diplomatic Office of the Deputy Minister for European Affairs, in Athens, and from 2003 to 2007 she was the Political Military Counsellor at the Permanent Mission of Greece to the Organization for Security and Cooperation in Europe (OSCE) in Vienna, Austria. She has served as Deputy Director, Directorate for Turkey, (Athens, 2007 – 2008), Consul General of Greece to Brussels, Belgium (2008 – 2011) and Deputy Permanent Representative of Greece to the North Atlantic Treaty Organization (NATO), also in Brussels (2011 – 2015).*
Ambassador Ekaterini Nassika holds a law degree from the University of Athens and is fluent in Greek, English and French.

ITALY
Salvatore Sciacchitano

What is your vision for ICAO in the future?

ICAO needs to strengthen the Organisation's global leadership for full implementation of its five strategic objectives. It needs to address the pressing challenges of acute global traffic growth, strengthen the support to Member States in the framework of the "No Country Left Behind" strategy and reconsider the mechanisms aimed at developing and adopting Standards and Recommended Practices and policies in order to facilitate support to the fast-paced aviation innovations.

What is the role of the next Council of ICAO?

Efficiency and respectful authority must be at the basis of the Council's decisions.

The role of the Council and the Secretariat (and reciprocal interfaces) will have to be refined, strengthening the focus on strategic and political issues for the former, and on implementation responsibilities for the latter with a view to maximising the efficiency of the whole Organisation.

The fast evolution of aviation technology will require a review of the working methods and procedures to be able to support this evolution and to prevent ICAO from hampering their implementation. In this regard, consideration will have to be given to the structure and work programmes of the Secretariat and to the Council's decision-making process, simplifying ICAO procedures and giving higher relevance to deliverables.

Finally, since innovation means new tasks, more resources will be needed and they will have a financial impact. Consequently, a new approach will be necessary to adopt the budget, including – where feasible and appropriate – opening up the possibility to financial contribution by the industry.

What would you do as President of the Council to improve the work of the Council and the Organisation?

I would steer the Council with leadership built on solid know-how and experience, neutrality and independence, aiming at consensus in order to take difficult but also long-lasting decisions. In this regard, it is worth recalling former president, Assad Kotaite, who stated in *My Memoirs* that the main challenge for the President of ICAO is to lead the Council conciliating positions, amongst the Council members or amongst Member States, in order to obtain not an average result but the best result possible. And that conciliation is an attitude of the mind requiring knowledge, openness, listening skills and patience.

Leadership, neutrality and independence when dealing with sensitive and controversial issues or disputes will be essential, as well as putting in place all the necessary actions to prevent tensions or disagreements from escalating.

Salvatore Sciacchitano joined the Italian Airworthiness Authority (RAI) in 1980 and became Director General in 1996. In 1999, following the reorganisation of the civil aviation administration in Italy, he became Deputy Director General of the Italian Civil Aviation Authority (ENAC).
At the international level, Mr Sciacchitano chaired the JAA Committee, represented Italy on EASA's Management Board and on the EUROCONTROL Provisional Council, of which he was also vice-president. He also taught several master's degree courses on aviation-related topics in various Italian universities. In 2010, he was appointed ECAC Executive Secretary, establishing cooperative relationships with the other regional organisations. He also participated in numerous international and regional ICAO events. He joined the ICAO Council in February 2019 as head of the Italian delegation.

NETHERLANDS/ABIS
Richard Ossendorp

ABIS GROUP PROUD TO PRESENT ITS NEW VISUAL IDENTITY

The Abis group was first formed in 1980 and has since evolved into a solid partnership of eight European States that have a clear interest in working closely together to ensure their continuous active engagement in ICAO. The Netherlands is honoured to be next in line to run for election to the ICAO Council on behalf of the Abis States. As a key component of our preparations for the 2019 Assembly, we launched into a collaborative creative process involving all Abis members to get to the heart of what Abis means to all of us. We think the result reflects the essence of Abis: positive, pragmatic and outward-looking. We hope you agree and invite you to take a look at our new website! (**http://www.abisgroup.org/**)

We were delighted to reveal the new Abis look at a special morning coffee hosted by the Abis team in Montreal on 12 June. We also made good use of this well-attended gathering of delegations to announce the launch of the Dutch campaign for Part II of the ICAO Council. In 1944, the Netherlands was a founding member of ICAO and to this very day remains firmly committed to the work undertaken within the framework of this specialised UN agency and its strategic objectives. The Netherlands has a strong tradition of engaging in international cooperation, based on open

dialogue and transparency. These will also be the guiding principles for our active involvement in the day-to-day proceedings of the ICAO Council during the next triennium, emphasising the need for good governance, promoting inclusive decision-making and embracing innovation. Rapid growth of air transport poses significant challenges, especially in terms of effective capacity management and the environmental performance of aviation. ICAO must show ambition and leadership in addressing such global challenges.

The candidate for the Netherlands is Richard Ossendorp from the Dutch Ministry of Infrastructure and Water Management. In recent years Richard headed the transport and environment division at the Dutch Permanent Representation to the European Union. However, in January 2019 he joined the Abis office at ICAO as Alternate Representative of Ireland on the ICAO Council. This will allow for a smooth transition of tasks and responsibilities within the Abis office and has given him an opportunity to quickly get up to speed with the key issues on the agenda for the ICAO Assembly. Richard comments: *"The Abis team in Montreal is professional, well-organised and friendly. They have all made me feel very welcome. It is also very clear to me that the European representatives at ICAO must work even more closely together to represent our common vision and shared interests. Europe does not find itself in an easy position, as is for example reflected in the difficult debate on the relationship between ECAC and ICAO."* As a member of the ICAO Council, Richard hopes to focus his attention in particular on organisational efficiency, transparency and accountability, advancements in aviation security and facilitation and further steps in the environmental portfolio.

SPAIN
Victor Aguado

We are facing a number of challenges that will require our collective attention from a global perspective.

One of these is the cyber threat related to security, which also affects the safety domain as aviation becomes more and more e-connected. The quasi-instant exchange of information is a reality in our daily lives so it is important to ensure that aviation doesn't fall behind in this area. The massive exchange of information among all aviation stakeholders will also be an important future consideration. Secure information will allow us to make the system – flight operations, ATM, airports – safer and more efficient.

As new types of operations are conceived, it will become essential for ICAO to attract the entire community of airspace users, including the new entrants. Global standards for all airspace users as well as users of the aviation infrastructure are a must if international civil aviation is to accommodate the foreseen growth. Engagement with the industry then becomes a strategic element of the near future.

ICAO's work in the environmental field is broadly recognised. Work on noise and emissions at and around airports has been on the agenda already for many years. To complete the environmental basket of measures, CORSIA – the global aviation carbon offsetting and reduction scheme – was finally agreed as an international standard. However, the efforts to reduce the impact of aviation on the environment should not be considered as a finished deal. Environment could become the Achilles' heel of commercial aviation if environment, including climate change, is not retained as one of the prime objectives. A major collective effort should be launched hand in hand with other aviation stakeholders to disseminate the systemic achievements in reducing CO_2 emissions.

Finally, from an institutional point of view aviation has evolved. While States retain their responsibilities as defined in the Chicago Convention, the role of the industry needs to be fully recognised. ICAO will need to take all kinds of initiatives to bring the aviation community together to adopt relevant and timely international standards.

Those are just some of the challenges that encourage us to continue to be part of ICAO's governing bodies, allowing us to contribute through our experience and our willingness to facilitate global solutions.

Víctor M. Aguado, member of the ICAO Council, has served as 1st Vice-President, Chairman of the Finance Committee, the Air Transport Committee, the Technical Cooperation Committee, and Chairman of the Special Task Force on the ICAO Policy on Assistance to Aircraft Accident Victims and their Families. Before this, Mr Aguado was Director General of EUROCONTROL and President of the Air Navigation Commission of ICAO.
Mr Aguado held high-level positions in Spain, including CEO of ISDEFE, Director General of the cabinet of the Minister of State for Defence, and Director for ATM in the Ministry of Transport. He served as a member of the supervisory boards of AENA International (airport operator), HISPASAT (satellite communications operator), ISDEFE (systems engineering) and INSA (aerospace engineering).
Mr Aguado holds a master's degree in aeronautical engineering from the Polytechnic University of Madrid, and a Master of Science in Management from the Massachusetts Institute of Technology.

UNITED KINGDOM
David Lloyd

AMBITIONS AND VISION FOR ICAO AND COUNCIL

During David Lloyd's time as United Kingdom (UK) Representative to ICAO, the UK has focused particularly on governance and efficiency issues and aviation security, while continuing to also support European efforts to develop and implement CORSIA. The UK has been instrumental in ensuring institutional issues are addressed properly by the Council, while during budget discussions the UK pushed strongly for a thorough review and re-evaluation of ICAO's financial management practices, leading to better accountability and greater transparency.

However, it is clear to the UK that ICAO must continue to evolve in order to adapt to the new challenges and ever-increasing pace of change in the aviation sector. The UK will continue to champion the following key objectives:

- Governance and internal processes that are flexible enough to adapt to the challenges of a rapidly changing aviation sector, and are fully transparent, efficient and meet the highest standards of professionalism and integrity.

- The rebalancing of priorities to reflect the current aviation context, in particular that aviation security is treated as a priority alongside aviation safety.

- Greater engagement between the Organisation and stakeholders, including industry, citizens' groups and new actors in the aviation sector, so that ICAO can truly be delivering to the demands of what is needed in the modern aviation sector.

- Embracing the opportunities provided by innovation in the aviation sector, through ensuring ICAO provides the necessary framework for new entrants to thrive, cooperate and innovate, while ensuring the same standards of safety and environmental integrity continue to be maintained.

The UK believes that the desire for the evolution of ICAO to meet these challenges is there amongst all States and within the Secretariat. We will work hard during the next Council session to ensure we make the most of the vast expertise within ICAO and its partners to capitalise on the new opportunities we are faced with.

David Lloyd was appointed United Kingdom Representative on the ICAO Council in December 2017. Prior to this he spent seven years in the UK Permanent Representation to the EU in Brussels, acting as principal adviser ("Mertens") to the UK's ambassador in charge of transport, energy environment, economic and social and agriculture policies. He also led the UK team working through the EU on preparations for, negotiations towards and follow-up to the agreement on the Sustainable Development Goals at the United Nations General Assembly in September 2015.
Mr Lloyd's background is with the UK Cabinet Office (Prime Minister's Office), having served as a senior policy adviser for transport, energy and low carbon technologies for the Blair, Brown and Cameron administrations, and also provided support to the prime minister for various intergovernmental negotiations, including all meetings of the European Council between 2008 and 2010.

INNOVATION IN AVIATION

> Artificial intelligence and air traffic management

> Boosting the use of sustainable aviation fuels

> Italian activities in aerospace

> Self-sovereign identity: giving control back to passengers

> Innovation in aviation security: improving the passenger experience

> Airport applications for RPAS

> Present and future challenges of anti-RPAS systems

> Smart regulation to support aviation innovation

> Innovation in European aeronautics in the context of a digitalised world

What artificial intelligence can bring to air traffic management

Florian Guillermet
Executive Director, SESAR Joint Undertaking

It is no surprise that artificial intelligence, or AI, is entering progressively into everyday parlance in air traffic management. The availability of data and advanced algorithms, not to mention the leap forward in computing power, means that AI now has something real and smart to offer our industry, writes Florian Guillermet, Executive Director of the SESAR Joint Undertaking.

Artificial intelligence (AI) has been around for more than 60 years but has gained ground more recently, thanks to advances in computing and access to data. Machine learning and deep learning – subsets of AI – are today helping to create applications that can learn autonomously and advise complex problems. Aviation is no stranger to the virtues of AI. The industry is taking a keen interest in, and turning to, AI to develop, among other things, intelligent maintenance, engineering and prognostics tools, as well as applications to streamline business processes, supply chains and customer services. This is not about being cool, but rather about recognising how these technologies can improve operations and bring business benefits, while enhancing safety.

The potential of AI for ATM has not gone unnoticed by SESAR. Automation is already a core focus of SESAR research and development, particularly with regard to the automation of repetitive tasks by controllers. Providing more support to these tasks will enable pilots and air traffic controllers to focus on safety-critical tasks. Automation is also proving invaluable for ensuring the seamless exchange of information and improved collaboration between all actors, including on the airborne side.

More recently, we have built up a portfolio of projects with specific AI components often using machine learning to process big data. These applications have been put to the test to better understand and address the underlying patterns of traffic.

Here are just a few examples of some of the complex problems where AI can lend support, addressing all phases of flight, from strategic and pre-tactical planning to tactical operations themselves.

▶ Improving strategic planning

Take the performance of the system. More often than not, trade-offs have to be made between key performance areas (KPA), but also between stakeholders as well as between short-term and long-term objectives. This is a complex job since trade-offs are riddled with interdependencies between policies and regulations, stakeholders, technologies and market conditions.

The SESAR INTUIT (interactive toolset for understanding trade-offs in ATM performance) project explored the potential of visual analytics and machine-learning techniques to improve our understanding of the trade-offs between KPAs (safety, environment, capacity, efficiency) and to identify cause-effect relationships between indicators. The project trained a machine-learning model in order

> › **Artificial intelligence** (AI) is a branch of computer science that aims to create intelligent machines. It has become an essential part of the technology industry. AI can be narrow, handling just one particular task, or strong, meaning a machine with the ability to apply intelligence to any problem.
>
> › **Machine learning** is a core part of AI. It uses data to train algorithms and give computer systems the ability to "learn" (i.e. progressively improve performance on a specific task) with data, without being explicitly programmed.
>
> › **Deep learning** is the most advanced type of machine learning. In recent years, the availability of large amounts of data ("big data") and the leap forward in computing power have paved the way towards unprecedented levels of performance, allowing for new levels of automation.

to assess performance for a certain piece of en-route airspace. The model was able to detect patterns that were not previously known on specific traffic flows and that, up until now, had not been taken into account when establishing key performance indicators. Another focus of the project was on identifying airlines' decision criteria using machine learning. These criteria can also be used to predict route choices in case of changes to route charges. The results of the project enable enhanced ATM performance-monitoring capabilities by helping detect and analyse low-performing routes in the European network.

Enhancing pre-tactical trajectory prediction

While the INTUIT project predicted which routes airlines would take before the flight plan was filed, the COPTRA (Combining Probable Trajectories) project focused on predicting the trajectory closer to the time of take-off or during the flight. COPTRA built probabilistic models to predict the occupancy and demands of the European airspace and airports, taking into account the uncertainty in planned flight trajectories to support improved demand-capacity balancing.

Machine learning was used to estimate the intended cruise speed of an aircraft when it is still climbing. This information about the trajectory was fed into a model previously trained with recorded trajectories. Based on the predicted trajectories, congestion indicators were calculated to support decision making.

Meanwhile, DART (data-driven aircraft trajectory prediction research) explored the applicability of a collection of data mining, machine learning and agent-based models and algorithms to derive a data-driven trajectory prediction capability. These algorithms are expected to provide increased levels of accuracy while considering ATM network effects in the prediction process.

Better understanding passenger behaviour

Big data is becoming a big deal for airports, as it is used increasingly to better analyse market demand, optimise security control and customise the passenger experience. The use of big data analytics is now being put to work to better understand how passenger behaviour can impact air traffic management. Research in these areas has so far been constrained by the limited availability of behavioural data, typically obtained from static demographic and economic datasets, often consisting of very small samples, and usually complemented with assumptions about behaviour.

Thanks to the growth of smart devices and interconnected services, researchers now have large-scale, detailed longitudinal (dynamic) data allowing them to test hypotheses about passenger behaviour. Partners from the BigData4ATM project investigated how different passenger-centric geolocated data can be analysed while respecting personal data and privacy, and combined with more traditional demographic, economic and air transport data to identify patterns in passenger behaviour, door-to-door travel times and choices of travel mode. Machine-learning methods were used to support the analysis of the data sources. The project is also exploring application of this data and how it could be used to inform several of the ATM decision-making processes.

Machine learning has also been applied in SESAR in a live trial to improve passenger flight connections at Heathrow. The live trial demonstrated that such techniques can provide accurate forecasts (together with prediction intervals), which can help the airport operations centre better understand the key factors that influence passengers' connection time as well as help improve passenger services in real time. In addition, better prediction of passengers' transfer activities can also improve the

accuracy and stability of the target-off-block-time, which is critical for optimised air traffic flow management in Europe.

More broadly, we are seeking to enhance airport performance predictions using big data analytics as part of our work on total airport management, which connects airside and landside processes with the flight turnaround processes. The aim is to enable optimised decision making for the benefit of passengers and goods, and improved ready times provided to the network for more predictable operations.

Increasing the operational efficiency of air traffic control

Nowadays, air traffic control instructions are most of the time still given via very high frequency (VHF) voice communication to the pilots. But systems, to be safe and efficient, need up-to-date data. That means controllers making a lot of manual inputs to keep the system data correct. This is where automatic speech recognition can offer a viable alternative, converting speech into text for input into the system.

Currently, modern models of speech recognition require manual adaptation to local environments. The MALORCA project (Machine Learning of Speech Recognition Models for Controller Assistance) designed a low-cost solution that adapts the speech recognition tools for use at other airports. The solution minimises local adaptation costs by automatically learning local speech patterns and controllers' models from the local airspace configuration, radar and speech data recordings, which are then automatically encoded into the recognition software.

Refining time and wake separation

When there are strong head-winds, aircraft ground speed is reduced on final approach. This results in a reduced landing rate, causing delays and even flight cancellations. SESAR's time-based separation aims at reducing the gap in landing rates in headwind conditions. Already deployed at Heathrow with further plans for wider deployment across Europe, the solution is helping to maintain airport regularity at the same level in all wind conditions.

The solution is currently further enhanced by machine-learning algorithms that refine wake separation minima in the departure and arrival phases. This is done by combining downlinked parameters from the aircraft with high-quality short-term atmospheric prediction of wake propagation to improve the accuracy of the predicted wake compression during the final approach. This in turn improves the accuracy of the time-based separation markers that advise the approach and airport controllers.

What about safety?

In the future, Europe's skies will be extremely busy and complex. As the number of air vehicles increases along with their levels of automation, so will the need to further automate the system, while keeping the human in the loop. In this respect, narrow AI can offer the means to develop smart solutions for managing air traffic.

For instance, sophisticated real-time decision support tools can be developed by combining machine-learning algorithms with data forecast models that capture traffic volume, airport runway direction and weather conditions. These tools can help the system with the specifics of a particular disruption or predict the likelihood of potential safety events – such as aircraft level busts, or geographical and airspace infringements. Machine learning could also be used to model controller behaviour and potentially assist controllers by proposing enhanced vertical and lateral trajectory clearances for direct up-link to the aircraft.

However, ATM remains a safety-critical industry and the introduction of such technologies must undergo rigorous research and impact assessments to ensure they can meet with the high safety and security requirements of aviation.

On the horizon

Much of what is described here is within SESAR's exploratory research programme. Our job now is to mature these concepts and bring them to the next phase of industrial research. At the same time, we will also look beyond narrow AI concepts and applications, exploring among other things joint human-machine cognitive systems, in the next wave of exploratory research projects. These projects will also address a wider application of AI at airports as well as for network operations, such as automated slot allocation provision, traffic and trajectory provision, automated apron and ground control. At the same time, we will investigate how to generalise results from tests of machine-learning-based processes and procedures to ensure their application in all situations and to allow for their certification. ∎

Exploring the boundaries of air traffic management
A summary of SESAR exploratory research results 2016–2018

> By advancing promising research ideas and embedding them in a broader programme of work, **the SESAR JU is helping to future-proof Europe's aviation industry and to maintain its global competitive edge.** This publication captures the results from some 28 completed exploratory projects. Taking place between 2016 and 2018, the selected projects have brought together 80 academic and industry partners from across the EU and beyond. **www.sesarju.eu**

Florian Guillermet was appointed as Executive Director in April 2014. He is responsible for leading the SESAR JU public private partnership, which is modernising Europe's air traffic management system. Mr Guillermet has worked in the civil aviation field for 20 years. He is an engineer and graduate of the *École polytechnique* and Civil Aviation Engineering School in France. He holds a master's degree in aeronautics and airport management.

Coordinated regulator-industry efforts to boost sustainable aviation fuels: a balanced approach

Raúl Medina Caballero
Director General of Civil Aviation, Spain

Aviation growth brings enormous economic and social benefits to Europe and the global community, and travelling helps promote friendship among countries and people around the world. This reinforces the importance of taking stronger action to mitigate aviation's climate impact and allow future generations to continue enjoying our planet as we know it today.

Aviation will continue to rely on liquid fuels for decades and its decarbonisation should become a common European priority. The establishment of the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as the first global carbon market mechanism established for any industry sector has been a key milestone towards achieving ICAO's objective of international aviation carbon-neutral growth after 2020. But CORSIA was approved as a "gap filler" until other reduction measures are developed, so the next priority should be to look at sustainable aviation fuels as the main means of achieving the European and global climate objectives for the aviation sector.

This is the last pillar of the ICAO "basket of measures" that is still pending becoming a reality.

ICAO and sustainable aviation fuels

Since 2009, the International Civil Aviation Organization (ICAO) has encouraged Member States to establish public policies for the use of sustainable aviation fuels (SAF), as part of the *basket of measures* to achieve the global air transport industry's climate change goals.

The 39th ICAO Assembly recognised the introduction of SAF as one of the key measures to achieve ICAO's climate goals and the carbon-neutral growth aspiration set in ICAO Assembly Resolution A39-2, and recognised that it may also bring economic, social, and environmental advantages. The Assembly also required to consider the necessary policies to ensure an increasing percentage of emissions reductions accruing from non-market-based measures (MBM) over time.

At its second Conference on Aviation and Alternative Fuels (CAAF/2, Mexico, 2017), ICAO endorsed the 2050 ICAO Vision for Sustainable Aviation Fuels and called on States, industry and other stakeholders to substitute a significant proportion of conventional aviation fuels with SAF by 2050 and to promote policies to ensure the competitiveness of SAF.

Nevertheless, despite substantial achievements in SAF's technical feasibility and readiness, its production price is still not competitive with fossil aviation fuel and existing policies have not been sufficient to enable its commercial availability and industrial deployment on a large commercial scale. Today, only one SAF-dedicated refinery exists worldwide with a sustained commercial production.

The European context

A few months after the first ICAO Conference on Aviation and Alternative Fuels (CAAF/1, 2009), Spain hosted in 2010 the first meeting between a number of European civil aviation authorities and other interested stakeholders to discuss how to follow ICAO recommendations and promote SAF in Europe.

Further developments led to the launch of the European Advanced Biofuels Flightpath in 2011 as a partnership between the European Commission and major European stakeholders, with the objective of achieving 2 million tons of SAF production in Europe by 2020. This objective looks far from being achieved and although there is potential SAF production capacity in Europe [1], it is currently dedicated to supplying the road biofuels demand, highly incentivised by European and national regulations.

Without a more ambitious policy effort, this situation in Europe is not expected to significantly change in the coming years. The revised EU RED II (post 2020 EU Renewable Energy Directive) and the current drafting of related national implementation plans bring Member States a great opportunity to establish regulatory frameworks and incentives to promote SAF production and supply in Europe.

---

(1) European Aviation Environmental Report 2019. Page 43.

Coordinated regulator-industry efforts to boost sustainable aviation fuels: a balanced approach

Photo courtesy of Iberia L.A.E. S.A. Toulouse-Madrid delivery flight of the first A350-900, made with a blend of biofuels

On the other hand, some European States are proposing to introduce new environmental taxes on the aviation sector activity and there is increasing pressure from civil society for the sector to internalise and compensate its environmental externalities.

While environmental taxes might reduce the air transport demand, it is less clear how such measure would effectively contribute to its decarbonisation, as the use of SAF would definitely do.

The need for global cooperation and dedicated SAF policies by States

The ICAO Assembly has asked States to set coordinated approaches in their national administrations for policy actions and investment to accelerate the appropriate development, deployment and use of SAF, according to their national circumstances.

Through CAAF/2, ICAO also encouraged States to support the development of stable policy frameworks that facilitate the deployment of SAF while avoiding competitive distortions, and to strive to establish a level playing field between aviation and other transportation sectors. The existing incentives for the road transport market and the lack of similar frameworks for SAF make it very difficult for potential producers, considering the investments required to set up a commercial-scale production.

Industry and governments will therefore need to collaborate to ensure that convenient supporting policies are put in place, and to support the creation of a stable business case for the research, production and distribution of SAF.

A coordinated regulator-industry effort: *the balanced compromise*

During the 11th meeting of the ICAO Committee on Aviation and Environmental Protection held in February 2019 (CAEP/11), France and Spain presented a joint paper proposing the concept of a balanced compromise between regulators and industry as a means to establish national SAF supply objectives through a dialogue with the industry, versus the "mandate" concept, which has traditionally been rejected by the aviation sector as a preferred policy option.

The introduction of SAF needs to match supply with demand. Without ensuring demand, producers will not invest to generate supply capacity.

It should be up to each State to decide which policy options, or combination of those, better fits its national circumstances. But a key element of the balanced compromise concept is that fair competitiveness shall be ensured and market distortions avoided in any policy implementation.

Establishment of national SAF supply objectives

Acknowledging that there are different policy options to incentivise SAF production, such as capital grants, fiscal incentives, loan warrantees, etc., it should be highlighted that the currently few worldwide SAF industry large-scale production investments and supply are only happening as a response to markets created by a regulatory obligation on the suppliers either in terms of carbon reduction (such as the California Low Carbon Transport Fuel regulation) or in terms of SAF percentage supply (such as the new Norway SAF mandate, which entered into force this year).

While the establishment of national SAF regulatory supply objectives might imply an initial increase in the fuel cost to be borne by the airlines and/or reflected on the ticket price, it might be worth the industry promoting the deployment of SAF and assuming such effort as a balanced compromise and a more effective alternative to assuming environmental taxes, which would bring neither environmental nor industrial benefits for them in the future. As the SAF production volume increases, the economic difference compared to conventional aviation fuel will progressively diminish.

In this context, Spain initiated a dialogue with key national stakeholders from the airline and fuel production industries to establish a regulatory supply of SAF in 2025 under implementation of EU RED II. The regulatory obligation would fall on the suppliers as a blending percentage to be determined after a feasibility study carried out in close cooperation with the national stakeholders to ensure that the measure does not harm the competitiveness of the air transport sector, and to avoid any market distortions.

It is clear that creating the market through an initial small percentage supply objective (around 2%) would serve as a booster to improve technologies and lower prices to make them competitive with conventional jet fuel.

Without the assessment and establishment of national supply objectives (both aspirational or mandatory) it might be difficult to set up a global coordinated flight-path to achieve the 2050 ICAO vision of substituting a significant proportion of conventional aviation fuels for SAF by 2050.

▶ Time for stronger European coordination

Some European States such as Finland, France, Netherlands, Norway, Spain, Sweden and the United Kingdom have announced different national short-term regulations or incentives to promote SAF.

Nevertheless, almost ten years after the first meeting between some civil aviation authorities to coordinate ways to promote SAF in Europe, there still does not exist today a dedicated policy discussion forum through which different regulatory agencies from ECAC States and industry stakeholders could exchange views and coordinate national programmes and necessary interactions with supranational institutions (such as the EU or ICAO).

The United States Commercial Aviation and Alternative Fuels Initiative (CAAFI), which many of our European States and stakeholders participate in, could be a good reference of successful coordination to be promoted in Europe.

The European Civil Aviation Conference along with other key agents such as EASA and the European Commission could, in my opinion, play a very important role in facilitating European coordination and a more effective promotion of sustainable aviation fuels, as was agreed at the ICAO Assembly, in order to achieve our common European and ICAO climate change goals.

Spain reiterates its commitment to play a leading role in this effort and invites all other ECAC partner States to take stronger action towards the promotion of SAF through a balanced compromise with the industry and in a European-coordinated manner. ■

Raúl Medina Caballero was appointed Director General for Civil Aviation of Spain in 2015, after serving as Deputy Director General since 2010. He is a member of the ECAC Coordinating Committee and ECAC Focal Point for Remotely Piloted Aircraft Systems, and the current president of EUROCONTROL's Provisional Council. Mr Medina Caballero began his career in the Siemens Group where he worked as a systems engineer. He then joined the Ministry of Transport where he held several positions, all of them in the regulatory and supervisory fields of the air transport sector. He holds master's degrees in aeronautical engineering (MS) from the Polytechnic University of Madrid and in public administration (MPA) from the Columbia University of New York, where he studied as a Fulbright Scholar. Mr Medina Caballero is a civil servant of the Corps of Aeronautical Engineers.

The Italian activities in aerospace: addressing the challenges arising from innovation in aviation

Alessio Quaranta
Director General of Civil Aviation, Italy

Emerging technologies without doubt represent a major challenge for all organisations dealing with the development of common technical standards and legal frameworks in all areas of civil aviation regulation: safety, security, environment, liability, insurance and privacy.

Among one of the main issues governments currently face is the big challenge posed by aerospace: flying in the atmosphere and surrounding space.

This could mean the possibility of connecting, for example, the west coast of the United States (Los Angeles or San Francisco) with Europe in about one hour and forty minutes based on a system of sub-orbital space flights that will completely reform the air transport of people and goods over the next few years.

While the international Standards and Recommended Practices (SARPs) for Remotely Piloted Aircraft Systems (RPAS) are reaching their deliverable stage, the International Civil Aviation Organization (ICAO) is also undertaking work to facilitate the operation of other Unmanned Aircraft Systems (UAS) in accordance with an internation-ally harmonised legal and technical framework.

In this regard, the revision and update of technical rules is necessary but not enough, since un-manned civil aviation operations require a comprehensive review of international conventions, typically designed for manned aircraft, in order to verify whether specific rules are still applicable to UAS or if they need to be cancelled, revised or integrated.

ENAC therefore considered it was necessary to become progressively involved in the aerospace sector.

In 2014 Italy was the first country to sign a Memorandum of Cooperation with the United States'

Federal Aviation Administration (FAA) to develop the legislation that will be applicable to sub-orbital space flights.

In 2016, that MoU was renewed and extended to the Italian Space Agency (ASI).

Moreover, a cooperation agreement has been signed between ENAC and the Italian Air Force (ITAF) to develop testing activities for commercial sub-orbital flights within the Italian national air space.

In July 2016, ENAC issued the first edition of a regulatory policy for Prospective Commercial Space Transportation Certification and Operations in Italy. In 2017, under the auspices of the Italian Ministry of Infrastructures and Transport, it

Seventh World Civil Aviation Chief Executives Forum in Singapore, April 2019.

© Sikov - AdobeStock

set up a dedicated Commercial Sub-orbital Transportation Task Force (CSTTF) together with ASI, ITAF and the main national institutional and industrial stakeholders, to develop the regulatory framework for commercial space transportation as well as a performance-based regulation for spaceport and operations.

On 12 and 13 February 2019, ENAC participated in the Commercial Space Transportation Conference organised each year by the FAA in Washington. ENAC was invited to speak, together with the Japanese Space Agency (JAXA), on the export of technology related to sub-orbital flight operations and the safety of people on board.

The conference underlined the need for a cooperative approach to the regulatory framework being developed.

The same element of cooperation on new technology issues emerged as being fundamental at the 7th World Civil Aviation Chief Executives Forum that ENAC attended in Singapore on 8-10 April 2019. The Forum brought together international civil aviation leaders and the major global stakeholders, representing both governments and the aeronautical industry, to discuss the main issues related to air transport growth and security.

Discussions focused on Building One Aviation Future by Leveraging Technology on the basis of global collaboration, which can allow all ICAO States and regions to advance together in the future development of international civil aviation.

Issues highlighted included the benefits offered by artificial intelligence to stimulate the decision-making process, and how techno-logical innovation can create new business models, improve market accessibility and help harmonise the air transport safety and security standards, especially in the light of the recent accidents involving Boeing 737 Max aircraft.

Innovation in aviation is certainly a work in progress. It is not only a technical area but also an area requiring collaboration and implementation of rules, where legislation is running after innovation. Cooperation and flexible tools will be needed to avoid continuously creating rules to keep up with the evolving technologies. ∎

Alessio Quaranta has been Director General of the Italian Civil Aviation Authority (ENAC) since 30 April 2009. He was confirmed in his duty as ENAC Director General on 1 July 2014 for a further five-year term. A law graduate, Mr Quaranta has a postgraduate degree in public administration and has attended several further training courses on legal matters. Before being appointed as Director General, he held a number of executive positions in ENAC, including: responsible for corruption prevention (2013/2014); director of economic regulation (2008/2010); director of the president's bureau (2005/2008); director of human resources (2004/2005); head of international relations (2001/2005); legal and economic advisor to the president (2001/2003). He currently holds the following positions in the main international aviation organisations: ECAC Vice President; ECAC Focal Point for Facilitation and Security; President of EATEO (European Association of Aviation Training and Education Organisations); President of JAA TO (Joint Aviation Authorities - Training Organisation); President of EASTI (European Aviation Security Training Institute); member of the EUROCONTROL Provisional Council Coordinating Committee and alternate member of the Italian Minister of Infrastructures and Transports in the Permanent Commission of the Agency; member of the management board of EASA (European Aviation Safety Agency); head of the Italian delegation at various sessions of the ICAO Assembly, high-level meetings and international negotiations. He is a member of the Scientific Committee of a number of journals, author of articles and publications, president of the Internal Evaluation Unit of the University of Naples "Suor Orsola Benincasa" and has been a speaker at several conferences on national and international air transport issues.

Self-sovereign identity – giving control back to passengers

Garry Kelly
Lead Developer, SITA Lab

We are now in a world where no one wants to hold personally identifying information if they don't have to. The General Data Protection Regulation (GDRP) has granted explicit rights to individuals whose data is held by organisations. Most importantly, it has also specified penalties for organisations not upholding these rights and brought a keen focus on what personal data is collected, stored and used.

But the air transport industry requires personally identifying information to operate. There are many different touchpoints on the passenger's journey. Often these touchpoints are controlled by different organisations. For example, airlines must collect passport data on behalf of governments in advance of passengers crossing borders, while organisations working at airports must ensure their employees and contractors have the appropriate security clearance. This involves collecting personal data. With the numbers of people employed at airports, this is a constant challenge, particularly as many are on short-term contracts.

With rising passenger numbers globally, the industry requires seamless travel to increase capacity of existing airports. The alternative – construction of new terminals and runways – is very expensive or impossible in some cases. Passengers, used to frictionless online e-commerce, want a better travel experience and are willing to provide more data in return. For this, the air transport industry needs a proven, robust, open, consistent method for passengers to provide trusted personally identifying information in advance online. Trusted, verifiable data provided in advance reduces work at the airport on the day of travel.

Gustavo Pina, Head of SITA Lab, said: *"There has always been a need for people to assert their identities and today that is lacking online. In the ideal world, individuals would hold all their identity data digitally themselves, which they could assert to various entities. In travel, that could be at every step of the journey, from booking, travelling through the airport, crossing borders and checking in to hotels."*

Currently, federated identity is the dominant online identification model. This is where the big tech companies provide a 'free' identification layer, allowing people to identify themselves using their user profile from the tech company. Examples include Facebook, Google, etc. However, by providing this layer, these companies learn more about the individual enabling them to sell targeted advertising or to further other business goals. The regulatory and risk models for international travel are very different to online social or commercial activity.

▶ Is self-sovereign identity the answer?

Self-sovereign identity (SSI) has emerged as an alternative solution to the digital identity challenge. With self-sovereign identity, the person has sole ownership of their data and chooses with whom to share data and what data they want to share. For example, a per-

GENERAL DATA PROTECTION REGULATION

Sovrin Blockchain
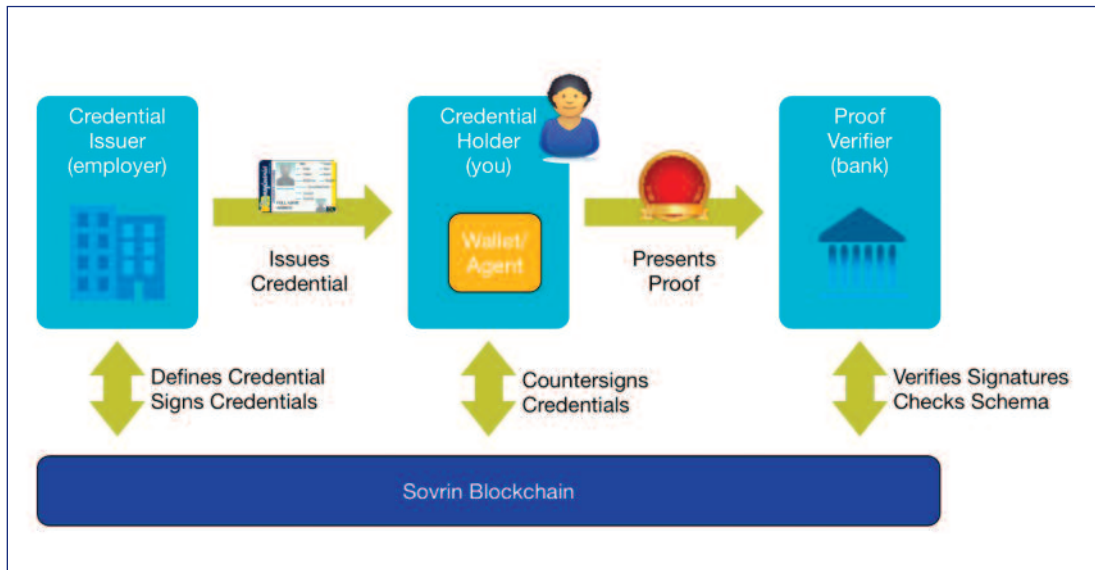
son may be willing to share some employment information with a border agency but probably not their salary details.

Sovrin (https://sovrin.org) is the most widely recognised, vendor-agnostic international non-profit for advancement of self-sovereign identity. SITA is a member of the Sovrin Alliance and a founding steward of the Sovrin Network. We have developed a Sovrin proof of concept for international air travel and are exploring how Sovrin could be applied to the air transport industry.

Overview of Sovrin verifiable credentials

Sovrin verifiable credentials are based on Worldwide Web Consortium (W3C) verifiable claims standards. Identity owners are issued with credentials and store them in their digital wallet. When an identity owner needs to assert something, they present proofs based on their credentials. The person or organisation receiving the credentials can verify the information presented.

In the Sovrin example above, you are the identity owner and want to apply for a bank loan. In order to qualify for the loan, the bank needs to confirm that you are

in full-time employment with a certain minimum salary. Your employer issues a credential to you confirming your current employment status and salary. This is your information; it has been signed by them and issued to you. To meet the bank's requirement, you can present a signed verifiable credential from your employer with just the data needed, without revealing the actual salary or other information in the credential.

It works as follows: the credential issued by your employer includes a reference to their well-known decentralised identifier on the Sovrin ledger. The credential that you present to the bank is countersigned by you and references the decentralised identifier you have used to connect with the bank.

Sovrin is built on the principles of privacy by design. There is no record of the credential on the Sovrin ledger. There is just enough information on the ledger to cryptographically verify the presented credentials. In addition, people use different identifiers when connecting to others on the network, preventing identification by correlation. Sovrin also supports zero knowledge proofs. This means that in some cases it is not necessary to transfer the actual data.

Self-sovereign identity in the air transport industry

The bank example is like what happens in air travel today. Consider how you use your passport. A government issues the passport to you. You keep the passport in a safe place and present it when necessary to prove identity to a verifier – this could be an airline employee, a security agent or indeed a kiosk or some other machine that can read passports. The verifier, human or machine, inspects the passport, they can see who issued it, they can verify it without contacting the government who issued it. Once they are happy it is genuine, they can trust the data, compare the person presenting the passport and make their decision.

This pattern is repeated at different touchpoints of the journey and across the global air transport industry. An airline issues a boarding pass, which the passenger presents at security or boarding. Visas are issued by governments. Sometimes a passenger requires a visa or even a letter of invitation from a business in a country to support a visa application. Airport staff are issued with photo ID cards, confirming their identity and access rights. Clearly, current processes used during travel are very similar to self-sovereign identity.

Standards and trust frameworks

Digital identity information, provided in advance of the day of travel, results in a more efficient airport and a better travel experience, if the information is sufficiently trusted to be actionable. Trust requires more information. Who issued the credential? How do I know the issuer is a genuine government/airline/airport/business? What process or standard does the credential comply with? What exactly is this credential certifying? Is this meeting my legal and regulatory requirements?

Addressing these concerns requires both interoperable standards for credentials and an agreed trust framework. Sovrin provides the supporting infrastructure and technology for verifiable credentials; it does not impose standards for different industries. A domain-specific trust framework could be created which works on top of Sovrin and contains the technology, business processes and legal agreements necessary for trust. An air travel trust framework could specify credential schemas, standards for issuing, registries of accredited organisations issuing such credentials and suggested operating models. This is like today, where boarding passes, passports, etc. are standardised and supported by a regulatory framework.

The future

For the foreseeable future, passengers will probably still carry physical identity documents such as passports and boarding passes. It is reassuring to have paper documents. But with self-sovereign identity, passengers can be issued with digital equivalents in the form of verifiable credentials, reducing the need to present physical docu-mentation at every touchpoint. The passenger benefits in several ways. They will have a better travel experience and enjoy more certainty in advance of travel while controlling their personal information. The potential benefits to the industry include: better data privacy, reduced costs in storing and processing personal data, more effective security and reduced industry liability by allowing passengers to provide more complete, certified and trusted data in advance of travel.

There is no doubt, we are approaching a turning point in our use of data and identities in air transport. Self-sovereign identity may well make travel easier than ever, giving control back to passengers. ■

Garry Kelly is a senior solution architect at SITA Lab, SITA's technology research arm. SITA Lab is focused on strategic research on behalf of SITA's 450+ air transport industry members, co-innovating with key industry stakeholders to create solutions to industry challenges using emerging technologies. Currently, Mr Kelly leads the blockchain and biometrics programmes, which he led in the development of the first integrated passenger boarding solution with the US Exit Biometrics programme.
During his 30 years in travel technology, he has led the development of solutions for airlines and airports in many different areas, including online and mobile reservations and check-in, airport passenger processing and baggage reconciliation systems. Mr Kelly graduated in 1988 from Dublin City University with an engineering degree and has held previous positions in Westinghouse and Datalex.

Technology for aviation security: innovation to improve the passenger experience

Alan Xavier Tan

Vice President, Aerodrome Safety & Aviation Security,
Changi Airport Group

The article aims to reflect on the current state of aviation security and to tease new thinking on how we could conduct aviation security differently in the future. Take this as an ideation reading – "dream big, think big, act wisely". As the topic of aviation security is far too wide to be covered in one article, the discussion that follows will centre on passenger screening.

With the series of successful attacks on the aviation system and uncovered plots that aim to disrupt aviation, the International Civil Aviation Organization (ICAO) had revised the Risk Context Statement several times to elevate the risk level for some specific types of threats. Coupled with rapid aviation growth, the sustainability of aviation security is crucial. There is great impetus to make smarter use of technology to create capacity, raise efficiency and even possibly design different concepts of operations for the future.

▶ Airport security for passenger screening – the single layer of defence

The current operating concept has inevitably made the security checkpoint the single layer of defence for the passenger journey. As a result, it is infamous for long queues, inconveniences and being intrusive. Why has the checkpoint become this huge bottleneck? With evolving threats and new modus operandi to conceal threat items, many screening processes and technologies have been added to the checkpoints in the last ten years, such as explosive trace detectors (ETDs), advanced imaging technology (a.k.a body scanners), bottle liquid screeners (BLS) and many other random checks. These add-ons are necessary for airport security but place more demand for airport real estates, increase the cost of operations and manpower requirements and negatively impact passenger facilitation.

To ease the checkpoint congestion, there were attempts to develop a newer concept of operations, such as the Next Generation Checkpoint (the famous three tunnels at one point in time) to allow passenger differentiation and to screen them differently. Such concept continues to thrive on the principle of risk-based security. However, not all concepts can be immediately realised and mammoth efforts to coordinate across different state agencies and industry players would be needed. The Smart Security programme evolved from the Next Generation Checkpoint with huge successes as technology development and concepts such as centralised image processing and CT X-ray were operationalised in stages of tests and implementation, which led to higher screening capacity and less need to divest items for screening. What more can we do to improve passenger screening?

▶ Framing the passenger screening problem statements

By framing the security problem statements, we could consider better use of technology or even allow other technology developers to work on solutions to serve the aviation sector better.

› PROBLEM STATEMENT 1
How to achieve better detection and lower false alarms?
This is the core problem statement for all security screening, which will not change over time. However, can we review the level of detection needed if we improve the risk-based security system?

› PROBLEM STATEMENT 2
How to increase screening capacity and efficiency?
If problem statement 1 is achieved, it could address some parts of statement 2, as re-check and false rejects would be reduced.

› PROBLEM STATEMENT 3
How can we turn more people into "whitelist" and look out for people in the "blacklist"?
By adopting a risk-based security concept, more people can be in the "whitelist", which reduces the need to put in additional measures at the checkpoint.

> PROBLEM STATEMENT 4
How can we develop continuous security that is dynamic and able to react to an evolving threat environment?
The current concept of operations will not address this problem statement. Are there better ways?

▶ Technology to the rescue

Technology is not the solution but how we use technology is the winning formula. How should we steer technology developments towards a more holistic solution to meet aviation security needs? Based on the above four problem statements, we could consider these two strategies (that most people already know):

a) **Strategy 1 – Continue the search for better detection capabilities**
Continue to look out for and explore technologies that will improve checkpoint efficiency and effectiveness (better detection and lower false alarms). Until we find a more effective concept of operations that can change how security is conducted for passenger screening, we need to continue this search for better technology solutions (addressing problem statements 1 and 2).

b) **Strategy 2 – Think outside the box**
Explore and use technology to design a different operating concept for aviation security (addressing problem statements 3 and 4). There will be many considerations in such a new concept development, thus the process of ideation must continue if the problem statements hold true.

(1) Extracted from InnerEye website (https://www.innereye.ai/)

▶ Strategy 1
Continue to search for better detection capabilities

Security screening equipment development is ongoing and the recent introduction of the advanced cabin baggage screening system a.k.a. CT x-ray is a huge milestone for aviation security. More machines of similar capabilities will be introduced as detection algorithm continues to improve.

HOW CAN WE INCREASE EFFICIENCY AND EFFECTIVENESS AT THE SCREENING CHECKPOINT?
The potential of artificial intelligence (AI) in screening could be the next big thing. Can AI perform faster and better to meet the need of image analysis and classification that is currently performed by security screeners? Do note that image classification is fundamentally different to threat detection algorithm, which is an analytical tool to aid the screeners. In the search for AI technologies for image classification, a product called InnerEye (https://www.innereye.ai/) was introduced by ICTS Europe at Passenger Terminal Expo 2017 and 2018 in collaboration with Inner-Eye, and this product was also shared at the ICAO High-Level Security Conference 2017.

AI for image classification is a deep-learning model that requires massive training sets of labelled images. In short, for AI to work, the human must first label those images with threat and non-threat items. Deep-learning models will also demand that the data set be continually updated for accuracy and to address new targets. There is great potential to AI but it will take years before it could be fully deployed.
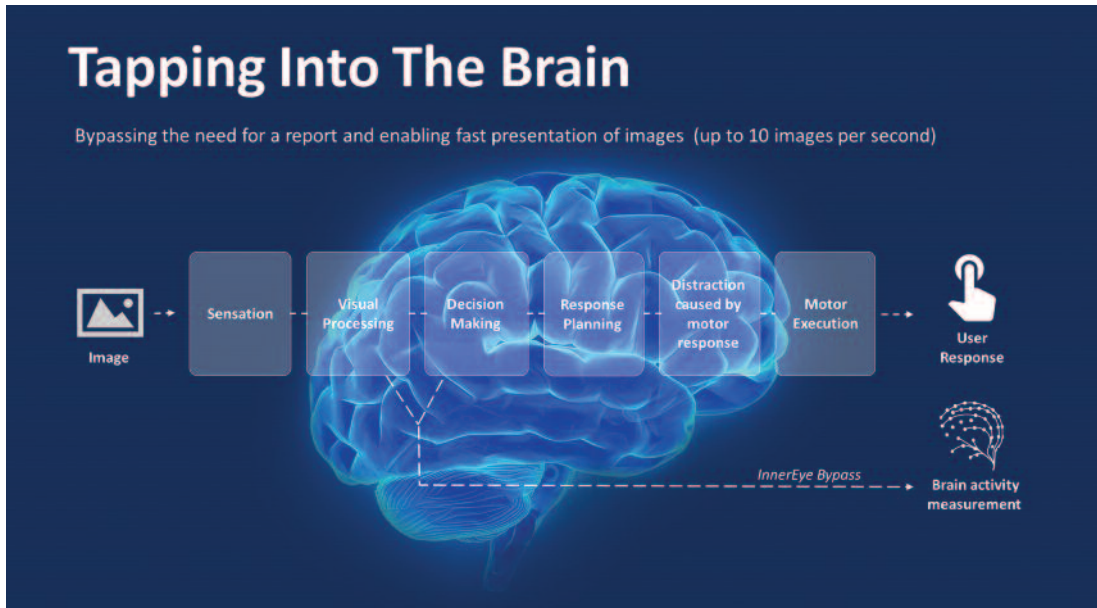

> "Without humans, artificial intelligence is still pretty stupid…"
>
> Wall Street Journal, 12 Nov. 2017

InnerEye's innovative solution combines human and artificial intelligence in one hybrid platform, allowing real-time human-machine interface for fast and accurate visual recognition tasks. InnerEye technology bypasses the need to record overt responses from the user (like button presses or speaking), reading the visual recognition signals directly from the user's brain and combining it, together with the visual data, into a unified artificial intelligence system. This combination overcomes a bottleneck of human performance, as well as capitalises on the merging of human neural processing and deep artificial neural networks [1]. What this simply means is that the same operator can now process more images faster in a networked setting. At their trial, human experts can process up to three images per second.

© phonlamaiphoto - AdobeStock

Tapping Into The Brain

Bypassing the need for a report and enabling fast presentation of images (up to 10 images per second)

Extracted from InnerEye's presentation

While it is good to process each image faster, the detection accuracy needs to be high. From operational and training experience, we know that every screener has different capabilities and there are blind spots in their analytical capabilities. A proof of concept (POC) was set up between Changi Airport Group, InnerEye and ICTS Europe to establish if image analysis could be faster and more accurate if we could present the same image to a few operators at the same time who have different capabilities. The combined analytical abilities will give better detection and at the rate the brain processed the image, efficiency could still be achieved. Indeed, the results from the POC were promising and Changi is working with ICTS Europe and InnerEye to refine this technology with a view to deploying it in time.

▶ Strategy 2
Think outside the box

Problem statements 3 and 4 require a rethink of how we conduct passenger screening and a relook at some fundamental principles and assumptions. First, are all passengers a threat to aviation? The answer is "no" as the majority of passengers are bona fide travellers. A threat is defined by its intent and capability and thus far security measures have focused on detecting the "capability" (threat items carried by the passenger) at the checkpoint. It is very hard to detect intent at the screening checkpoint due to the high passenger numbers and the time available to make such assessment.

HOW CAN WE BUILD A "WHITELIST" OF PASSENGERS?

If we do not want to treat every passenger the same, we need some ways to differentiate them. Security vetting of passenger information has been used to effect border clearance, and passenger enrolment programmes such TSA's pre-check are available to differentiate passengers for screening – but cover only a small portion of travellers. For these groups of trusted travellers, a reduced security check is applied. There are practical considerations to using passenger data due to privacy challenges and the huge amount of resources needed for the administration of enrolment programmes.

Fast forwarding into the future, how can technology help to build a case on an individual's propensity to commit a nefarious act (how to detect intent?)? Can behavioural science and analysis be used to assess an individual's intent? Technology for facial detection, mood detection, extreme motion detection and body temperature detection are tools which could be combined to provide an assessment of an individual's propensity to commit a nefarious act. If trigger points to
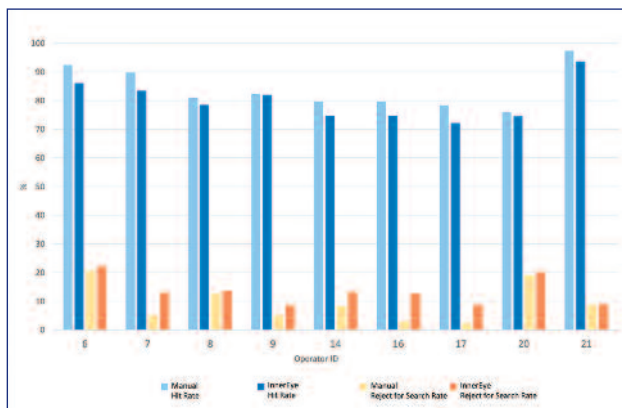
PROMISING RESULTS
Following the successful creation of operator's brainwave EEG, image screening was reduced from 5 seconds per image to 0.5 second and the POC demonstrated potential for combined operator screening (higher hit rate and lower false alarm).

behavioural changes are added into this dimension, e.g. presence of security personnel or robots with overt surveillance, it could trigger a natural response in physiological ways in someone who is planning or about to commit the nefarious act, due to fear and anxiety. If we couple this with stand-off threat detection capabilities to remove larger threats like arms, weapons and improvised explosives devices (IEDs), it is possible to provide an assessment of whether a person is a threat (intent + capability). This will be a new security layer that complements security screening. At this stage, it could be hypothesised that the majority of passengers are already "whitelisted". The challenge will be building a policy and an assessment tool for this to determine that the person is not an immediate threat.

HOW CAN THIS ASSESSMENT BE MADE DYNAMICALLY AND CONTINUOUS THROUGHOUT THE PASSENGER JOURNEY?

It will be a very powerful application if we could track persons who have not been "whitelisted" throughout the passenger journey. The use of facial recognition and attire recognition could be an effective mode, as we are dealing with someone who has presented themselves physically at the airport and therefore the facial and attire recognition is current. This is different from trying to use facial recognition to identify persons of interest (POI), which could produce significant false alarms. Should POIs be detected, or the person is highlighted as a threat concern, continuous tracking and assessment of the persons could take place. For instance, someone who appeared to be angry and had huge move-

ments when they first arrived at the airport could have calmed down after checking in. Their behaviour could have been driven by stress: late for check-in or just had an argument with someone prior to arriving at the airport. The continuous tracking and assessment of such individuals could then help to reduce their threat level and so they would eventually be "whitelisted". For those that remained a concern, an enhanced process could be introduced to intercept them for questioning, or enhanced checks could be conducted at the checkpoint. A final security assessment of the person would be made, and the system could be updated by the security personnel for that specific passenger.

WHAT WOULD CHANGE IF WE WERE ABLE TO ACHIEVE THIS WHITELISTING OF PASSENGERS?

If we can build an assessment tool as proposed, the screening of the passengers will start from the moment they present themselves physically at the airport. This new security layer means threats can be intercepted earlier, and we could also turn an "initial assessed threat" to a whitelisted passenger. The assessment tool could also be applied at different stages of the passenger journey to identify changes in behaviour so that intervention can be conducted at the earliest detection of change in threat level.

When passengers are already "whitelisted", the degree and type of checks needed at the checkpoint could be further calibrated and additional random checks could be eliminated. This provides the basis to let technology do more of the screening work as the checkpoint screening could be more algorithm-based to look for IEDs and

specific prohibited items only. To push this concept further, if we can include passenger data for vetting as part of this physical threat assessment process, even if a passenger is found to have brought along his Swiss Army knife, there is no need to remove it as the passenger has no propensity to commit a nefarious act.

▶ Conclusions

The security checkpoint problems will not be solved easily, thus the need to continue to search and use better equipment and technologies to address the challenges. We should not limit screening capabilities to just screening equipment and detection algorithms. The human capabilities must be maximised to respond to emerging threats.

Nonetheless, it is untenable to continue to rely on the security checkpoint as the single layer of defence. To ensure a sustainable security system, there is great impetus to re-think the security concept to "whitelist" more passengers from the moment they arrive at the airport facilities as a new layer of defence. If the aviation security threat is presented from the moment it set foot at the airport, the earlier we can detect it, the better we are at preventing the next successful attack. This layer can also serve to improve landside security since the threat assessment starts from the public area. To sum it up, we must seriously consider leveraging on a combination of technologies to develop a multilayered and more robust security system for the aviation system to grow safely. There is no silver bullet in any single technology solution today. ∎

As Vice President Aerodrome Safety and AVSEC in the Changi Airport Group (CAG), **Alan Tan**'s responsibilities include directing, planning and coordinating security operations, aviation security policies and compliance. He is responsible for implementing security enhancement and developmental projects, managing the contracted security services, undertaking aviation security audits and inspection and promoting security culture and awareness. He also works with different regulatory entities to ensure CAG meets the security requirements to support Changi's infrastructure developments and passenger services projects. He is the immediate past chairman of ACI World Security Standing Committee and chairman of ACI Asia Pacific Security Committee. He is also a member of the SMART Security Management Group. As the SMS manager, he oversees the Aerodrome Safety Unit (ASU) and is responsible for Changi's Safety Management System (SMS). ASU works with different internal stakeholders to ensure compliance with safety requirements to maintain the aerodrome certificate. Under his leadership, ASU successfully achieved the aerodrome re-certification in 2015. Prior to joining CAG, Mr Tan was a senior police officer holding various key appointments in his 12 years with the Singapore Police Force.

Airport applications for Remotely Piloted Aircraft Systems

**Salvador
Fo Alonso,
Enrique Sanchez
Cuellar
and Alberto Taha
Barriuso,**
AENA

Remotely Piloted Aircraft Systems are a different form of aviation, but aviation nonetheless. How these new technologies integrate into aircraft operations is a challenge for the next generation of airport management companies all over the world. They can provide additional services to improve operations and management in a more efficient way. This challenge is one of the major pillars of Aena's Innovation Strategy, "Aena Airport 4.0".

The unmanned or Remotely Piloted Aircraft Systems (RPAS) have broken into the air sector and society, from being a mere hobby to becoming work tools with multiple applications in different industrial sectors. Functions such as rescuing people, firefighting or delivering online shopping packages no longer seem like science fiction possibilities, and the rustic gadgets that emerged only five years ago have evolved significantly in anticipation of a technological revolution that, together with Big Data or artificial intelligence, will change our lifestyle.

Under this framework, Aena has developed a programme called "RPAS Utility", or unmanned aircraft, created with the purpose of adapting the new functionalities provided by drones in different fields, such as the management and maintenance of an airport. Aena's objective with this programme, included within the "Aena Airport 4.0" strategy, is to apply the use of RPAS in airports, launching pilot initiatives for direct airport application and, above all, coordinating RPAS's operation in the airport environment. Coordination

actions with local administrations have therefore been carried out for the use of RPAS at Aena airports in order to test and validate, in a controlled and staggered manner, both the operation in operational facilities and the direct application in management and maintenance.

▶ Drones that repel birds or that are used to calibrate the lighting systems at airports

Aena has currently launched two initiatives to validate RPAS technology at airports:
1. Falconry with drones.
2. PAPI (Precision Approach Path Indicator) system calibration.

The first case seeks to validate the results of the local fauna control with drones, with the aim of reducing bird strikes at airports. This initiative, which has already been tested by several companies in the United States and Central America, is an innovative technology in Europe. It uses a drone that mimics

> **The Innovation Strategy: Aena Airport 4.0**
> Nowadays, smart airports welcome innovative ideas as an emerging asset to develop technological solutions that will make their processes, products and services more efficient.
>
> Based on this, Aena's innovation strategy, "Aena Airport 4.0", seeks the development of the airport in the society of the future as a framework within which to integrate new technologies and innovative trends with application in the airport environment.
>
> This strategy aims to develop the different pillars that make up the passenger journey and infrastructure management thrusts, so each of these two points of view contribute to the definition of Airport 4.0, through programmes and projects that validate different technologies and procedures.

Falconry with Drones.

the external shape of a predator (hawk or eagle) and that integrates flight patterns with changes in them to prevent the birds in the vicinity getting used to them. Aircraft are programmed for different flights depending on the local fauna to be controlled, the time of year or frequency of flights. This equipment even allows the use of thermal currents to mimic even more precisely the flight of real falconry birds, and its programming allows the coordinated flight of several teams at the same time.

The second initiative is related to the PAPI lighting system calibration. The PAPI system is a visual aid that indicates to the pilot the suitability of the descent path in the approach using a colour code. The system must be calibrated before the first use and periodic checks are made from the air to ensure the correct indication.

Usually an aircraft carries out the task with a crew of three, and equipped with on-board systems that indicate the position in real time with high precision. This task supposes an additional workload for the pilot because several approaches to the runway are necessary, including some of them below the protection surface (space with possible obstacles).

In this regard, the measurement made by an RPAS significantly reduces the risk and increases the safety of people, since the presence of people in-flight is not needed. Thus, the capacity for a multi-rotor RPAS to remain in a stationary position allows for greater accuracy in the measurements, and facilitates the tasks of adjusting the PAPI's units on the ground. This means a significant reduction in runway occupation time, which is a great advantage compared to a manned aircraft.

This initiative has already been successfully tested at El Hierro, Cordoba and Huesca airports and at the Region of Murcia International Airport (AIRM) and will soon be tested at Burgos Airport, its main objective being to validate the procedure and to compare the results with measurements made by the traditionally used manned flight.

Based on these tests, carried out during the operational closure of the airport and in uncontrolled airspace, the procedure has been refined so that, in the last measurement made at Huesca Airport, the differences between the measurements made with RPAS and those with manned aircraft were below 25% of the tolerance margin of the measurement. In all cases, an attempt has been made to match the RPAS measurement with the calibration flight.


PAPI System Calibration.

▶ Real tests conducted

1) **The first measurement was taken at Cordoba Airport in January 2018.** On that occasion, the manned flight to which the measurements would be compared was carried out by the Czech Republic air navigation services. The measurement differences in some of the units (the widest of 0.1º) were due to difficulties in the mechanical adjustment of the units that were made simultaneously with the approaches made by the airplane. In any case, the differences were lower than the admitted tolerance (± 0.2º).

|	Horizontal Range * (degrees)	
	Left	Right
Standard procedure	15,00	13,00
RPAS	14,73	14,92

Note: Horizontal limit of calibration, measured from the axle of the runway to the right and left.
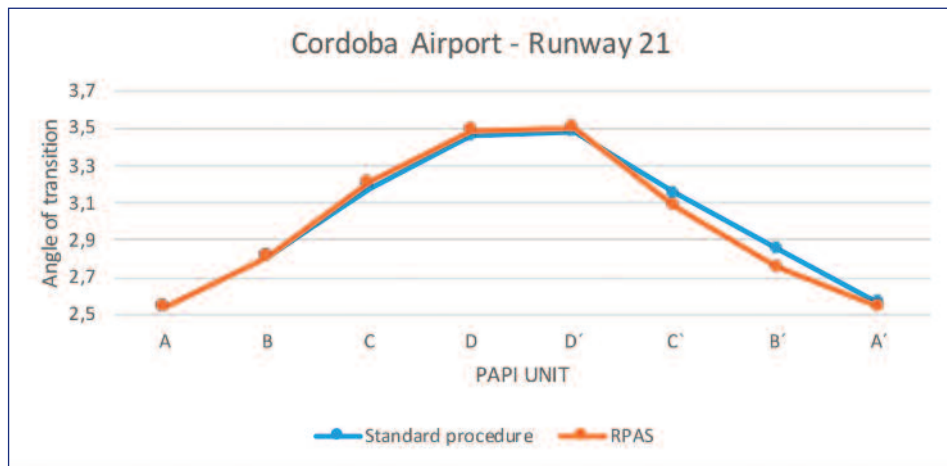
2) **The measurement taken at the Region of Murcia International Airport was carried out by Aena Internacional's Verification Unit.** During the RPAS measurements, an error was made when registering the coordinates of the PAPI units (due to mistakenly registering the height difference between the RPAS camera and the GPS antenna). However, having detected this error it was possible to refine the procedure and include mechanisms to prevent it in future measurements.

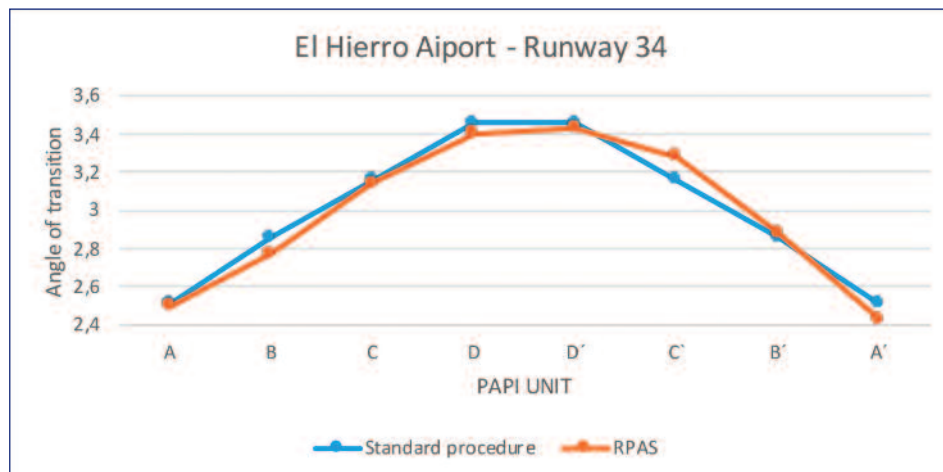|	Horizontal Range* (degrees)	
	Left	Right
Standard procedure	10,00	10,50
RPAS	4,12	15,96

Note: Horizontal limit of calibration, measured from the axle of the runway to the right and left.
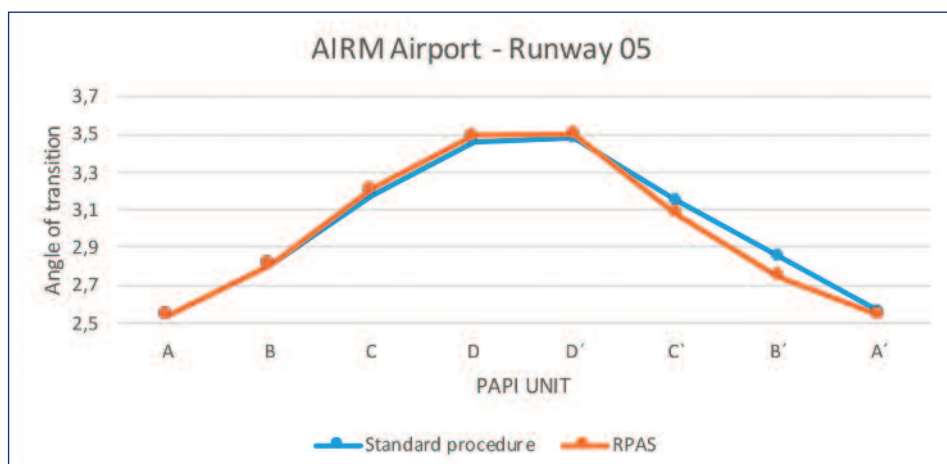
3) **The third measurement was taken at El Hierro Airport.** In this case, an automatic recognition system based on artificial intelligence was tested for the first time, which reduces the influence of the human operator during the measurement. This system also allows the manoeuvres to be automated, reducing the total flight time to the minimum and in the same way minimising the runway occupation time for the measurement. The measurements shown below, however, were made with the previous procedure.

	Horizontal Range* (degrees)	
	Left	Right
Standard procedure	10,01	4,80
RPAS	13,39	5,52

Note: Horizontal limit of calibration, measured from the axle of the runway to the right and left.

	Horizontal Range* (degrees)	
	Left	Right
Standard procedure	7,90	8,20
RPAS	12,1	8,57

Note: Horizontal limit of calibration, measured from the axle of the runway to the right and left.
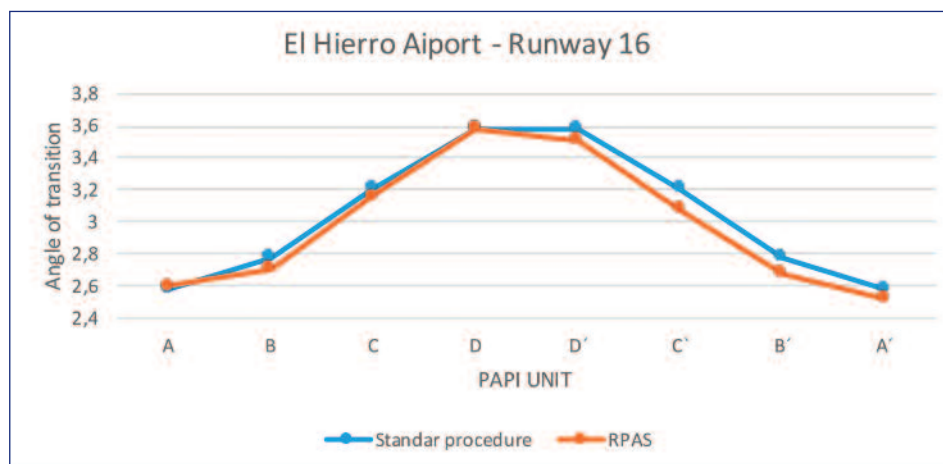
4) **Finally, the most recent measure was carried out at Huesca Airport in January 2019.** The procedure used was the automatic system, without the influence of the operator. In this measurement, the smallest differences between manned flight and measurements with RPAS were obtained.

	Horizontal Range* (degrees)	
	Left	Right
Standard procedure	8,29	8,44
RPAS	6,71	6,56

Note: Horizontal limit of calibration, measured from the axle of the runway to the right and left.

Huesca Aiport - Runway 12R
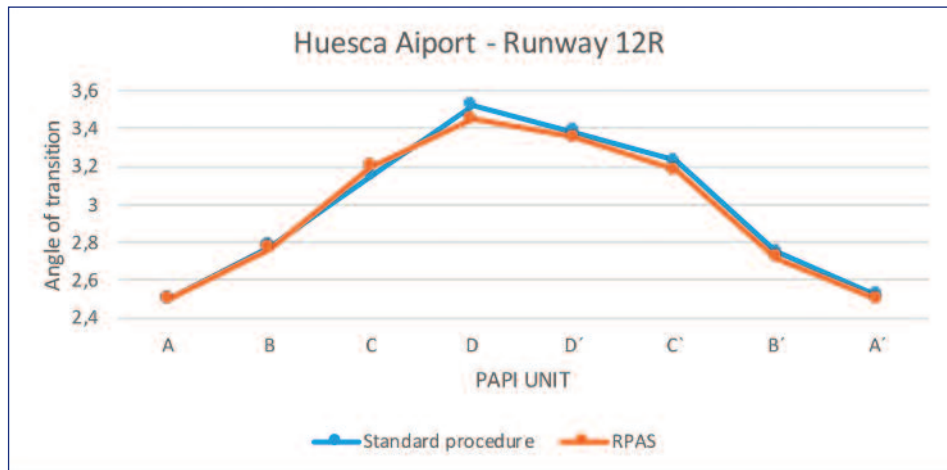
	Horizontal Range* (degrees)	
	Left	Right
Standard procedure	9,79	10,62
RPAS	5,21	4,38

Note: Horizontal limit of calibration, measured from the axle of the runway to the right and left.

El Hierro Aiport - Runway 30L
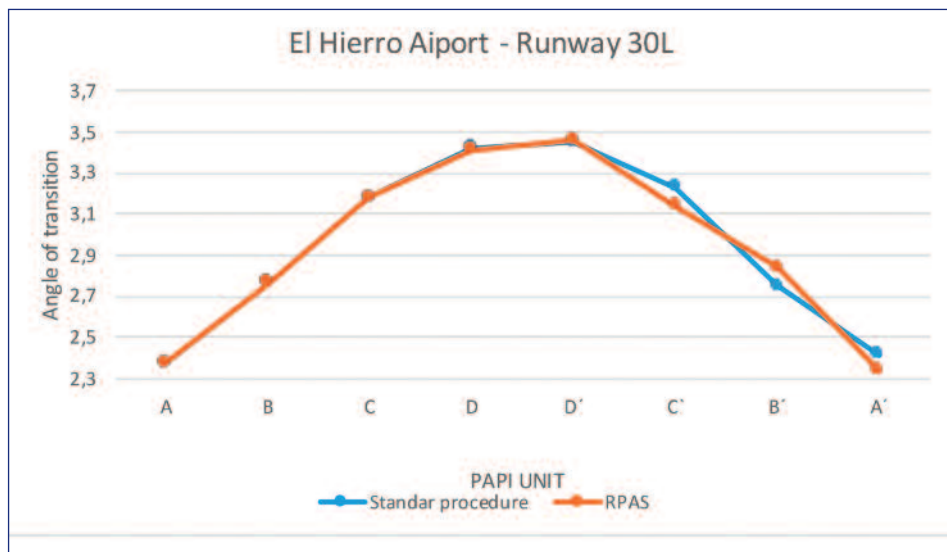
PAPI Calibration, RPAS + artificial intelligence.
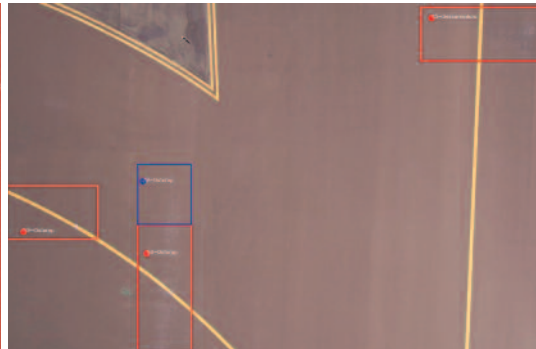
Inspection of runway pavements, RPAS + artificial intelligence.

As can be seen from the data, these calibration systems are a valid option since they provide results in many cases equal to or better than those obtained with the standard method – although for about a tenth of the cost associated with the conventional procedure using calibration aircraft. In addition to the cost, the flexibility of the RPAS systems must be taken into account, since they allow calibration tasks to be carried out with interruptions without worsening the quality of the measurement. Preparation time prior to the calibration is therefore lower, since the operational-free windows need less time.

The future of RPAS in the airport environment will require greater integration of their operations both in society and in the airport environments, from two requirements: first, we need to match the RPAS operations within airports, and secondly, we need to promote greater professionalisation and continuous improvement of the operating procedures of RPAS companies, in accordance with the high safety standards of the aviation sector.

▶ Future innovative solutions with RPAS at airports

Aena's Innovation Strategy aims to implement "Aena Airport 4.0" at Aena airports. Its application is being achieved through various development programmes, one of which is RPAS Utility. This programme includes the future applications of RPAS in airports, which are detailed below:

• Calibration of Air Navigation Equipment: VOR (Very High Frequency Omni-Directional Range), DME (distance measuring equipment), ILS (instrument landing system), etc.

• Flight inspection of runway and approach lighting systems, currently performed taking advantage of the presence of the laboratory aircraft to calibrate the ILS and PAPIS.

• Inspection of runway pavements, taxiways and aircraft stands, currently made on foot by maintenance technicians.

• Review of results and cartography.

• Track detection of FODS (foreign object debris detection).

• In-house use for maintenance and transport of packages.
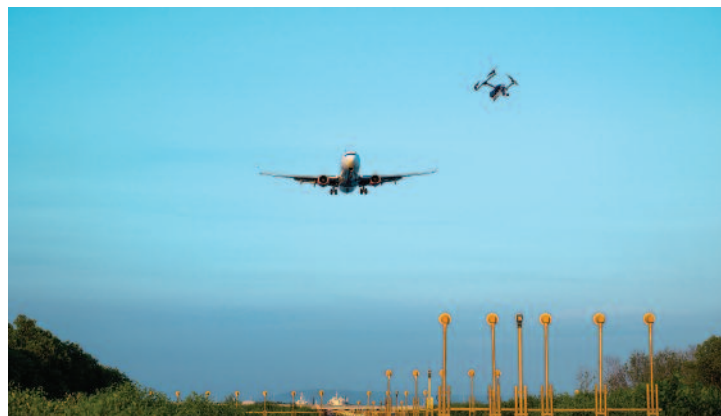
- Security by improving perimeter surveillance.
- Inspection of infrastructures that are difficult to access, such as bridges, elevated structures, platform lighting towers, etc.

Applications such as those mentioned above have already begun to be developed and many other initiatives are still to be explored, but all of them will require an adaptation of the current legislation in order to make the operation of these new technologies compatible with airport activity. The application of RPAS aircraft in airports is not easy, however, given the complexity of the environment itself as well as the legislation that seeks to regulate and protect infrastructures from the improper use of these tools in such a sensitive environment.

However, airports cannot remain outside the technical advances that are made available to the society they serve and for this reason they must promote the use of disruptive technologies adapted to the conditions of their activity.

If we do not adapt to the growth of RPAS operation within airports, we will miss a great opportunity to make use of an emerging technology that allows us to improve the operation and maintenance of critical infrastructures, reduce maintenance costs and in many cases make significant improvements in the results obtained compared with those obtained through conventional methods. ■

Salvador Fo Alonso is a technical aeronautical engineer. He graduated from the *Universidad Politécnica de Madrid,* and holds a degree in aeronautical management from the *Universidad Autónoma de Madrid.* He has more than 26 years' experience in the world of airport infrastructures, developing its functions at the airports of Gran Canaria and Adolfo Suárez Madrid-Barajas and at Aena headquarters. Mr Fo Alonso is currently in charge of the Maintenance Technical Support Department of the Project and Construction Directorate at Aena.

Enrique Sanchez Cuellar is an industrial engineer from the UVA. He is in charge of Aena's electrotechnics and beacon laboratory. Responsible for the "Calibration of PAPI systems through RPA", he currently audits the visual aids and energy systems of all Aena airports. Before that he managed projects and constructions. Previously he performed design and development tasks in the paper industry and in the automotive and teaching sector at the *Universidad de Alcalá.*

Alberto Taha Barriuso is an aeronautical engineer from the *Universidad Politécnica de Madrid.* He currently works as Aena chief innovation officer. He has more than 15 years' experience in the airport sector working in different units, including operations and responsibilities at the network's airports and at headquarters, as well as in different national and multinational companies in the industrial sector in engineering, maintenance and systems integration.

Present and future challenges of antidrone systems

Jorge Munir El Malek Vazquez
Head of Counter UAS Solutions, Indra

This article focuses on an analysis of the main challenges antidrone systems have ahead, first in a general approach and second, focusing on the particularities related to their use in the civil aviation environment. Some of the main technical and non-technical challenges are presented. Considering the latter (regulatory, procedural, limitations and terms of use), important issues need to be specified and clarified to support real and effective deployment and ensure the highest standards of safety and efficiency. The contribution of governments, end users, regulators, operators, manufacturers and research and development entities is key to achieving this demanding objective.

The emergence of drones in both the civil and military spheres has been marked from the outset by the constant duality between their advantages and their disadvantages. The pros (advantages) demonstrated by different disruptive-use cases, which have supported new business opportunities, and then the cons (disadvantages), evidenced by multiple incidents caused by the illicit use – errant or clearly hostile – of these platforms in the vicinity of airports, penitentiary centres, critical infrastructures in general, and so on. In this situation, and progressively over the last few years, potentially threatened entities and individuals as well as those in charge of security have demanded solutions to deal with this threat, hence the proliferation in the market of different antidrone technologies and solutions. Note the trend highlighted by multiple recent market reports that establish market expectations in double-digit compound annual growth rate figures for the next five years.

On the one hand, this article addresses some of the main challenges these antidrone systems have ahead from both a general and a specific perspective. The specific perspective focuses on the particularities arising from their use in the civil aviation environment. On the other hand, different technical challenges are presented as

well as regulatory and procedural challenges, which are highly relevant to making the deployment and use of these systems a reality.

The main challenge for antidrone systems is the nature of the threat, both in terms of the growth rate of the drone market size (value and volume), which has been exponential to date, and in terms of the technology evolution where advances in navigation capacity, flight range, payload weight supported, etc. are breaking limits year after year, faster and faster. In view of this, it is evident that any antidrone system must be in constant and fast evolution and be equipped with new and better technologies on a recurrent basis.

From a general perspective, unfortunately neither the perfect antidrone system nor the infallible sensor or countermeasure exists. For this reason, the best strategy is based on three key principles: first, adaptation of the solution to the particular needs of each operating environment, "one configuration does not fit all the operational scenarios"; second, coexistence and collaboration between different types of sensors and countermeasures; and third, redundancy in number and location.

▶ Technical and non-technical challenges

In terms of technical challenges, the main one is to have new, improved and better sensors and countermeasures that can face advanced and complex threats such as swarms and more intelligent and autonomous Unmanned Aerial Vehicles (UAVs). When faced with this, and taking as a reference the different phases that compose the typical antidrone framework (detection, identification, tracking, and neutralisation), some activities should be highlighted: (1) better detection of (very) small drones in adverse environmental conditions (occlusions, clutter, etc.) and radio silence; (2) speed and precision increase of identification and classification of each potential threat, not only in terms of type and model of drone but also in terms of its nature (friend, enemy); and additionally (3) better non-lethal countermeasures in cost, efficiency and less collateral impact, for example, ensuring that the planned activity does not interfere with other systems located in the vicinity.

With regard to non-technical challenges and from a general perspective, it is essential to boost the collaboration and contribution among different actors, including governments, end users (security forces, operators, etc.), regulators, manufacturers, research and development entities, etc. These collaborations are already taking place at different levels focused on answering key questions such as: (1) regulatory framework that supports and authorises the use of these systems, clarifying the conditions and limits of their use, including, of course, aspects related to the radioelectric spectrum; (2) procedural framework according to each operational scenario, clarifying what to carry out and how to act in the presence of a potential threat; and (3) the relevant decision-making authority, identifying the bodies and individuals that can make use of these systems.

▶ Use of antidrone systems in the civil aviation environment

It is essential to point out that the airport environment and, in general, the use of antidrone systems in civil aviation, have their own peculiarities that require specific analyses and solutions to ensure the key principles of safety and efficiency. In this sense, collaboration with the national and international aviation administrations is essential.

First, conventional ATM (air traffic management) systems are not prepared for detecting small drones. It is only a matter of time before drones acquire a main role in our skies; that is why UTM (Unmanned aircraft system Traffic Management) systems are critical to face this reality. Additionally, it is necessary to ensure interoperability of UTM systems with existing ATM systems in order to facilitate the monitoring and control of all those collaborative Unmanned Aircraft Systems (UAS). Additionally, non-collaborative UAS must be taken into account. It is therefore critical and necessary to combine ATM/UTM with antidrone systems to provide a global picture of the operating air environment. Unfortunately, "bad guys" will be able to bypass the restrictions that most commercial drones already include or will include in the near future, such as geofencing, remote identification, etc.

Secondly, the use of antidrone systems at airports requires special care to ensure these new systems are not considered a threat, either for the security of operations or for the electronic equipment that supports them, which is particularly delicate in the case of the use of countermeasures. Special mention should be made to the activity carried out to date by the Federal Aviation Administration in its task of evaluating and analysing the use and incorporation of antidrone technology in the airport environment, showing that there is still a long way to go.

When faced with a threat that not only exists but continues to increase and where it is necessary to ensure maximum security and efficiency, it is reasonable to consider the use of antidrone systems in this environment (airports). This approach should be a progressive and multistage plan, starting with focusing on detection technologies that can provide at least situational awareness and certainty of threat existence, leaving the use of active countermeasures such as radio frequency neutralisation for later phases. Anyway, the inclusion of any system must be carried out ensuring non-interference with the other existing systems.

With regard to the use of countermeasures, it goes without saying that this is considered an extremely delicate issue requiring an exceptional analysis that will take time. In the meantime, the option of allowing very narrow scenarios for their use should be explored, identifying which authorities could do so and which strict operating and coordination procedures should be followed. All countermeasures to be considered must be highly precise about the threat to be neutralised, ensuring the minimum interference in the rest of the environment. This requires systems with high precision on time, frequency, power selective and space as well as far-reaching detection to be able to support such actions.

In addition, the recent incidents at airports have demonstrated the lack of preparation and harmonisation in the required response, making evident the need to define and establish clear and common protocols and procedures allowing these threats to be faced with a greater probability of success. This harmonisation at international level is also a key aspect towards advancing in the seamless sky strategy.

Example of ARMS deployment

Circular Array SDR Jammer

▶ What is Indra proposing?

In conclusion, antidrone systems are necessary in the face of the existing threat, making it clear that companies specialised in this type of antidrone technology need to innovate and collaborate with different players (governments, end users, regulatory bodies, etc.). It is necessary to support integration and interoperability with other high-order systems such as ATM and UTM. For all these reasons, Indra, as a leading company in the defence and security and ATM systems market, has developed ARMS (AntiRPAS Multisensor System) conceived to operate both in isolation and as part of a more global solution such as, for example, Indra Air Drones, the company's solution for the management of unmanned traffic.

ARMS has been designed to detect, identify, track and neutralise drone threats by using a combination of different state-of-the-art technologies, offering maximum flexibility to adapt to each scenario and thus maximise the protection of each infrastructure and key location, such as airports, nuclear power plants, government buildings and so on. The joint integration of ATM, UTM and ARMS systems allows Indra to guarantee improved situational awareness, resulting in an immediate increase in the security levels of the airspace and airport environments.

In short, Indra is offering the most effective protection against this new type of aerial threat, considering flexibility and adaptability as key components of its DNA to face this challenging and fast-evolving reality. ∎

Jorge Munir El Malek Vazquez is a telecommunications engineer who specialised in communications signal processing and telematics at the University of Vigo (Spain). He has a master's in signal processing-based applications in communications from the University of Vigo (2010), and an Executive MBA (2016) from ESADE Business School (Madrid, Spain).
His career has been related to research and development in the defence and security, aerospace and broadcast sectors. In recent years (2013–2018) he led the Advanced Communications Department at the Galician Research and Development Center in Advanced Telecommunications (Gradiant). He is specialised in mobile and satellite communications subsystems as well as in technologies for unmanned platforms, focused on payloads and on detection and counter UAS technologies. In 2019, he joined the Business Unit for Security at Indra Defence & Security as head of counter-UAS solutions, contributing to Indra's firm commitment to providing the best and most advanced solutions to face this new and ongoing threat.

Reconciling innovation and regulation

Jean-Marc Cluzeau

Principal Advisor to the Executive Director,
European Aviation Safety Agency (EASA)

The aviation world is evolving at a high pace and every single day we hear about innovative developments concerning new products, new technologies and new services that will be on the market soon. It is a challenge for EASA, not only to adapt to these developments but also to support and accompany changes in industry.

Almost all sectors of aviation are affected. Aircraft designers are moving from trend monitoring of key elements to digital twins, maintenance of these aircraft rely increasingly on on-board systems that are ever more connected. This in turn affects aircraft operations by allowing certain operations to be carried out remotely. In certain extreme cases such as drones, this can take the shape of full automation with minimal remote human intervention. Drones are by their sheer number revolutionising ATM through the development of unmanned traffic management (UTM), a far more automated approach to separation. These are only a few of the upcoming transformations, without mentioning the topics of training, data-driven decision-making, robotics and artificial intelligence.

Innovation in aviation creates high expectations: the general public expect electric and hybrid propulsion to help towards cleaner skies, urban air mobility to relieve congestion in city centres, artificial intelligence to increase the level of safety, etc., while industrials and private investors see an opportunity to develop new business models or gain market shares.

For EASA, the main questions to meet these expectations are the following:

1) What changes are needed in the regulatory system to accompany, and benefit from, innovation?

2) What actions are needed for the Agency to keep abreast of innovation topics, in particular in its role of certifying authority?

3) How to maintain the highest level of safety while not discouraging innovation?

All this revolves around one key question: **"How to reconcile innovation and regulation?"**

▶ The four challenges for regulators to support innovation

Innovation is challenging the way regulators work. In EASA's opinion, there are four main challenges we must face:

1) The first challenge is to be able to adapt our regulatory framework to allow the early implementation of innovation. In many instances our regulatory framework is too rigid: it is too prescriptive and it takes too much time to introduce rule changes. The past 50 years were extremely stable. What we used to call an aeroplane, a pilot, an airline, a maintenance organisation have remained the same. And we have built our regulations around those products, definitions and business models. Now we are facing a short- and long-term challenge. In the short term to provide flexibility and adaptability within the existing framework to cope with ongoing and forthcoming developments and, in the long term, to rethink the overall framework to make it innovation-proof.

2) The second challenge is that for years we have been certifying new aircraft, engines or equipment using the same methods. Manufacturers expect to improve their design cycles relying more and more on simulation and digital twins. We need to prepare ourselves to adapt our processes to new technologies (e.g. certification of artificial intelligence). To do so, we must learn from the challenges of innovative development in close partnership with the industry.

3) The third challenge is that we need to overcome the knowledge asymmetry with the industry. It is very important that our certification experts are capable of challenging new technological developments to ensure no hidden safety threat would remain unassessed. To this end, EASA has put in place an internal innovation network, the purpose of which is to encourage colleagues to share information and knowledge on innovation. To date, more than 100 colleagues have joined the network. More importantly, we are in the process of signing memoranda of cooperation on

---

An example of IPC:
Daedalean and EASA Innovation Partnership Contract

The project titled "Concepts of Design Assurance for Neural Networks" aims to examine the challenges posed by the application of neural networks in aviation, in the broader context of allowing machine learning and more general artificial intelligence on board aircraft. Experts from EASA and Daedalean are bundling their expertise to create concepts and safety standards for the application of this branch of artificial intelligence in safety critical avionics. [...]

Challenges for artificial intelligence in aviation

Denser use of airspace, as for example envisioned in a future with widespread application of autonomous drones or personal electric air-taxis, comes with problems for which neural networks can be a good – or with the current state of the art in artificial intelligence, *only* – solution, making it imperative that their safety is understood and guaranteed.

Scope and starting points of the IPC

Under the scope of this IPC, EASA brings their expertise in the field of safety analysis and certi-fication, and Daedalean contributes their expertise in computer vision, robotics and deep learning, to come up with ways to guarantee safety and adequacy to aerospace industry stan-dards of the novel flight instruments that are pos-sible when incorporating neural networks, and the novel applications to flight operations they enable.

Source: Daedalean press release

---

innovation with a number of key industry players. Those agreements foresee coopera-tion on innovative projects, the organisation of joint work-shops, joint training sessions, exchange of staff, etc.

4) **The fourth challenge** is to inte-grate new entrants in the avia-tion community. By definition, new entrants do not come from the aviation world. Our aviation system has reached an exceptionally high level of safety not only because we have good regulations, well implemented by the industry and well overseen by the na-tional aviation authorities (NAAs), but also because we have over the years consolidated an ex-tremely robust safety culture and a spirit of collaboration, which is shared by all actors of the aviation systems. Drone manufacturers, drone opera-tors, future actors in urban air mobility and developers of ar-tificial intelligence may not yet have this culture and spirit of collaboration. It is our role, as regulators, to make this hap-pen because this is essential to aviation safety. Cooperation can only work if the parties share information, actively col-laborate and communicate, and if those like EASA dissemi-nate the information EU- and worldwide.

In fact, to meet these innova-tion challenges we need to activate two levers: **working in partner-ship** with the industry and NAAs, and **becoming a smart regulator.**

▶ Partnership with industry and NAAs on innovation

Innovation partnership contracts (IPC) and memoranda of cooper-ation (MoC) on innovation are the tools that EASA has recently devel-oped to collaborate on innovation with the industry.

IPCs aim at supporting innova-tive industry projects at the con-ceptual phase. On the one hand, they allow the industry to benefit from the Agency's technical exper-tise and aviation safety culture, which is particularly relevant to new entrants. On the other hand, they give the Agency the opportu-nity to learn from new technologies at an early stage of development, and to identify possible regulatory gaps and safety challenges.

For instance, we have started a collaboration with Daedalean, a start-up based in Switzerland, on the development of flight automa-tion systems based on deep learn-ing and neural network. Together, we explore ways to certify artificial intelligence, which has never been done before.

IPCs for drone cargo operations and single pilot operations are other examples that enable setting up partnerships and progress to-wards smooth and in-time regula-tion updates.

MoCs on innovation are broader partnership agreements, intended to facilitate the exchange of infor-mation on innovation between

industry key players and the Agency. They will allow the Agency to be kept aware of the most advanced developments on innovation but also to launch joint initiatives (training, workshops, exchange of staff) that will further enhance the Agency's understanding and vision of upcoming developments.

MoCs have already been signed, or are currently under discussion, with key players in the field of aeroplane, helicopter, engine, systems, aerodrome equipment manufacturers and maintenance, repair and overhaul (MRO) organisations.

But MoCs are not limited to the industry: a partnership agreement has also recently been signed with the Civil Aviation Authority of Norway. It aims at supporting Norway in an ambitious programme to decarbonise regional air transport in the country.

CAA Norway and EU aviation safety agency (EASA) have concluded a binding agreement which will accelerate work on electrifying aviation.

[...]

Comprehensive agreement

The agreement covers technology, the regulatory framework and other preparations for phasing in electric passenger planes. The agreement aims to deliver results in the following areas.

- Prepare for the development, testing and approval of new technology for both aircraft and infrastructure
- Develop an arena for innovation, which will encourage collaborative activity
- Contribute to quicker regulatory change in areas of aviation, as the technology develops and matures
- Facilitate cooperation in research and development
- Support and guide developers of new technology and concepts in selected areas
- Identify and disseminate information about financial instruments and incentives for collaborating parties
- Identify potential hurdles that may impede development
- Study and report on the effects and consequences of electric aircraft for the whole aviation system, including the consequences for infrastructure, expertise development and training, airspace management and new route structures etc.

Source: CAA Norway press release

▶ Becoming a smart regulator

For the short-term regulatory challenges, the key word is pragmatism. For instance, considering the integration of drones: a new concept of operations, new technology supporting new business models, safe integration of new, more autonomous airspace users, the increased use of digitalisation and autonomy in aviation will require a new regulatory approach by EASA as pan-European safety regulator. Currently, the priority for EASA is to understand the operational concept and the evolution of this market. Only with a mature operational concept and demonstrated and validated technology can a safety regulator establish the necessary regulations. If not, there will be a risk of being either too conservative or not thorough enough. However, this doesn't mean that EASA does nothing until everything is ready. EASA is very

EASA Executive Director Patrick Ky and CAA Norway's General Director Lars Kobberstad sign binding agreement on electrifying aviation.

active setting up the necessary tools to allow early implementation in a safe manner. This will be more on a case-by-case approach but will allow learning before developing the more scalable solutions. In terms of priorities and while we are waiting for technology to mature (e.g. detect and avoid systems), the Agency has several work streams i.e. very low level airspace, where U-space services will be provided, and airspace above, with the aim of better understanding the roles, responsibilities and procedures to integrate the "new" airspace users.

For the long term, as the pace of innovation is increasing we can no longer afford to constantly adapt our regulatory framework to innovation, as we are currently doing for the short-term needs. We also have to make it resilient to

innovation that will come in five or ten years, or more. In other words, the rules need to be prepared for the unexpected. In practice, what we need is to make our regulatory framework agile and technology- and business model-agnostic. To achieve this, we will need to make them more abstract and general, performance- or objective-based rather than prescriptive, while ensuring legal certainty.

The art of smart regulating will be to combine these three aspects.

▶ Conclusion

For the safety regulator, innovation is a race against time. In an increasingly competitive world where everything is accelerating, it must meet multiple and apparently contradictory expectations: to encourage innovation and at the same time guarantee the highest level of safety; and to respond to multiple short-term regulatory challenges and at the same time maintain a robust, stable and coherent regulatory framework. Only by engaging with its key partners (industry and NAAs) in a more agile and collaborative manner, and rethinking the way it develops regulations by combining short-term flexibility with long-term resilience, can the regulator reconcile innovation and regulation. ■

Jean-Marc Cluzeau is principal advisor to the Executive Director of the European Aviation Safety Agency (EASA), in charge of innovation. As a graduate engineer in aeronautics, he began his career in 1985 as an aircraft design engineer at Aerospatiale, and then held a number of management positions in an airline's maintenance organisation. From 1994 to 2003, he worked for the Joint Aviation Authorities (JAA) and was responsible for continuous airworthiness, mechanics licensing, third-country operators and human factors developments. He then joined Air France Industries in 2003 as head of the Flight Safety Department.

He joined EASA in August 2008 where he successively held the positions of head of the Flight Standards Department, head of the Strategy and Programmes Department and now principal advisor to the Executive Director, in charge of innovation.

Innovating in the future: challenges and opportunities for the European aeronautics sector in the context of a new digitalised world

Vincent de Vroey

Director of Civil Aviation at AeroSpace and Defence Industries Association of Europe (ASD)

Supporting over 860 000 jobs, the aeronautics, space, defence and security industries are playing a crucial role in Europe. They are a powerful indicator of the skills, leadership, innovation and cross-border cooperation that makes these important sectors competitive in highly sophisticated markets worldwide.

The Aerospace and Defence Industries Association (ASD) is the recognised voice of European industry and is also one of the founding members of the International Coordination Council of Aerospace Industries Associations (ICCAIA), which is the recognised voice of the civil aeronautical industry at the global level within the International Civil Aviation Organization (ICAO).

In the civil sector, the industry plays a key role in safeguarding our future and reducing the environmental impact of civil aviation, particularly in relation to noise and emissions. European Union (EU) industry supports the long-term goals from the Air Transport Action Group (ATAG): i.e. to reduce CO_2 emissions by 50% by 2050 compared to the year 2000 and to have carbon neutral growth as from 2020. This is based on the so-called four-pillar approach (technology, infrastructure, operations and market-based measures). In this context, EU industry plays a key role in the development of the next generation of technologies, which will enable a reduction in the environmental impact of civil aviation. The EU industry is also fully committed to support the implementation of the global Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) agreed at the ICAO level.

EU research programmes such as Clean Sky and SESAR play a key role. Today's aircraft and engines are much more fuel-efficient than earlier generations, and constant research ensures that the next generations of aircraft models will lead to even higher emission reductions. A new generation of aircraft typically reduces emissions by 15-20%. On the other hand, an improved, more performant, European air traffic management system could reduce emissions by up to 10% within Europe. The combined effect of these two positive elements would allow industry to achieve greener and more efficient aviation activities. Hence, it is important to keep on supporting joint technology initiatives such as Clean Sky and SESAR, representing the two most important research programmes for the aeronautics sector.

Advancements in automation, the development of digital technologies and breakthroughs in the field of artificial intelligence (AI) all contribute to the enhanced progresses in the field of autonomous systems. Particularly, these new technologies introduce new operational concepts, such as single pilot operations (SPO), unmanned aircraft systems (UAS), urban air mobility (UAM) and high-altitude pseudo-satellites (HAPS) operations, through partially or fully autonomous operations.

From the 1950s to the 1980s, crew size on commercial flights decreased from five to two crew members, thanks to several technological developments, specifically related to the implementation of jet engines, and improvements in avionics and radio systems. Since then, research has focused on the possibility of a commercial aircraft

© MyCreative - AdobeStock

Innovating in the future: challenges and opportunities for the European aeronautics sector in the context of a new digitalised world

© Alexandre Rotenberg - AdobeStock

that can be flown by a single pilot. The implementation of these new concepts - which will become a reality in the near future, thanks to technological innovation - would present different advantages. First of all, it would significantly reduce costs for airlines, since flight crews represent one of the most relevant direct operating expenses. Moreover, SPO could be a significant way to address the issue related to pilot shortages, and obviously technological innovation should enable the implementation of this new concept in a safe manner.

As a result of further improvements in automation and communication, it has also been possible to develop innovative systems allowing for remotely piloted operations. The design, production and operation of UAS is not new, with military versions being deployed, for example in World War II. However, recreational and commercial use is now growing in such a way that requires effective and efficient regulations to ensure a safe, secure, environmentally friendly and commercially supportive environment. Regulators have been active in this area for several years now, but a comprehensive regulatory framework – encompassing national, regional and international rules – has yet to fully materialise.

There are growing challenges and opportunities to mobility in urban areas that industry is preparing itself to develop and deploy. Many EU industry projects related to UAM are in the pipeline by both established players and new start-up companies. Efficient and effective transportation is high on the European transport agenda and the European Commission is currently encouraging the development of UAM through such initiatives as the European Innovation Partnership in Smart Cities and Communities (EIP-SCC). The EU Commission and SESAR have also developed the so-called U-Space concept as a set of new services relying on a high level of digitalisation, and automation of functions and specific procedures. This is designed to support safe, efficient and secure access to airspace for large numbers of unmanned aircraft, which in the future will also include traffic management for new UAM concepts as a subset.

While low altitude activities, such as recreational UAS and urban air mobility, have been a focus in the media, the upper airspace, which is typically the airspace above FL600 (60 000 ft, 18km) is also gaining attention. HAPS are unmanned aircraft which hover for long periods of time at high altitudes, whereas high altitude long endurance (HALE) aircraft are long

range unmanned aircraft operating at a high altitude, carrying out missions that can last over 30 hours. Their proposed use includes telecommunications and remote sensing, thus typical satellite activities, but this time performed by aircraft in certain areas to avoid high wind speeds, above commercial air traffic and to provide large coverage area for telecommunications application.

Automated systems allow for the replacement of humans in the understanding and interpretation of a huge amount of data and, thanks to AI, also help generating future scenarios and improving predictability. Thus, AI and digitalisation are paramount game changers in aviation, as in many other sectors, making it possible to analyse additional data for more adaptability, optimisation and efficiency and more support to pilots and air traffic controllers. For these reasons, they may have a deep impact on the competencies of aviation professionals, and there is a need for the whole aviation sector to prepare for this significant change.

Despite the possible drawbacks connected to these innovative solutions, industry is getting ready to mitigate the consequences of risks related, such as with regard to cyber security. The connectivity of computers is essential in aviation as systems must

simultaneously and constantly speak with one another. For example, computers enable passengers to book tickets, check in online and clear airport security. Furthermore, air carriers rely on them to operate their aircraft, such as through varying communications links with ground handlers, air traffic controllers, other air users and the relevant airports. As the use of computers and their connectivity increases in aviation, cyber security will continue to grow in importance, as it will be vital to provide safe and secure transportation. Therefore, while cyber security is not a wholly new topic for civil aviation, whereby technological industry solutions are advanced with regulatory steps beginning to replace and supplement industry standards, the work is ongoing and the solutions must stay ahead of the constantly and fast-evolving risks.

In the context of reduction of the environmental footprint, it is worth mentioning a less explored field of optimisation in operation design. Automated formation flight operations in cruise applied to civil aircraft allow significant fuel burn savings and associated CO_2 emission reduction without additional ground infrastructures or aircraft sensors. The automated formation flight concept is inspired by the V-shaped formations of migrating geese, which have naturally found a way to save energy whilst flying long distances.

It is essential to highlight how any advancements always bring together new challenges. Innovative ideas often come across as disruptive and time is crucial to develop trust and prove the efficiency and safety of any new system. Industry is moving fast to keep up with users' needs but, at the same time, the continuous support of States and European institutions providing the necessary regulatory framework and an adequate level of investment in research and technology is indispensable.

ICAO plays a key role to ensure that those new technologies and concepts can be deployed on the global civil aviation market through the development of ICAO Standards and Recommended Practices (SARPs) as well as ICAO guidance material. It is, therefore, of utmost importance for EU governments, EU industry and other EU stakeholders to drive the ICAO agenda on those issues. At a European level, it is also critical that an open dialogue is maintained between the different stakeholders, such as: the European Commission (e.g. DG MOVE), the European Aviation Safety Agency (EASA), SESAR Joint Undertaking, Clean Sky Joint Undertaking, European Civil Aviation Conference (ECAC), EUROCONTROL and national governments, as well as European standardisation bodies such as EUROCAE. ECAC plays a key role as the platform to bring all EU stakeholders together. This will help ensure that this potentially disruptive technology is integrated into the airspace, which is already occupied by manned and unmanned aircraft, in a safe, secure and economically viable way, where it must also be stressed that everyone is a stakeholder, whereby social acceptance is paramount to the success of these developments.

In conclusion, EU industry is preparing for the next generation of flight which will reduce the environmental impact of civil aviation while boosting the competitiveness of Europe through the creation of new high-tech jobs. Let us work together to make it happen. ∎

© photoraidz - AdobeStock

Vincent de Vroey has been director of civil aviation at the AeroSpace and Defence Industries Association of Europe (ASD) since November 2014. In this role, he is in charge of the management of the ASD Civil Aviation Business Unit and he represents ASD vis-à-vis the European and international civil aviation community. He also represents the civil equipment manufacturers at the board of the SESAR Joint Undertaking and the Provisional Council of EUROCONTROL. He has extensive experience in the civil air transport industry and European trade associations. Before joining ASD, Mr de Vroey was general manager technical and operations at the Association of European Airlines (AEA). In this role, he was also the chairman of the European Aviation Safety Agency (EASA) Advisory Board from 2009 until 2014 and he represented the civil airspace users on the board of the SESAR Joint Undertaking (SESAR-JU).
Mr de Vroey holds a Master of Science (1993) in Electronic Engineering from the Free University of Brussels (VUB) and a Master of Science (1994) in Transport and Business Economics from the Free University of Brussels (VUB). In 1988, he represented Belgium at the International Chemistry Olympiads after finishing second at the national competition.

NEWS FROM
ECAC & JAA TO

- › ECAC Spotlight
- › ECAC – Asia/Pacific Security Forum
- › ECAC in brief
- › EaP/CA in brief
- › News from the JAA TO

The Facilitation Sub-group on Immigration

Interview with **Evgheni Kostetki**
Chair of the Sub-group on Immigration, State Liaison Officer for the Republic of Moldova at EUROCONTROL

ECAC Sub-group on Immigration considers the facilitation aspects of immigration issues. Its aim is to share experience and develop best practice on border control procedures and implementation matters such as inadmissible passengers and deportees, Automated Border Control systems (ABC), biometrics, Advance Passenger Information (API), interactive API, and Passenger Name Record (PNR). Evgheni Kostetki, who has been chairing the group since 2018, answers a few questions for ECAC News on the latest issues it has dealt with.

1. What is the FAL Sub-group on Immigration?

In the field of facilitation, ECAC has a range of working groups that deal with issues mainly arising from implementation of Part I of ECAC Doc 30: "Policy Statement in the field of Civil Aviation Facilitation". These issues include harmonisation of the provisions of Doc 30, Part I and similar EU regulations, as well as the applicable ICAO Standards and Recommended Practices (SARPs) from Annex 9 to the Chicago Convention. The groups also ensure that information and best practices are shared between the Member States in order to achieve harmonised and good working facilitation rules in all ECAC States to the maximum extent possible. The FAL Sub-group on Immigration, as one of the specialised groups in the ECAC system, in particular focuses on topics related to the immigration processes.

2. How does the sub-group relate overall to the Working Group on Facilitation and /or other groups working on this topic?

Within ECAC, the FAL Sub-group on Immigration regularly reports on its work to the Facilitation Working Group, which then provides the information to all ECAC Member States and observers. Based on the sub-group's report, the Facilitation Working Group defines an annual work programme, including immigration-related tasks and subjects, which are presented later to the Directors General of the national civil aviation authorities for their approval. Subject to due coordination between the Member States, proposals could be sent for further discussion in the ICAO Facilitation Panel for the development and improvement of ICAO SARPs and guidance material. In other words, the sub-group is a tool that aims to identify and support changes in immigration-related issues that need to be implemented, and help the whole system achieve these changes on a larger global scale.

3. What topics is the sub-group currently focusing on?

The FAL Sub-group on Immigration is quite unique of its kind. As the topic of immigration is not purely an aviation matter, our objective is to launch the dialogue not only between Member State experts from the civil aviation agencies, but also from the immigration, border and national enforcement bodies.

As you can imagine, this is both a challenging and an exciting experience. We try to keep our work extremely relevant to all the national authorities involved, and it requires a high level of involvement and commitment from the sub-group members.

Currently, the issues on the table for discussion within the sub-group include: implementation of the Entry/Exit System (EES) in the Schengen States and its impact for both EU and non-EU ECAC Member States; elaboration of the Passenger Data Exchange Systems recommendations to be included in ECAC Doc 30, Part I; the impact the implementation of Automated Border Controls (ABC gates) has on civil aviation in Europe; and many more. Our experts also contribute to defining the European priorities at the ICAO level.

4. What problems do you see arising for the future?

European – and notably EU – legislation in the field of immigration evolves quite fast. Thus, the European Travel Information and Authorisation System (ETIAS) will without doubt be one of the focuses of discussion for us, as it is expected to be operational by 2021 and will have a huge impact on ECAC Member States. We can also expect interesting discussions on the Smart Borders initiative and how it could be implemented throughout Europe.

Recently we have been examining the critical topic of safeguards against human trafficking that are expected to be in place for the future, especially as the

issue also covers the recommendations and rules on the travel of unaccompanied minors.

We are convinced that with the large number of authorities involved in regulating this topic at the national level in Member States, and the industry and passengers' interest in having clear, flexible yet protective rules and practices in place, this subject will remain a hot topic for the sub-group.

5. What about the surveys on API/PNR and on biometrics and ABC systems?

As I mentioned before, on the topics that are already occupying much of the debate for aviation-related immigration issues, we are making every effort to share experience and develop best practices, as well as to monitor how the development and application of new technologies can help Member States achieve their air transport facilitation goals. As the technological benefits are neither automatic nor a given, it is important to think about the coordinated and well-defined use of them. To this end, surveys are one of the tools we use to collect up-to-date information from Member States in order to have a precise global picture. Our experience has already proven that annual web-based surveys on immigration-related matters are a reliable and informative source to identify the issues

to be tackled. For this purpose, we encourage Member States to help us by replying to the surveys and other related requests from ECAC.

6. Some final words?

Because of the specific nature of the FAL Sub-group on Immigration, we encourage experts from both civil aviation authorities and other relevant State institutions to come and contribute to the discussions. We are looking forward to a more active participation from immigration and border control officers whose valuable opinion is very welcome at the sub-group meetings. It should be highlighted that ECAC actively encourages the involvement of non-EU States in the discussions in order to take on board a wider spread of needs and opinions. Our doors are open to new experts from Member States as well as to the participation of observer organisations. So far, we are proud to have already established a fruitful collaboration with ACI EUROPE and A4E and we will be making every effort to further expand collaboration with a large number of organisations. ∎

Meeting of the FAL Sub-Group on Immigration in March 2019, Paris.

Evgheni Kostetki joined the national civil aviation authority of Moldova in 2005. He has been chief expert for international relations, responsible amongst others for implementation of the Moldovan National Facilitation Programme since 2007, and national continuous monitoring coordinator for ICAO's Universal Safety Oversight Audit Programme (USOAP) and Continuous Monitoring Approach (CMA) activities in Moldova since 2009. Since 2017, he has been seconded to the European Organization for the Safety of Air Navigation (EUROCONTROL) as the State liaison officer. On three occasions, Mr Kostetki has been included in the national delegation representing Moldova at ICAO Assemblies Mr Kostetki was appointed as chair of the ECAC Sub-group on Immigration in 2018 having previously held the position of vice-chair for two years and having participated in the group for more than five years. He has a master's degree in international law and a degree in economics.

The Forum in 2019.

▶ ECAC hosts 6th Europe – Asia-Pacific Aviation Security Forum

ECAC and the Ministry of Transport of Singapore organised the sixth edition of the Europe–Asia Pacific Aviation Security Forum in Paris at the end of February, bringing together over 60 experts from Europe and the Asia Pacific region.

Over two days, the participants had the opportunity to exchange information and experiences on current aviation security priorities and recent developments in their regions in an endeavour to promote the global implementation of international aviation security requirements.

Held every two years, this year the Forum addressed the evolution of threats, technology and innovation, security training and culture, and cyber security and disruptive technologies. Discussions were spread across four sessions moderated by Carla Pinto (Portuguese Civil Aviation Authority), Douglas Yeo (Singapore Ministry of Transport), Hugo Porter (New Zealand Civil Aviation Authority) and Urs Haldimann (Swiss Federal Office of Civil Aviation),

The first session of the Forum looked at the evolution of threats in the regions and the approaches taken by States to address emerging challenges to aviation security. Discussions focused on insider threats, non-metallic improvised explosive devices, threats from remotely piloted aircraft systems including the measures to address them, as well as additional measures to protect passengers attending major events.

Security technology and innovation, and the operational challenges linked to the deployment of new technology were the focus of the second session. Participants considered how technology is used to support aviation security, the regulator and airport perspectives on experience gained from deployment of the latest screening solutions at airports in Europe and the Asia Pacific region, and the use of deep learning algorithms in screening equipment.

In the third session, participants discussed security training and culture as tools to further strengthen aviation security at national and entity level. They shared experiences and lessons learned on the current challenges in aviation security training, on best practices to enhance staff motivation, and on various aspects of security culture, including how to improve it at airport level, the key challenges faced by airlines in the Asia Pacific region, and the value of occurrence reporting.

Finally, the fourth session focused on cyber security and disruptive technologies. Speakers elaborated on cyber security arrangements in their own States, incident and occurrence reporting systems for cyber security in civil aviation, airport cyber security, e-commerce and its influence on aviation security, cyber security in the cargo security supply chain and ATM risks from digitalisation and artificial intelligence.

Throughout the two days, the Forum provoked lively debate and offered much food for thought. Key conclusions included: the need to constantly review and adjust mitigation measures to reflect the evolution of the threat picture; that people are security's biggest asset and that it is vital to strive to find the right conditions to keep staff motivated and trained; and the importance of sharing information amongst all partners to encourage further collaboration.

This Forum has continued to prove the immense value of international cooperation in aviation security, especially among like-minded partners. The sharing of perspectives and knowledge amongst the experts from Europe and the Asia Pacific was insightful. They provided ideas and dialogue on addressing the common aviation security challenges faced.

▶ New Zealand joins ECAC Behaviour Detection Study Group

ECAC is pleased to welcome New Zealand in an observer status to its Behaviour Detection Study Group. Under the Cooperation Agreement signed between ECAC and the Civil Aviation Authority of New Zealand, both organisations seek to strengthen, promote and develop their cooperation in the field of civil aviation security on the basis of reciprocity and mutual benefit.

On joining the group, Chris Ford, Deputy Director Aviation Infrastructure and Personnel at the CAA said, *"We appreciate and acknowledge the important guidance and support made available to New Zealand thus far via its involvement to date in the group. The relationship with ECAC in the field of aviation security is one that is immensely valued by New Zealand."*

▶ Strengthening cooperation between ECAC and regional organisation ACAO

Paris, 20 March 2019

ECAC President Ingrid Cherfils and Acting Executive Secretary Patricia Reverdy met with Director General of the Arab Civil Aviation Organization (ACAO) Abdennebi Manar on the sidelines of the 2nd ICAO European and North Atlantic (EUR/NAT) meeting of Directors General in Paris. The two parties discussed their ongoing cooperation and enhancing support between the sister regional organisations.

Kuwait, 24 March 2019

Exchanges between ECAC and ACAO continued later in the month when Ms Cherfils and Ms Reverdy visited Kuwait to meet with Chairman of the General Assembly of ACAO and President of Civil Aviation of Kuwait, Sheikh Salman Sabah Al-Salem Al-Homoud Al-Sabah, who was accompanied by Abdennebi Manar.

The discussions focused on existing and future cooperation between the two regional organisations and events to be jointly organised in the coming years. Ahead of the 40th Session of the ICAO Assembly, the two parties exchanged information on their respective priorities in the areas of safety, security, facilitation, the environment and economic matters, and the forthcoming elections of the ICAO Council and the ICAO Council President.

Rabat, 2-3 May 2019

ECAC President Ingrid Cherfils attended the Extraordinary General Assembly of its sister organisation, the Arab Civil Aviation Organization (ACAO), in Morocco at the beginning of May.

In her keynote address, Ms Cherfils highlighted the impressive progress seen in the air transport sector in the Arab States, though underlining that both regions are, and will be, faced with common challenges.

In this globalised state of play, Ms Cherfils supported ACAO's efforts to intensify cooperation and partnerships in order to promote the establishment of global standards and facilitate their implementation. She emphasised the key role regional organisations could play, driven by the mutual interests of their Member States, in harmonising policies and practices.

Member States of both organisations, as well as their African (AFCAC) and Latin American (LACAC) counterparts, will meet again in September in Montreal at ICAO's 40th Assembly.

▶ Coordinating Committee hosts United States delegation in Paris

Paris, 28 March 2019

The members of the ECAC Coordinating Committee met with a delegation from the United States authorities. Led by Hugo Yon, Deputy Assistant Secretary for Transportation Affairs, Department of State, the nine-strong US delegation comprised representatives of the Department of Transportation, the Federal Aviation Administration and the Transportation Security Administration.

The main objective of this 23rd meeting between European and US counterparts was to continue their regular exchange of views on topics of common interest, including on environmental issues, with discussions on the implementation of CORSIA and the latest developments related to supersonic aircraft.

With the 40th Assembly coming up in the autumn, ICAO-related matters were high on the agenda this year, with both delegations sharing their respective priorities in various domains, such as aviation security and safety, and their views on the ICAO Council elections.

The next formal meeting between the Coordinating Committee and the United States authorities will take place in 2021 in Washington DC.

▶ Directors General focus on European preparations for 40th ICAO Assembly at Paris meeting

Paris, 6-7 May 2019

Directors General gathered in Paris for their first meeting of the year, joined by observers EASA, the European Commission, the ICAO EUR/NAT Regional Office and JAA TO. The meeting was honoured to welcome Secretary General of the African Civil Aviation Commission, Tefera Mekonnen, invited to share his organisation's developments in view of the upcoming ICAO Assembly. Addressing delegates, Mr Mekonnen emphasised AFCAC's commitment to strengthening the cooperation and mutual understanding with ECAC and its Member States. He spoke of his appreciation of the ECAC/AFCAC collaboration on the CASE Project, which provides invaluable support to AFCAC's Member States on capacity building programmes in the aviation security field.

With the 40th ICAO Assembly taking place in September and October, a significant share of the meeting's discussions focused on the status of preparation of European papers for the Assembly. Directors General endorsed six papers: five in the safety and ATM domains and one on environment. For the first time, Directors

General were joined in their discussions by industry representatives from ASD, ACI EUROPE and IATA, who shared their organisations' priorities for the Assembly.

Annemarie Smith Floch, representative of Ireland and the ABIS Group on the ICAO Council, updated the meeting on recent developments in ICAO, including on the main outcomes of the 216th ICAO Council Session. Armand Petrescu, Director General for Civil Aviation of Romania, the current holder of the EU Presidency, presented an overview of the presidency's accomplish-

ments to date and priorities until the end of its mandate on 30 June. Pekka Henttu, Director General for Civil Aviation, Finland, provided a report on the work of the Wise Persons Group on the future of the Single European Sky, while the European Commission briefed the meeting on the latest activities in the European Commission, focusing in particular on external relations developments.

In the safety and ATM domains, EUROCONTROL and EASA shared their organisations' recent developments. Eamonn Brennan, EUROCONTROL Director General, in particular highlighted EUROCONTROL's re-appointment as Network Manager until 2030 and the recent release of the Airspace Architecture study prepared in collaboration with SESAR, which defines how Europe's airspace architecture should look in the medium- to long-term (2025-2035) and what practical steps would need to be taken to make it a reality. He also spoke of the strong coordination and engagement with industry in Europe and the joint work programme between EUROCONTROL and EASA. EASA Executive Director Patrick Ky focused his intervention on providing an overview of the measures taken following the Lion Air and Ethiopian Airlines Boeing 737-800 MAX accidents.

Preparations for the August Special meeting of Directors General in Malaga, the 12th ECAC Forum in December on the theme of environment, and the autumn 2020 ECAC/EU Dialogue with the air transport industry also featured on the agenda.

▶ Air transport liberalisation focus of 4th ICAO Air Transport Symposium

Incheon, 8-10 May 2019

ECAC contributed to the ICAO Air Transport Symposium and Conference on International Air Transport Cooperation 2019, co-hosted with the Ministry of Land, Infrastructure and Transport (MOLIT) of the Republic of Korea.

Opening the event, Kim Hyun-mee, Minister of Land, Infrastructure and Transport, spoke of the tremendous air transport growth in Korea. She was joined in the opening session by ICAO Council President Olumuyima Benard Aliu and Guyana's minister responsible for aviation in the Ministry of Public Infrastructure, Annette Ferguson.

Held every three years, the 2019 edition of the conference focused on air transport liberalisation, assessing the current state of play and exploring the issues of safeguards, cross-border investments, regulatory convergence and the impact of levies.

Gabrielle Hubler, ECAC's Communications Officer, participated in a session examining regional experiences of liberalisation, with contributions from Australia, Canada, Chile and Guyana and perspectives from the International Transport Forum and Air Busan. Ms Hubler presented the European approach to liber-

alisation since the deregulation of its domestic market in the 1990s. She emphasised the need to reform ownership and control restrictions in order to promote the development of air services agreements on a liberal basis.

▶ Portugal hosts ECAC Security Forum in Lisbon

Lisbon, 28-29 May 2019

The 27th meeting of the ECAC Security Forum, held in Portugal, gathered experts from 20 ECAC Member States, the United States and organisations.

The importance of threat and risk assessment in relation to the emerging threat posed by Remotely Piloted Aircraft Systems (RPAS) was discussed at length. The meeting emphasised the need for cooperation between States and for possible response protocols against a range of potential attack scenarios, as well as the need to test and use technology-oriented solutions and to further develop regulations and standards.

Presenting their work priorities for 2019, participants highlighted: challenges related to implementing new enhanced background checks and vetting, cyber security, security culture, challenges related to RPAS, insider threat, explosive detection dog certification, landside security, in-flight supplies and the deployment of new screening technology.

The results and lessons learnt following the trials and installation of explosive detection systems for cabin baggage technology across Europe and globally were noted, and the meeting discussed the advantages, challenges, policy development and implementation process in relation to the use of this technology.

Participants acknowledged the valuable work being carried out by all the ECAC task forces and security groups, and in particular the Guidance Material Task Force and the Training Task Force, and thanked the members and chairs for their valuable input.

▶ News from the ECAC Secretariat

ECAC welcomes new staff members

MARA KELLER joined the Secretariat on 18 March as Air Transport Officer. Prior to joining ECAC, Mara worked for six years in economic development at the ICAO Secretariat in Montreal. Before joining ICAO, she worked in governance and programme management at Lufthansa Technik, and previously completed a traineeship at EASA. In the Secretariat, Mara will be supporting ECAC's activities and groups in the fields of economics, facilitation, legal issues and Remotely Piloted Aircraft Systems. Mara looks forward to working with ECAC Member States and, after many Canadian winters, to summer in Paris!

GAËL WEIDMANN joined the security team on 1 April as Aviation Security Technical Officer. Gaël will be managing the ECAC Common Evaluation Process (CEP) of security equipment as well as other security-related activities, including the Technical Task Force, the Cyber Security Study Group and the Explosive Detection Dogs Study Group. After working in the medical industry, Gaël worked at the French Directorate General of Civil Aviation for seven years as head of the security lab and as international cooperation technical expert for the Security and Defence Department.

KIRSI TERVOLA-JOUTSEN from the Finnish Transport and Communications Agency Traficom joined the ECAC Secretariat on 15 April for a six-month secondment in the facilitation field. Kirsi has seven years' experience working with EU passenger rights and is specialised in the rights of passengers with reduced mobility (PRMs). Before joining Traficom, she worked for SAS Ground Handling. During her secondment, Kirsi will be in charge of a PRM pilot programme that aims at supporting ECAC Member States in monitoring the implementation of ECAC Doc 30 recommendations on the transport of persons with disabilities and persons with reduced mobility. *"I am really happy to be working at ECAC and especially on this project. I hope many Member States will join the forthcoming PRM pilot programme!"*

▶ Events to come

AUGUST

28/ 9th meeting of the European Safety and Air Navigation Coordination Group (ESANCG/9), Brussels

29/ Informal meeting of the ECAC Coordinating Committee, Malaga

29-31/ 68th Special meeting of Directors General (DGCA(SP)/68), Malaga

30/ 37th Plenary Session (ECAC/37), Malaga

SEPTEMBER

4-5/ 48th meeting of the Guidance Material Task Force (GMTF/48), Istanbul

6/ 36th meeting of the Legal Task Force (LEGTF/36), Paris

10/ 10th meeting of the European Safety and Air Navigation Coordination Group (ESANCG/10), Brussels

10-11/ 33rd meeting of the Study Group on Cyber Security in Civil Aviation (CYBER/33), Paris

12/ 64th meeting of the Facilitation PRM Sub-group (FAL-PRM sub-grp/64), Paris

13/ 13th meeting with FAL-PRM experts and FAL-PRM Sub-group, Paris

17/ 48th meeting of the Facilitation Immigration Sub-group (FAL-IMMIGRAT sub-grp/48), Paris

17-18/ Behaviour Detection Study Group Research and Development Workshop, Romania

EaP/CA IN BRIEF

▶ First Best Practices for National Auditors - Level 1 training courses organised for EaP/CA States

Kiev, 4-8 February 2019
Riga, 18-22 February 2019

Two Best Practices for National Auditors – Level 1 training courses were organised for the first time by ECAC for the benefit of EaP/CA Partner States. The courses were held from 4 to 8 February in Kiev (Ukraine) and from 18 to 22 February in Riga (Latvia). Seventeen participants from Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan and Ukraine attended both courses.

Through a combination of training techniques, including practical exercises at Kiev and Riga airports, participants became familiarised with best practices in auditing techniques and European requirements in key areas of aviation security, including access control, passenger and cabin baggage screening and hold baggage security. The training courses also enabled participants to gain a better understanding of their role and responsibilities as national auditors and strengthen their competencies in conducting national compliance monitoring activities in the field of aviation security.

The training was organised in close cooperation with the appropriate authorities of Ukraine (State Aviation Administration) and Latvia (Civil Aviation Agency), which hosted the courses, facilitated the organisation of on-site exercises and provided English-Russian translation in order to ensure the best learning conditions for participants. The ECAC Secretariat thanks both States for their cooperation.

▶ Best practices training for national auditors in Ukraine

Kiev, 18-22 March 2019

The third Best Practices for National Auditors - Level 1 training course was organised in Ukraine for the benefit of EaP/CA Partner States. Ten security experts from Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Tajikistan and Ukraine attended the course.

Over five days, participants reviewed best practices in auditing techniques and European requirements in key areas of aviation security, including access control, passenger and cabin baggage screening and hold baggage security.

"The BPNA/1 course has allowed me to gain useful knowledge on how to plan and conduct audits and inspections, as well as how to draft meaningful reports and recommendations for rectification measures," said Mirzaian Kashkariev, a national auditor attending the course from the Ministry of Roads and Transport in Kyrgyzstan.

Our sincere thanks go to the State Aviation Administration of Ukraine, which offered the facilities, facilitated the organisation of on-site exercises and provided English-Russian translation to ensure the best learning conditions for participants.

▶ EASA hosts EaP/CA Project Technical Board Meeting

Cologne, 4 April 2019

The EaP/CA Project Technical Board, comprising representatives of the European Commission, EASA and ECAC, along with ICAO in an observer capacity, met at EASA's headquarters in Cologne on 4 April. The meeting acknowledged the progress made in implementing the Project to date and discussed the activities to be planned for the coming months. On the security component, the meeting heard an overview of the activities already undertaken and discussed ECAC's capacity-building actions for the current year, including two workshops on security equipment (Paris, 9-11 July 2019) and quality control in aviation security (Paris, autumn 2019) following specific requests from EaP/CA beneficiary States. The effective cooperation between all the parties involved was acknowledged as being crucial in efficiently implementing the Project in the Partner States.

▶ Mentoring activities

In the framework of the EaP/CA Project, ECAC continues to organise mentoring activities for national experts to review their national aviation security legal frameworks and provide proposals to amend and develop their regulatory requirements, taking into consideration ECAC Doc 30 and ICAO Standards and Recommended Practices (SARPs). These activities also focus on reviewing National Civil Aviation Security Programmes, National Civil Aviation Security Training Programmes and National Civil Aviation Quality Control Programmes.

Since February, three activities have been delivered in:
> ***Paris, 11-12 March 2019*** for experts from Azerbaijan and Kyrgyzstan;
> ***Dushanbe, 23-25 April 2019*** for experts from Tajikistan;
> ***Yerevan, 21-23 May*** for experts from Armenia.

ASSOCIATED BODY OF ECAC

News from the JAA Training Organisation (JAA TO)

▶ JAA TO reflects on their innovative role in aviation training

Innovation is a deeply ingrained concept within JAA TO. This quarter, several ICAO Training Packages (ITPs) were delivered at the JAA Training Organisation – introducing new and developing concepts in the field of aviation. For the first time, the ICAO Training Package: Aviation Data-Driven Decision Making (A3DM) was hosted in Europe, by JAA TO. This course helps professionals generate, interpret and make decisions as evidenced by data.

As of 1 July 2019, JAA TO relocates to a new training centre with more space, upgraded facilities and more opportunities delivering value to the visitors and

professionals who learn with JAA TO. The new training facilities signify an important milestone enabling the organisation to level up as the leading learning and knowledge centre for aviation professionals and the trusted training body of the European Civil Aviation Conference (ECAC).

With innovation so deeply rooted at JAA TO, this section will elaborate on how JAA TO facilitates innovation in aviation regulatory training. It will also provide an in-depth look into an upcoming course in one of the more innovative technical areas of aviation today – Unmanned Aircraft Systems (UAS).

▶ How to facilitate innovative aviation training

Capacitating aviation professionals effectively does not stop at the classroom. Delivering real value to professionals with training involves observing the entire training experience. 1 July marks the first day JAA TO opens the doors to the new state-of-the-art training facility. JAA TO reached out to ECAC vice president and chairman of the JAA TO Foundation Board for his perspective on the relocation:

Alessio Quaranta, Chairman of the JAA TO Foundation Board, ECAC Vice President, Director General of the Italian Civil Aviation Authority (ENAC)

"JAA has come a long way from its founding objective back in the 1970s. I believe we have really developed in concert with the needs of the aviation field. I joined as chairman of the JAA Training Organisation's Foundation Board shortly after it started operating exclusively as a training organisation and am delighted that we've been able to grow to this point. With the recent expansion, JAA TO is taking this opportunity to create a space for learning unlike anything else that exists in regulatory aviation training today. I've always had pride in the quality JAA TO has been able to deliver through its courses, and to be able to deliver these in an environment that meets the same quality for highest standards is going to make JAA TO even more effective at what it does."

The importance of innovation in training

Innovative solutions in aviation training are more important today than they were ever before. The International Civil Aviation Organization (ICAO) has estimated that all air transport activities are expected to double over the next 15 years. Along with that growth comes the need for experienced and skilled talent – and the aviation community is concerned whether they can keep up.

In regulatory training specifically, training courses are still generally developed in reaction to a continuously changing aviation landscape. Regulations and Standards and Recommended Practices (SARPs) are constantly being revised to address new circumstances, and aviation organisations face the challenge of delivering training that they can reliably scale with their growth.

Delivering predictive training

After nearly a decade of experience training aviation professionals, and after witnessing the rudimental transformations within the aviation community in that time, JAA TO has succeeded delivering relevant training by predicting the training needs of professionals, rather than by reacting to them.

By predicting the possible challenges that arise as a result of upcoming or existing regulation, JAA TO enables a thorough identification of overall training needs and a clear direction on adding real value to aviation professionals and, ultimately, their organisations.

These predictions are achieved thanks to the close relationship JAA TO maintains in the aviation community. Its Business and Course Development Units work in close collaboration with an international network of regulatory bodies, civil aviation authorities and subject matter experts with practical experience in their sector.

It is worth highlighting that JAA TO is one of the few – if not the only – training providers in Europe to employ business development and intelligence talent. This intelligence provides JAA TO with critical insights into the aviation market, which guide the needs of the aviation professionals being trained.

▶ Update: JAA TO begins development on the first ICAO Training Package about drones

In April 2019, ICAO's Global Aviation Training office (GAT) officially confirmed its approval for JAA TO to proceed with the development of a new ICAO Training Package (ITP) on drone regulation. This is an evidential example of the JAA TO innovative methodology aforementioned, since drone operation rules were only adopted by the European Commission on 24 May 2019.

To discover the impact of this regulation, JAA TO sits down with Filippo Tomasello, instructor and faculty manager on Unmanned Aircraft Systems (UAS), regarding the impact which UAS as a technology is having on aviation regulations.

The wide applicability of drones

The most common perception society has of UAS is that of military applications. However, the concept of a UAS can be utilised in many capacities, serving different sectors. The majority of UAS are utilised for digital information collection – whether that be for commercial use, municipality surveying, investigating high-risk environments, or recreational use.

This technology of many applications poses a serious challenge when it comes to regulation. Civil aviation authorities (CAA) will need to approach regulating UAS with a different perspective than how it has been done to address every concern. Tomasello predicts that regulatory bodies will need to adopt "performance-based" and "risk-based" approaches to regulation – both of which JAA TO intends to introduce in the new ITP.

The impact on aviation training

The JAA TO faculty manager further states that he foresees a disruption in the way aviation training is conducted as drones become more commonplace. *"Practical skill training for small UAS will not be as important as competency-based training. When dealing with drones, pilots will need psychological training, security*

training and privacy awareness, so that they know how to use the technology responsibly."

This trend towards competency-based training is not unique to small UAS. It is in fact the approach ICAO has taken for licensing of remote pilots of large civil remotely piloted aircraft in the amendment to Annex 1 of the Chicago Convention, which will become applicable in 2022.

Furthermore, in developing aviation sectors, such as those that are environment and sustainability focused, this type of training is essential. The focus of developing competencies is necessary to ensure that aviation professionals make responsible and effective decisions while on the job.

The new ITP will hence focus on the competency-based approach for training of remote pilots – both for large (i.e. standardised by ICAO) and small UAS.
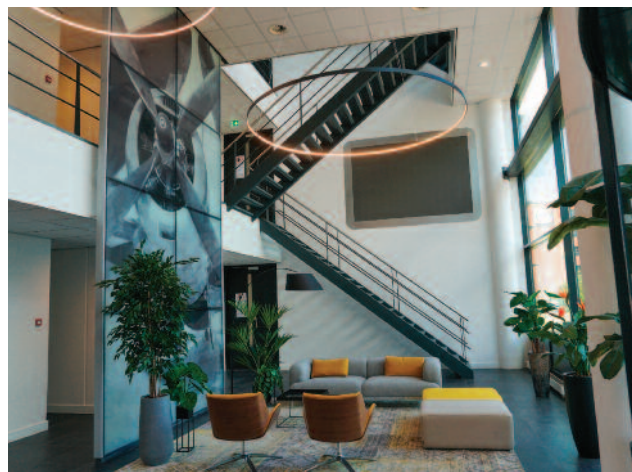

If your organisation or CAA is interested in requesting support from the JAA Training Organisation in preparing for your annual training plan, including the development of customised training courses to take place at your location, please get in touch with the JAA TO Training team.

For more information, visit: https://jaato.com/trainingoutside

▶ JAA TO relocates to Schiphol-Rijk!

After 28 years of JAA history in the Dutch town of Hoofddorp, JAA TO is relocating its operations to Beechavenue 1-19, Schiphol-Rijk – even closer to Amsterdam International Airport.

For more information on the new training centre, please visit : https://jaato.com/news/JAATO_Relocating _Schiphol_Rijk/