AUTONOMOUS OPERATIONS
Preparation the ATM industry for disruptive change

INTERVIEWS
Dr. Olumuyiwa Benard Aliu, President of the ICAO Council
Teri Bristol, CANSO Chair
Azat Bekturov, Director General, Kazaeronavigatsia

SPOTLIGHT
Cybersecurity
Letter from Europe
10 years of Airspace
Performance-based communications and surveillance
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This edition marks the 10th anniversary of Airspace magazine. It was launched to inform both CANSO Members and the wider aviation community – airlines, airports, and manufacturers – about the key issues and challenges facing the ATM industry. Tackling high-level policy discussions and featuring senior industry interviews and in-depth articles on technology and operations, it has become a must-read for individuals across the ATM and aviation industries.

Over the past 10 years, Airspace has sought to reflect the changing face and progress of the ATM industry. Looking back at early editions, it is impressive to see how far we have come but also interesting to see how many issues continue to challenge us. Understandably we are still progressing complex, long-term initiatives like the Single European Sky and NextGen but we can also see that in other areas, the pace of change has really increased. Articles looking at integrated glass towers have given way to ones on remote and digital towers; news on way points has been replaced by free route airspace developments; and discussion is on space based ADS-B rather than modernising radars.

Overall the aviation and the ATM industries are in far better shape than they were in 2008. Back then the economic slump saw traffic down 6%, high oil prices and airline industry losses of $5 billion leading to reduced revenues for ANSPs, increases in ATM charges and redundancies in ANSPs. Now we have just seen the best ever year for airlines with profits forecast at over $38 billion for 2018 and a healthy forecast growth in passenger traffic to 4.3 billion. The air traffic management industry has risen to the challenge of safely handling traffic growth of over 5% a year by constantly striving to improve efficiency, productivity, innovation and safety performance – as highlighted in CANSO’s latest Global Air Navigation Services Performance Report and safety benchmarking work.

A decade ago airlines, airports and ANSPs were constantly complaining about each other and there was a distinct lack of understanding. Now all parts of the industry work with a greater sense of partnership across a whole range of issues from enhancing safety to improving the efficiency of airspace to tackling challenges such as new entrants to airspace.

There is no doubt the industry has changed and adapted significantly since we first started producing this magazine. Like the industry it supports, Airspace is constantly adapting and improving to meet the changing demands of its readership. It has become an authoritative source of information on trends and technologies in ATM, and we are proud to share our 10th birthday edition with you. So please, continue reading, keep sharing your views and look forward to a bright and exciting future for ATM.

Jeff Poole
CANSO Director General
Taking centre stage

Teri Bristol, CANSO Chair, and Chief Operating Officer of the Federal Aviation Administration’s Air Traffic Organization, says CANSO’s ability to influence the future direction of ATM has never been greater.

What are your aims during your time as CANSO Chair?

My objective is to build on the hard work and progress of my predecessors. We need to find new and creative ways to add further value to CAnso Members.

There have already been developments in this area. CANSO has been able to tap into service niches with projects such as the CANSO ATFM Data Exchange Network for the Americas (CADEnA) and the Standard of Excellence in Air Navigation Service – Safety (SEANS-Safety). The value these projects represent is clear and that is something members can support.

My goal is to help CANSO capitalise on the good work it is already doing.

How can CANSO best maintain its relevance to Members and continue to deliver benefits?

CANSO’s greatest strength is its ability to adapt to the changes in the industry. That is how it maintains its relevance and ensures Members see the advantages in the organisation.

There is great clarity in the work CANSO is doing and the guidance material it is producing. There are roadmaps that provide paths to success that all ANSPs can navigate, no matter how big or small.

CANSO needs to ensure that open dialogue continues. It is important for Members to communicate with CANSO, so we can understand what they are thinking and the ways in which we can further support them. A lot is happening in this regard and on 5 March there will be a CANSO CEO Strategy Summit that will look specifically at ensuring Members continue to derive value from CANSO.

Are Associate Members important to the future of CANSO and what role would you like to see them playing?

From 2017, the representation of Associate Members increased from one to two on the CANSO Executive Committee (ExCom). This indicates how important Associate Members are to CANSO and that importance is only going to grow.

Associate Members have added tremendous value to internal discussions on the ExCom and have driven renewed interaction with all Associate Members. They also bring a wealth of experience that traditional ANSPs may not have. It adds a different dynamic.

It is important for Members to communicate with CANSO, so we can understand what they are thinking and the ways in which we can further support them. A lot is happening in this regard and there will be a CANSO CEO Strategy Summit that will look specifically at ensuring Members continue to derive value from CANSO.
to CANSO and I am sure we will see more companies joining as Associate Members in the future.

How is CANSO keeping up with the fast-changing developments in the ATM industry? Will new entrants, increasing competition, advances in technology, and changing business models be disruptive?

CANSO’s focus is always on safe and efficient airspace for all users. That will not change. But clearly, new entrants such as drones bring new models of air navigation service delivery and new technologies.

Currently, the operating parameters of traditional airspace users are well understood, as is the regulatory framework. New entrants are challenging that paradigm. The vehicles used are often unique in their operating dynamics, especially compared with conventional aircraft.

That means we need to look at a number of regulatory areas, such as access prioritisation, communication and navigational standards; all the while ensuring safety is never compromised.

As for ANSP business models, CANSO has no preference for any particular model. We know that some ANSPs will corporatise and some never will. CANSO’s structure allows us to deliver value no matter what the governance of its Members.

As the global voice of air traffic management, how does CANSO influence the development of policy, regulations and best practice?

CANSO is the focal point and voice of ATM. As such, it has the ability to keep all the key players engaged, including airports, airlines, governments, and such industry bodies as Airports Council International, International Air Transport Association and ICAO. The aim is to leverage capabilities and goals to support continued harmonisation in the industry.

CANSO is able to spotlight where the industry is now and where it needs to go. Through the relationships it has with all stakeholders, it is ideally placed to influence the development of the industry on a global basis.

What do you see as being the major challenges for ATM?

Integrating new entrants and new technologies into existing airspace is an ongoing challenge. Everyone involved in ATM wants to build on the industry’s exemplary safety record.
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MEET THE TEAM
Upper airspace, above 60,000 feet, is an emerging focus as well. Activity in this segment of airspace is expected to rise with the advent of commercial space transport. The traditional airspace ownership and management structure will not necessarily hold true here.

New entrants and new technologies are moving faster than regulation. To ensure we maintain that safety record, we must be even more nimble.

The industry has to be proactive and look at how implementation strategies can be harmonised and brought into the regulatory framework more quickly. New entrants have access to many resources and will not accept the status quo.

In the US, for example, local governments are very interested in drones. The Drone Advisory Committee (DAC), a 35-member body comprised of airlines, airports, government and third parties, as well as the Federal Aviation Administration, is wrestling with what this involvement might look like. The path forward has yet to be defined.

Upper airspace, above 60,000 feet, is an emerging focus as well. Activity in this segment of airspace is expected to rise with the advent of commercial space transport. The traditional airspace ownership and management structure will not necessarily hold true here.

Do you see technologies from outside the industry as an opportunity or a threat?

I see technology from outside the industry as an opportunity. As one of my colleagues is fond of saying, “nothing worth doing is ever easy”. But this goes back to why CANSO is so important. Its long-standing collaboration with a number of partners means that most technologies that will have an impact on the industry – such as artificial intelligence – are on its radar. That will help promote global interoperability.

Of course, different parts of the world will need different solutions. Partnership is a way forward for modernisation in general.

What progress do you see towards the development of seamless airspace globally?

A global seamless sky is the goal we all want to achieve. Airspace is complex with a number of factors involved, political as well as technical. You cannot just flip a switch.

CANSO needs to be prepared with strategies to address the differences in each region which are driven by socio-economic issues, differences in aviation growth, and key differences in ATM needs.

In time though, all things are possible. And the best progress will come through CANSO taking centre stage, promoting safety and efficiency.

Has the structural change in the US airline market – consolidation – affected ATM strategy or timelines?

We are certainly not seeing any of the timelines involved in NextGen implementation lengthen as a result of airline consolidation. If anything, the timelines are shortening. There are obviously fewer divergent views. Agreement and implementation is easier to achieve.

The overall strategy has not changed either even though we are seeing some differences in traffic flow. As an example, traffic in the Midwest is down, but in California and across the south it has increased.

Again, though, it is all about partnerships. Through collaborative decision-making, we engage with all relevant stakeholders regularly, even hourly when the need warrants. It is all about having the right conversations at the right time.

How challenging has it been to align NextGen with European initiatives, such as the SESAR Joint Undertaking?

There is a strong relationship with the SESAR JU. A State of Harmonisation report is publicly available, and we will be publishing an update in advance of the October 2018 ICAO Air Navigation Conference. Information management, trajectory management, data communications and surveillance are all areas where we have worked together.

We conduct regular meetings on both sides of the Atlantic and these continue to explore the initiatives planned and how we can contribute to each other’s success.

Teri Bristol will be participating in the conference of World ATM Congress 2018. Find out more at worldatmcongress.org To learn about the benefits of CANSO membership visit canso.org

A global seamless sky is the goal we all want to achieve. Airspace is complex with a number of factors involved, political as well as technical. You cannot just flip a switch. In time though, all things are possible. And the best progress will come through CANSO taking centre stage, promoting safety and efficiency.
safety and flight efficiency are paramount to us
The implementation of air traffic flow management (ATFM) is one of the priorities under the ICAO Global Air Navigation Plan (GANP) and requires a determined collective effort.

To help improve awareness and openness to its benefits and needs, ICAO gathered more than 260 experts in Singapore last November for our very first Global ATFM Symposium.

It was hosted by the Civil Aviation Authority of Singapore (CAAS) and with important support and contributions from Civil Air Navigation Services Organisation (CANSO), International Air Transport Association (IATA), EUROCONTROL and the Federal Aviation Administration (FAA).

A key takeaway for ICAO from this successful event was that ATFM is no longer of interest to air navigation service providers exclusively. Very clearly it has now also become a key priority for airport operators, airlines and airspace users, and for State regulators as well.

This variety of participants reflects the growing understanding that air traffic flows can only be managed transparently and cooperatively. And while the event focused on many challenges specific to the ICAO Asia and Pacific (APAC) region, its outcomes and conclusions were largely valid at the global level as well.

Practice makes perfect

A key point here though is that talking about the need for ATFM collaboration is one thing – but putting that talk into practice can be very complex and challenging. Addressing those complexities was what our Global ATFM Symposium was specifically designed to kick start.

There are a variety of ATFM projects now ongoing globally, but in virtually every instance States need to be exchanging and collaborating much more to make ATFM a truly operational reality.

Our symposium last year underscored the urgency of these needs, and we sought to inspire its participants to return home with a wealth of new ideas regarding their local solutions.

A key point is that talking about the need for ATFM collaboration is one thing – but putting that talk into practice can be very complex and challenging.

Ultimately, future air traffic management systems need to safely and efficiently accommodate more aircraft, reduce delays, and provide the predictability that airspace users need to organise their operations.

To truly work together and be efficient, a key first step at this stage is to resolve a common ATFM data format so that States can talk to each other and share related advice with the dependability and frequency that will be necessary.

At the same time, common procedures are needed between States to avoid situations where a flight or a given traffic flow could be subject to conflicting ATFM demands.

Continuous innovation

All of this is virgin territory in terms of procedures and information sharing, but what is very clear is that the solutions required must be arrived at through consensus and in a manner which challenges some of our more traditional understandings of sovereignty in the civil aviation context.

As a specialised agency of the United Nations, ICAO could not be better placed to guide that transition.

Looking ahead, we also have to accommodate the need for continuous innovation and consider that what we contemplate in terms of ATFM requirements today will likely change dramatically as new unmanned or other high altitude air transport operations begin to come online.

There are also related concerns regarding cybersecurity and cybersafety, which present a challenging and evolving threat and risk context for us to deal with.

Ultimately, future air traffic management systems need to safely and efficiently accommodate more aircraft, reduce delays, and provide the predictability that airspace users need to organise their operations. The simple truth is that it is impossible to meet those expectations without a practical and reliable flow management capability.

Dr. Olumuyiwa Benard Aliu is participating in the conference of World ATM Congress 2018. Find out more at worldatmcongress.org
Kazakhstan is the largest landlocked country in the world. At some 2.7 million square kilometres, it is roughly the size of Western Europe. That makes air transport absolutely vital.

Kazaeronavigatsia was established in 1995 to manage the country’s vast airspace and it has used the two decades since to make major improvements. It now boasts one of the most advanced and modern air navigation systems in the Commonwealth of Independent States.

But this is just the beginning, says Azat Bekturov, Director General of Kazaeronavigatsia. “In December 2015, we adopted a long-term development programme, to run until 2025,” he informs. “This identified opportunities for organisational, economic, and technical improvement to ensure the continued effective use of airspace.”

Greater flexibility

Performance-based navigation (PBN) is the centrepiece of the development. A working group has been established, and consultations are being held with international organisations, such as ICAO and IATA, and with the ANSPs of neighbouring countries.

By the end of 2018, required navigation performance, part of PBN, should be operational in upper airspace. This will give overflights

Improvement in the skies is also helping home airline, Air Astana. The airline will have a fleet of 35 aircraft by 2020 and plans to expand its network to link the Kazakh capital, Astana, with major financial centres, including Dubai, Hong Kong, Tokyo, Singapore and New York.
greater flexibility, making Kazakhstan more attractive to those airlines flying between Europe and Asia.

“The next step will be the flexible use of airspace,” says Bekturov. “From 2020, free routing is planned, allowing airspace users to develop their own preferred routes. At the same time, we will upgrade the climb and descent procedures to continuous climb and descent (CCO/CDO). This will reduce an aircraft’s fuel consumption and CO₂ emissions.”

Kazaeronavigatsia also plans to implement the Global Navigation Satellite System (GNSS), beginning in 2018. By 2020, it is envisaged this will transition to being the mainstay of the organisation, bringing some relief to the costly maintenance of hundreds of ground facilities.

Secondary radar will be supplemented with automatic dependent surveillance – broadcast (ADS-B). Decommission of secondary en-route radars will begin in 2020 as ADS-B gradually takes over.

Going digital

A lot of work has also been done on the digital side of the business. Since 30 March 2017, the Aeronautical Information Publication (AIP) has been in electronic format and, further ahead, all forms of information exchange will be automated. Moreover, to reduce the human factor in the provision of air navigation services, data integrity and quality control mechanisms are being implemented.

“Digital NOTAM and automated pre-flight information systems, with unified access to aeronautical and meteorological information for self-briefing, are also being developed,” says Bekturov. “By 2019, there will be electronic air navigation charts. Work is also underway to introduce electronic data on terrain and obstacles.”

In addition, an Internet flight scheduling system will allow the prompt submission and editing of flight plans and the calculation of flight routes. This will be supplemented by automated billing so Kazaeronavigatsia can promptly bill airspace users.

All these measures are aimed at the complete automation of information provision, the reduction of manual data entry and the simplification of procedures.

Supporting training

Kazaeronavigatsia’s training centre in Astana is available to the entire civil aviation industry. In April 2016, it became a full member of the ICAO TRAINAIR PLUS program, which means all aviation personnel trained at the centre use standardised programmes approved by ICAO, resulting in certification recognised around the world.

The October 2017 ICAO Aviation Training Symposium and TRAINAIR PLUS was held in Kazakhstan, the first time the country has hosted the event. “It was an opportunity for Kazakhstan to contribute to the further development of the aviation industry in the Eurasian continent,” says Bekturov.

Like much else, the training centre is being modernised. Work has begun on the construction of a new facility in Astana, which will comply with international best practice and set the tone for the future of Kazakh ATM.

Flight flexibility

Bekturov accepts that all the work requires considerable investment, which has to be paid for using the net profit of Kazaeronavigatsia.

But the advantage of being at the crossroads of the European-Asian air transport market is the potential for increasing overflight revenues.

Since 1995, the length of available transit air routes has increased almost tenfold – from 8,900 km to 82,600 km. More than 50% of air traffic volume in Kazakhstan is transit flights in upper airspace.

One of the most promising areas for increasing transit flights is the development of a network of non-stop flights from the Gulf countries, India and Pakistan to the US and Canada using cross-polar routes.

The work is being done in conjunction with Russian colleagues, and serves airlines like Emirates, Air India and Pakistan Airlines connecting Dubai, Delhi and Islamabad to Los Angeles, San Francisco, Seattle, Toronto and more.

Improvement in the skies is also helping home airline, Air Astana. The airline will have a fleet of 64 aircraft by 2026 and plans to expand its network to link the Kazakh capital, Astana, with major financial centres, including Dubai, Hong Kong, Tokyo, Singapore and New York.
## Departures

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Kazakhstan borders Russia, China, Kyrgyz Republic, Uzbekistan, Turkmenistan and Azerbaijan. Some 73 air corridors go across borders with neighbouring countries, mostly Russia (30 routes) and the Republic of Uzbekistan (30 routes).

“The key point is that there are no constraints on the constant growth of traffic for all airlines, including Air Astana,” says Bekturov. “The available airspace capacity is much higher than the actual volume of air traffic served.

“Airlines will have more flexibility for flights on more direct routes, which will improve the efficiency of flights by reducing route length and approach paths. Furthermore, there is a flexible tariff policy that gives airlines with individual tariff exemptions when opening new regular routes.”

The drive to increase transit flights is part of a national programme of infrastructure development ‘Nurly Zhol’, running 2015-2019. Following a meeting in early 2017, further actions were identified. These actions comprise airport development, the provision of jet fuel at competitive prices and at the required amount, and the provision of a joint package of discounts for airlines. All work is being carried out in conjunction with the relevant airport partners.

Kazaeronavigatsia is also working with the Ministry of Defence on the effective use of restricted airspace, and with the Ministry of Foreign Affairs on reorienting foreign airline flights passing through territory of the Republic of Kazakhstan.

Neighbourhood watch

The enhancement of transit flights naturally brings Kazaeronavigatsia into close contact with its neighbours.

Kazakhstan borders Russia, China, Kyrgyz Republic, Uzbekistan, Turkmenistan and Azerbaijan. Some 73 air corridors go across borders with neighbouring countries, mostly Russia (30 routes) and the Republic of Uzbekistan (30 routes).

Thoughts on the future

Bekturov says remote tower technology will feature heavily in Kazaeronavigatsia’s development plan. “I recently attended the launch of a remote tower in Budapest, and was impressed with what I saw,” he reveals. Implementation will begin with a pilot in Almaty.

“This system will reduce the cost of constructing control towers and maintaining air traffic controllers at small aerodromes, and improve the efficiency of ATM,” believes Bekturov.

Changing the traditional model of managing sovereign airspace is not on the agenda, however. Bekturov describes the existing system as “effective”.

He says airspace, like land and natural resources, is part of the wealth of a country. And the sovereignty of airspace is also an important aspect of national security.

“At the same time, airspace efficiency requires harmonised development with ANSPs regionally and globally,” he adds. “All technologies that are being introduced are proving effective. Of course, the scope is conservative because of the main priority, which is ensuring flight safety.”

We all work in one region, Eurasia,” says Bekturov. “We have a common structure in air traffic flow, which means we need to coordinate. The effectiveness of air traffic is largely determined by the interaction of ANSPs; the harmonisation of rules and procedures for planning and servicing air traffic; and the technical support for flights.”

Key to cooperation is the Eurasia Coordination Council, which was established in 1999 to increase airspace efficiency. Additionally, a regional group of ANSPs has been established in Central Asia, comprising ANSPs from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

“And the Eurasian Economic Commission is considering a common air transportation market between the Eurasian Economic Union (EAEU) countries (Russia, Kazakhstan, Kyrgyzstan, Armenia, Belarus), specifically the application of non-discriminatory tariff conditions, and the definition of entry/exit points,” informs Bekturov.

Greater agility

The main tasks on a regional level are harmonising the rules for the use of airspace, reducing bureaucratic barriers, and implementing new technologies. To that end, work has been going on for several years on establishing the Vostok international air navigation system.

Vostok enables greater agility for all participants by simplifying the reception and processing of flight plans. At the 33rd Eurasia Coordination Council in 2017 in Sochi, members agreed the establishment of Vostok. The functioning and structure of the management organisation has been proposed and sent to the respective governments for the signing procedure.

“The air traffic management system needs constant development, and the introduction of new technologies that will allow airlines to fly with even greater safety and efficiency,” concludes Bekturov. “Our company is working in this direction, and is striving to become the most effective ANSP in the Eurasian region.”

The enhancement of transit flights is vital.
Autonomous operations are getting closer and the ATM system needs to be ready to accommodate them.

About 60 years ago, it was not unusual to see a crowded cockpit – two pilots, a flight engineer, a radio operator and a navigator might all be squeezed inside. The radio operator and navigator were soon phased out, followed a couple of decades later by flight engineers. Pilots, autonomous operations – therefore seem inevitable. Indeed, the next step – reducing the cockpit to a single pilot – is already underway.

One pilot

The growth of air traffic, leading to the requirement for a correspondingly large number of pilots, is a strong driver behind the move to single pilot operations. Boeing’s estimate of some 640,000 pilots needed in the next two decades far outweighs the number of pilots trained since commercial air travel began.

Moving to a single pilot would entail a cockpit redesign, so that all controls are accessible. It might also involve a remote-control pilot on the ground, in case of emergencies, who would monitor a number of flights at the same time.

Despite the disruptive nature of this change, a number of companies are pursuing options, including Airbus and Boeing. Both are exploring artificial intelligence that will ultimately enable autonomous operations.

Will the public accept it?

An August 2017 UBS Evidence Lab Survey of 8,000 people found that 54% would be reluctant to take a pilotless flight, with only 17% welcoming the opportunity.

Perhaps unsurprisingly, younger participants between the ages of 18 and 34 were the most positive, with 30% willing to try out the experience. UBS believes that this indicates that acceptance would grow over time.

And time is something that pilotless planes has, according to the bank. It noted “design, security and technological challenges” surrounding the concept as well as the need for more regulation in this area.
In-cockpit machine vision, robotic components to actuate the flight controls, an advanced user interface and speech recognition and synthesis are all part of the ALIAS technology. It also features a knowledge acquisition process that facilitates transition to a new aircraft type in less than one month thanks to an understanding of aircraft procedures and general airmanship.

Airbus Chief Technology Officer, Paul Eremenko, has admitted the company is looking to develop autonomous aircraft, helping to cut costs for carriers and improve safety. “We’re pursuing single-pilot operation as a potential option and a lot of the technologies needed to make that happen has also put us on the path towards unpiloted operation,” he said.

Meanwhile, Boeing-owned Aurora Flight Sciences’ Aircrew Labor In-Cockpit Automation System (ALIAS) program has been successfully tested in a Boeing 737 simulator. ALIAS functions as a second pilot in a two-crew aircraft, with the aim of promoting high levels of automation in existing aircraft.

In-cockpit machine vision, robotic components to actuate the flight controls, an advanced user interface and speech recognition and synthesis are all part of the ALIAS technology. It also features a knowledge acquisition process that facilitates transition to a new aircraft type in less than one month thanks to an understanding of aircraft procedures and general airmanship.

What else is out there?

Aviation is awash with ideas for autonomous operations from high-altitude solar planes providing Internet access to low altitude taxis taking customers to do their shopping and drones delivering humanitarian aid.

Airbus is developing an autonomous air taxi known as Vahana, intended for short urban hops. It is designed to take off and land in tight spaces and has a range of about 50 miles.

Meanwhile, in early January 2018, Boeing unveiled a new unmanned electric vertical-takeoff-and-landing (eVTOL) cargo air vehicle (CAV) prototype that will be used to test and evolve Boeing’s autonomy technology for future aerospace vehicles.

“This flying cargo air vehicle represents another major step in our Boeing eVTOL strategy,” said Boeing Chief Technology Officer, Greg Hyslop. “We have an opportunity to really change air travel and transport, and we’ll look back on this day as a major step in that journey.”

Boeing has also invested in, and partnered with, Near Earth Autonomy, a company focused on developing a portfolio of technologies that enable safe and reliable autonomous flight.

“This partnership will accelerate technology solutions that we feel will be key to unlocking emerging markets of autonomous flight,” said Steve Nordlund, Boeing HorizonX Vice President.

“Having successfully demonstrated on a variety of aircraft, ALIAS has proven its versatile automated flight capabilities,” said John Wissler, Aurora’s Vice President of Research and Development. “As we move towards fully automated flight from take-off to landing, we can reliably say that we have developed an automation system that enables significant reduction of crew workload.”
Swiss U-space

U-space is a set of services and procedures defined by the European Commission and designed to support safe, efficient and secure access to airspace for large numbers of drones. U-space is capable of ensuring the smooth operation of all categories of drones, all types of missions and all drone users in all operating environments.

At skyguide we believe in collaboration beyond Swiss borders using the U-space standards defined by SESAR. We call it «Swiss U-space».

Behind Swiss U-space is more than anticipating the exponential growth in drone requests during the past five years. Skyguide wants to build a facilitating environment in which the drone industry can flourish. We do not only endorse drones, but make use of it ourselves like the world’s first drone that is capable of doing ILS maintenance checks.

More information www.skyguide.ch/u-space

Drone-flight requests at skyguide

Skyguide provides air navigation services in Switzerland and certain adjacent parts of neighbouring countries. Special operations in Europe’s most complex and dense sky is common ground to us.

More information www.skyguide.ch/u-space

Drones at skyguide

Employing drones to check the ILS

By employing a drone for checking a part of the instrument landing system (ILS), we will be able to reduce the costs for flight calibration services. By 2020 we will operate drones for maintaining NAVAIDs. We will thus save 360’000 CHF per year.

<table>
<thead>
<tr>
<th>From 2020:</th>
<th>From 2023:</th>
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<tbody>
<tr>
<td>-33%</td>
<td>-60%</td>
</tr>
<tr>
<td>-94 tons CO2</td>
<td>-169 tons CO2</td>
</tr>
<tr>
<td>-361,000 kWh</td>
<td>-649,000 kWh</td>
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Skyopener & ViaDrone

The pilot project deals with maintenance flights for high-voltage lines and railway tracks with a drone that has a wingspan of 4.2 meters, an operating time of 10 hours and a maximum range of 1'000 kilometres. Skyopener and ViaDrone will show the use of Remotely Piloted Aircraft Systems (RPAS) for commercial applications. Skyopener is the European funded project (H2020), while ViaDrone is funded by Switzerland.

Skyguide Sales & Marketing

20+ customers benefit from ILS maintenance via drone. Interested? Please contact us at solutions@skyguide.ch
Aurora believes reassigning cockpit roles, allowing humans to perform tasks best suited to humans and automation to perform tasks best suited to automation, would improve pilot performance and reduce individual workload, while also providing significant cost savings in the form of simplified training and lower crew costs.

**Safety improvements**

Eventually, it seems likely that autonomous operations will form a significant proportion of commercial passenger flights. Swiss bank, UBS, has estimated that there could be $26 billion in pilot cost savings for commercial airlines.

“The opportunity would depend on the timing of the roll-out of pilotless planes and we think it is likely we would initially see cargo as the first subsector to adopt new related technologies, with the number of pilots falling from two to one and eventually from one to none,” UBS noted.

Safety is, as ever, the main concern. But it may be that cutting the human out of the equation is a boon. A 2013 UPS accident that killed both pilots blamed the crash on fatigue and pilot error while the 2015 Germanwings accident that killed all 150 people on board was caused by a mentally disturbed pilot downing the plane on purpose. These are the most recent examples of pilot errors that have featured throughout aviation history.

Autonomous operations could significantly raise the bar on safety. Higher degrees of automation could reject a change-of-altitude command if it put an aircraft below the height of surrounding terrain, for example. In 2016, Lockheed Martin’s Automatic Ground Collision Avoidance System (Auto-GCAS) is credited with saving the life of an unconscious F-16 pilot.

**ATM structure**

The question then becomes how ATM needs to respond to pilotless aircraft. Teri Bristol, CANSO Chair and Chief Operating Officer of the Federal Aviation Administration’s Air Traffic Organization, says the organisational structure of ATM will continue to evolve.

“Our structure supports both strategic and tactical interactions with operators/pilots,” she says. “While operations may become nearly-autonomous, the need to interact with the operator/pilot, and they with their vehicle, will not go completely away. There will likely be a shift to more strategic and less-tactical interactions.”

This is not far off from today’s operation in the oceanic environment. We are currently transitioning to digital means of controlling airspace. This supports not only manned operations, but will be essential for the integration of UAS and long-term nearly autonomous operations. Bristol insists that the industry and ANSPs must leverage their existing strengths if this is to occur rapidly. One potential business process shift being considered by FAA involves the ANSP determining overall policy, standards, and setting requirements, while industry develops, builds, and sustains the necessary infrastructure to support a more dynamic response.

“We are testing this shift through a prototype evaluation of a UAS tool called the Low Altitude Authorization and Notification Capability (LAANC) and it involves industry and the FAA exchanging data to quickly process airspace authorisation requests,” Bristol informs.

“LAANC leverages the industry's strengths by permitting it to rapidly build and deploy the interface and infrastructure, and also leverages the FAA’s policy and regulatory authorities to grant small UAS access to controlled airspace. If the deployment of LAANC is successful, this business process shift may be applied to an increasing set of capabilities in the national airspace system.”

**The human touch**

As Bristol notes, interaction between an ANSP, the operator/pilot, and the vehicle will not go completely away. But there are many different autonomous operational ideas and concepts being explored and so where exactly the line is drawn between the human and the machine is open to question.

Whether a human plays a role in autonomous operations will be determined by a variety of factors, says Bristol. But two factors stand out for her: will technology be able to manage all of the potential “what if” scenarios; and will the public accept it?

“In the short term, we believe that there is a continuing role for the human to provide some assistance with non-standard operational issues and also provide some level of reassurance to the public that the technology is performing properly,” she says.

“We anticipate that as the technology matures and is proven reliable over time, automation will continue to augment operations. This will have the effect of reducing the number of non-normal conditions without standard resolutions and also provide increased assistance to the human in resolving any remaining rare cases.”

Autonomous operations is a session topic at the conference of World ATM Congress 2018. Find out more at worldatmcongress.org
Making safe operations safer

Theresa Brewer and Vince McMenamy, FAA, and Paul Radford, Airways New Zealand, explain ICAO performance-based communication and surveillance requirements that must be implemented by 29 March 2018.

What is performance-based communication and surveillance?

The ICAO performance-based communication and surveillance (PBCS) framework ensures that emerging technologies for communication and surveillance fully support ATM operations and are implemented and operated safely.

Why is it important?

Part of the framework is performance-based separation minima. This allows aircraft to be separated safely according to technological capability rather than “one-size-fits-all” prescriptive distances. New requirements for performance-based separation minima under the PBCS framework were originally due to come into force in November 2016 but ICAO then extended the deadline to 29 March 2018.

Accommodating PBCS

Performance-based separation minima used in some oceanic airspace is covered under the performance-based communication and surveillance (PBCS) framework. So, the key for ANSPs applying these separations is to meet the March deadline for implementing PBCS.

The State regulator will need to determine which policies under its jurisdiction need to be revised to accommodate PBCS. States are
**Performance-based Communication and Surveillance**

**High-level summary of the responsibilities of the State, ANSP and Operator**

<table>
<thead>
<tr>
<th>In accordance with the ICAO PBCS Provision</th>
<th>In accordance with State policies</th>
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<tbody>
<tr>
<td><strong>State responsibility</strong></td>
<td><strong>ANSP responsibility</strong></td>
</tr>
<tr>
<td>➤ Establishes PBCS policies for ANSP, operator, airworthiness, etc.</td>
<td>➤ Provides RCP/RSP-compliant services</td>
</tr>
<tr>
<td>➤ Prescribes RCP/RSP specifications in the applicable airspace for the relevant operations.</td>
<td>➤ Recognises RCP/RSP capabilities in air traffic control (ATC) automation</td>
</tr>
<tr>
<td>➤ Publishes PBCS requirements in aeronautical information publication (AIP)</td>
<td>➤ Establishes PBCS monitoring program</td>
</tr>
<tr>
<td><strong>Operator responsibility</strong></td>
<td></td>
</tr>
<tr>
<td>➤ Prepares to file RCP/RSP capabilities in flight plan</td>
<td>➤ Participates in ANSP PBCS monitoring programs</td>
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**Operational readiness** can be facilitated by working closely with the regulator to obtain authorisations enabling the filing of the proper RCP and RSP codes in the flight plan.

Operational readiness can be facilitated by working closely with the regulator to obtain authorisations enabling the filing of the proper RCP and RSP codes in the flight plan.

These authorisations include aircraft manufacturer certification that the relevant safety and performance requirements are met by the aircraft system; verifying that an operator meets its allocated requirements, including PBCS training for its staff; and a contract/service level agreement with its communication service provider that details expected network performance.

The CSP is a vital stakeholder in the provision of performance-based separation minima, which are dependent on data link. The CSP should coordinate with its ANSP and operator customers to ensure that its system is capable of providing the service that is needed to achieve RCP240 and RSP180.

The ANSP and operator in turn should ensure the means to enforce the applicable requirements, including system latency, availability and outage notification.

An essential aspect of the PBCS framework involves post-implementation monitoring for continued safe operations in remote and oceanic airspaces.

This includes end-to-end monitoring of the performance of automatic dependent surveillance – contract (ADS-C) and Controller/Pilot Data Link Communication against RCP and RSP requirements at an airspace and operator level.

The monitoring of system availability and a robust problem reporting, investigation and resolution mechanism to support continuous system improvement and hazard mitigation are equally vital.

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Responsible for establishing an approval process for their operators that are utilising data link and would like to be eligible to use performance-based separation in any available airspace.

This process will outline the procedures for operators to obtain the authorisations that substantiate compliance with all of the applicable requirements and allow them to file the RCP240/RSP180 codes in their flight plans.

Examples of this type of policy document include the Federal Aviation Administration’s advisory circular AC 90-117, Data Link Communications, Transport Canada’s advisory circular AC 700-041, Special Authorization (SA) for Required Communications Performance (RCP) 240 and Required Surveillance Performance (RSP) 180 and the UK Civil Aviation Authority’s advisory circular, Y094/2017.

Furthermore, if a State has responsibility over an ANSP that intends to continue applying or begin applying performance-based separation minima, it will be required to establish policies for the prescription of the RCP240/RSP180 specifications and ensure the ANSP complies with all the necessary requirements.

**How to plan**

For a smooth transition to PBCS operations, an ANSP needs to develop, in concert with its regulator, operators, and any other stakeholders, an implementation plan in accordance with ICAO requirements.

The plan will cover policy and procedures for air traffic controllers, changes to air traffic service automation, development of a monitoring mechanism and a strategy to increase PBCS awareness with all stakeholders.

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Part of the framework is performance-based separation minima. This allows aircraft to be separated safely according to technological capability rather than prescriptive distances.
Air Traffic Control is at the center of your airport. With fully integrated information systems, ATC can gain a better view of what's really happening. Automation manages aircraft movements and lighting, while ensuring it always has its finger on the pulse. The result is less time spent taxiing, better use of capacity and more productive ATC staff.

Visit us at stand 351 at World ATM Congress, Madrid, 6 to 8 March.
Cybersecurity must have due prominence in future ATM technology and a number of initiatives are pointing the way forward.

Satellite SVN 23 has a lot to answer for. When it was decommissioned it caused a 13 microsecond discrepancy that affected global positioning system (GPS) satellites and set off alarms across the world for the best part of 12 hours.

While this was not a cyberattack, it highlights the vulnerabilities of GPS, a technology that underpins many ATM advances, such as performance-based navigation (PBN).

A new report by the Atlantic Council, Finding Lift, Minimizing Drag, notes that GPS is subject to natural interference and degradation as well as these occasional blips. In addition, GPS signals can be easily jammed; it happened to New York’s Newark Liberty International Airport in 2013. Again, it was not deliberate. A passing truck driver was trying to hide his whereabouts from his company.

On one occasion, more than 20 vessels reported GPS location errors in the Black Sea. One ship, with a GPS accuracy of less than 100 metres, showed its location as twenty-five miles inland. Additionally, the automatic identification system, which vessels use to transmit their location to each other, was showing a number of ghost ships.

Nevertheless, sophisticated attacks have happened. On one occasion, more than 20 vessels reported GPS location errors in the Black Sea. One ship, with a GPS accuracy of less than 100 metres, showed its location as twenty-five miles inland. Additionally, the automatic identification system, which vessels use to transmit their location to each other, was showing a number of ghost ships.

It is not difficult to imagine the consequences for the industry should this happen to aviation. The report argues that “wide-area augmentation systems and ground-based augmentation systems, which transmit either space- or ground-based signals to correct GPS signal errors, may make it more difficult to spoof aviation systems”, but notes that this is “yet to be assessed”.

Encrypted signals

Automatic dependent surveillance – broadcast (ADS-B) is also discussed in depth. The advantages of the technology are well documented and potential security flaws – caused by many ADS-B units using Wi-Fi and Bluetooth connectivity – are being handled proactively and effectively.

“There has been considerable alarmist publicity regarding ADS-B security,” noted ICAO, “but careful assessment of security policies in use today for ADS-B and other technologies provide a more balanced view”.

In theory, ADS-B signals could be blocked or replicated for malicious intent. The Atlantic Council report Finding Lift, Minimizing Drag even suggests this capability can be had “for a few hundred dollars with cheap software-defined radio and easily accessible open source software”.

Securing the systems of the future

On one occasion, more than 20 vessels reported GPS location errors in the Black Sea. One ship, with a GPS accuracy of less than 100 metres, showed its location as twenty-five miles inland. Additionally, the automatic identification system, which vessels use to transmit their location, was showing a number of ghost ships.
Research has, however, already been carried out into the two main defence options; securing the link and validating the location. To secure the link between ADS-B units requires encryption or some form of validation.

To validate the location of an ADS-B transmission, multilateration (MLAT) can be used, but only for ground-based units. MLAT can correlate the signal arrival at different receiving stations to calculate a location for the transmitting station, which is difficult to fake.

Keeping radar capabilities intact will also help. The FAA is no longer scaling back radars as part of its NextGen programme so it has this fall-back position. Of course, this would create capacity challenges due to the greater separation distances required, but at least it would ensure business continuity.

Making the case for ADS-B

Aireon, which is launching space-based ADS-B services, has gone to great lengths to ensure its systems are secure. “Aireon is committed to reducing vulnerabilities to security related incidents, GPS jamming and spoofing and cybersecurity management techniques throughout the system and service offering,” says Vinny Capezzuto, Aireon’s Chief Technology Officer and Vice President of Engineering.

Aireon addresses cybersecurity over the life cycle of a system or service through governance, design assurance, standards and regulations. It is also seeking safety certification from the European Aviation Safety Agency (EASA).

Aireon is undergoing a series of audits that address software assurance, integrity of management processes (safety, security, configuration management, quality assurance, test) and validation of operational continuity of services (data, technical support and billing).

According to Capezzuto, the EASA organisational air traffic management/air navigation service (ATM/ANS) certification represents a commitment by Aireon to provide a level of service commensurate with the critical needs of an ANSP providing air traffic separation services.

ADS-B will also form part of the future Airborne Collision Avoidance System X (ACAS-X) alongside other data sources. ACAS-X utilises probabilistic modelling and dynamic programming to determine the best course of action. The report says that “any increased integration with aircraft collision avoidance systems and ADS-B must be very careful.”

Realising the benefits of SWIM and ADS-B

ATM is investing in its future. The systems coming online, such as ADS-B and SWIM will bring a host of benefits for ANSPs and airspace users alike.

But for these benefits to be realised, the systems must be secure. Finding Lift, Minimizing Drag highlights the vulnerabilities that remain to be addressed. These are the same challenges facing any other large, complex network attempting to secure its information architecture.

Clearly, there is work to be done on cybersecurity, but ANSPs, through CANSO, are taking huge strides forward.

“As the aviation industry makes the leap to the latest generation of new technology, it also needs to be aware of the growing cyber threats to its systems, which have the potential to compromise safety if robust mechanisms are not put in place,” says Jeff Poole, CANSO’s Director General.

“To help tackle this cyber problem in air traffic management, CANSO has not only produced some excellent guidance material but is also working closely with ICAO and industry partners on a closed network, inaccessible to the public, for aviation data and SWIM.”

The CANSO ATM Security Workgroup (ASWG) submitted a paper on cybersecurity to the ICAO Aviation Security Conference in 2017. It highlighted the human factor in cyber strategies, notably around awareness, resilience and contingency planning. It called for the training of all personnel to be increased on these items.

“CANSO is also a member of the ICAO Secretarial Study Group on Cybersecurity (SSGC),” informs Nico Voorbach, CANSO’s Director, ICAO Affairs. “This is a multi-disciplinary group composed of safety and security experts from ICAO together with industry stakeholders. It will produce guidance material for States and the industry on how to deal with cyber threats and contingency planning.”

Additionally, CANSO will produce a working paper for the 13th ICAO Air Navigation Conference in October based on the work previously sent to ICAO in 2017.

SWIM will increase its network connectivity as it develops in the years ahead. Around 2023, it is expected that aircraft will be fully connected to SWIM, enabling “full participation in collaborative ATM processes with access to voluminous dynamic data”. Protecting such a system is necessarily complex and requires detailed discussions with multiple stakeholders to ensure the different perspectives are taken into account.
carefully considered. Adversaries attempting to cause ACAS-X to take avoiding action on false ADS-B signals is a potential threat that researchers have already highlighted.”

Like ADS-B, controller-pilot data link communications (CPDLC) are potentially vulnerable due to a lack of encryption. An attack could allow false instructions to be given to either ATC or aircraft. Though voice communications act as a back-up, CPDLC is essentially a digital version of voice, meaning both systems could suffer the same effect.

Aviation intranet

Finding Lift, Minimizing Drag also explores one of the mainstays of ATM’s future – system-wide information management (SWIM), which will be the digital backbone for moving ATM data. The report describes SWIM as “an aviation intranet with numerous touchpoints”. Details of how aircraft – external users – will be securely connected to that intranet still need to be defined.

SWIM will increase its network connectivity as it develops in the years ahead. Around 2023, it is expected that aircraft will be fully connected to SWIM, enabling “full participation in collaborative ATM processes with access to voluminous dynamic data”.

Protecting such a system is necessarily complex and requires detailed discussions with multiple stakeholders to ensure the different perspectives are taken into account. This may be easier said than done given that the International Coordinating Council of Aerospace Industries Associations has pointed out that SWIM itself is not yet clearly defined.

The FAA may help with the way forward. Its work on cybersecurity includes an ‘air gap’ that physically separates the FAA operational network and external users while providing accessibility. Additionally, the FAA has been working with EUROCONTROL on identity access management.

ICAO is supporting these efforts through the INNOVA Task Force, which is exploring governance and cybersecurity in a global SWIM architecture. Topics under consideration include global standards, Internet protocols and the public key infrastructure security system.

The report acknowledges the tremendous advantages of SWIM but notes that several contributors expressed “unease about SWIM as a system with global access points, bringing acute concern of threat propagation (worm attacks) or adversaries pivoting across systems”.

Find out more about cybersecurity in the CANSO Cyber Security and Risk Assessment Guide available from canso.org

Like ADS-B, controller-pilot data link communications (CPDLC) are potentially vulnerable due to a lack of encryption. An attack could allow false instructions to be given to either ATC or aircraft. Though voice communications act as a back-up, CPDLC is essentially a digital version of voice, meaning both systems could suffer the same effect.
Comprehensive and Integrated Training

Aviation System Block Upgrade (ASBU)

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CANSO booth #403 and MITRE booth #574
mai.mitrecaasd.org
We are at a hugely exciting point in the history of our industry. There are, undoubtedly, many challenges ahead. But those who are excited by the aviation industry (I presume most of us!) and by the pioneering spirit it encapsulates and engenders, will, I hope, feel the same sense of excitement I do about having the opportunity to tackle these challenges and to prepare our industry for what lies ahead.

Of course, the number one priority for CANSO Members in Europe is, and always will be, keeping the skies safe, and we do this very well. I think it is important that we continue to remind people too that this does not happen by chance.

Last year saw around a billion passengers rely on our service in Europe and circa 36,000 flights safely criss-crossing Europe’s skies on its busiest days. That only happens thanks to a huge amount of hard work and dedication from a lot of talented people across all organisations and the wider industry.

But I also think we have a fundamental role in driving forward the wider industry of which we are part; finding new ways to make the airspace work as safely and efficiently as it can for both today’s users and for future users. The challenge for ANSPs across Europe is to ensure we continue to keep the skies safe but also to help the industry of which we are part to grow and to evolve, finding new
We have free route airspace in operation across significant volumes of the upper airspace within Europe, allowing airspace users to plan and take the routes they want to take, helping them to save fuel, reduce flying time and lower their costs.

ways to ensure safety as traffic grows, to improve environmental performance and to find solutions to accommodate demand for new uses of the airspace.

Reflecting on what CANSO Members in Europe have achieved to date, Single European Sky ATM Research (SESAR) deployment is continuing and, with the coordinated efforts of the SESAR Deployment Manager supported by European Commission funding, accelerating. New airspace concepts are being implemented which are helping us to optimise the use of our busy skies.

There are extended arrival management horizons operational at places such as Munich, Reims and Heathrow, with many more to follow, helping to provide enhanced and more consistent arrival sequences by sharing information across borders. New precision area navigation (PRNAV) approach procedures are in place across the continent, including Dublin, Stockholm Arlanda and Paris CDG, improving the design and organisation of our busy terminal manoeuvring areas and reducing workload on controllers.

And we have free route airspace in operation across significant volumes of the upper airspace within Europe, allowing airspace users to plan and take the routes they want to take, helping them to save fuel, reduce flying time and lower their costs.

We are also seeing new ways of working gaining traction, helping to push us towards the realisation of a virtual Single European Sky. Whilst the European Commission’s Functional Airspace Blocks have not perhaps driven us as far down the seamless airspace route as was desired, there are new collaborations that are providing additional impetus – from the COOPANS systems grouping through to the Gate One and Borealis Alliance ANSP initiatives.

Tailored approach

As we look ahead to the year, at a technical level, extensive research and development continues through the industry-leading public-private SESAR research programme. There will be many more simulations taking place this year helping take new concepts one step closer to being ready for operational deployment – from wake vortex separation optimisations that will enhance runway throughput, through to testing new means of organising controllers that will better match demand to capacity, reducing congestion and improving traffic flows.

Alongside this and with the input of its Members, the SESAR Joint Undertaking (SJU) is currently finalising its recommendations to the European Commission in terms of the concepts whose implementation will be mandated via European law through Common Project 2, the follow up to the European Commission’s Pilot Common Project.

CANSO in Europe is turning much of its focus to preparing for the next regulatory reference period – RP3 – which covers the period 2020-2024.

We have been working hard to ensure the Commission recognises that continued cost cutting each year by pre-set percentages, without consideration of local implications, is not sustainable and that a more tailored approach to target setting and measuring performance and value is required. We hope they have listened.

We are also heavily engaged in discussions about the future institutional make-up of aviation in Europe. The end of 2017 saw agreement reached within the European Union’s institutions and member states for a revised “Basic Regulation” covering the European Aviation Safety Agency (EASA).

This legislation enhances the common European Union safety rules for civil aviation and extends EASA’s remit to safety-related aspects of security – most notably cybersecurity – and environmental protection.

It also introduces the principle of proportionate and risk-based rule-making, designed to reduce bureaucracy and enhance innovation – a key development for CANSO Members.

Preparing for drones

But it is not just measures to help us better manage today’s civil aviation industry we have to think about. We are also thinking hard about the future of our industry and the evolving and emerging demands being placed on airspace. Arguably one of the most
significant changes to the EASA Regulation is the inclusion of the first-ever EU-wide rules for civil drones.

This followed the publication in summer 2017 of the blueprint for what the European Commission has badged ‘U-Space’, the provision of lower level airspace for drones, especially in an urban environment. The blueprint actually goes beyond just the urban environment and aims to enable complex drone operations with a high degree of automation to happen safely in all types of operational environments.

Work is now underway across Europe to prepare for this. From SESAR-led research projects such as CORUS (Concept of Operation for EuRopean UTM Systems) and PODIUM (Proving Operations of Drones with Initial UTM) through to national efforts, most ANSPs are recognising the need to engage with these challenges and are considering how they need to evolve to meet the demand for this new use of airspace.

Trying to think about what role ANSPs will have to play in these emerging markets and how we need to respond to new technologies will continue to form a major part of CANSO’s work in the months and years ahead, as I am sure it will in all parts of the world.

The next few years are undoubtedly going to be challenging ones for all of CANSO’s European Members as traffic levels grow, new technologies enter operation and different airspace users fill our skies. But within CANSO, we must continue to use that challenge as an inspiration, to reflect on the opportunities we have and to recognise that we are very lucky to be involved in such an exciting industry at such an exciting time.

And we must use that inspiration to ensure that we continue to both keep the skies safe every day and help grow and evolve the industry of which we are such a fundamental part.

Martin Rolfe is participating in the conference of World ATM Congress 2018. Find out more at worldatmcongress.org
Airspace was launched 10 years ago and rapidly became an effective platform to highlight key industry issues. This edition of Airspace reviews the major trends highlighted in the first few issues of Airspace in 2008 and charts their development to the present day.

Then and now...

Airspace was launched 10 years ago and rapidly became an effective platform to highlight key industry issues. This edition of Airspace reviews the major trends highlighted in the first few issues of Airspace in 2008 and charts their development to the present day.

SEAMLESS ASIAN SKY

In the first issue of Airspace in 2008, Ashley Smout, then Airways New Zealand CEO and CANSO Chair said: “Just as [governments] have created organisations like APEC (Asia Pacific Economic Cooperation) and ASEAN (Association of Southeast Asian Nations), they should consider the building blocks for a Single Asian Sky. “So, while a Single Asian Sky may not happen in my lifetime, we should at least work towards it. Because without addressing the key issues, the Asia Pacific region will face serious capacity problems similar to the experiences of the US and Europe – delays, increased fuel consumption and emissions, and possibly a rise in incidents. There is good reason for politicians and the industry to act now and build the aviation highway before it is too late.”

Ten years on, the seamless Asian sky, as it is now commonly called, is coming to fruition and a planned meeting of the region’s Transport Ministers in the first half of 2018 could get the project close to the finish line.

As it is, a number of cooperative arrangements are enabling the potential benefits. CANSO is working with regional ANSPs, States and industry partners on a sub-regional air traffic flow management (ATFM) system known as the Distributed Multi-Nodal ATFM Network. Trials are already demonstrating increased efficiency, reduction in holding times, and fuel savings and the advantages continue to build.

One key challenge remaining if a seamless Asian sky is to be fully implemented is the different separation standards. Though some States such as Singapore and Hong Kong have cutting-edge air traffic services, some airspace is still using older technology that requires larger separation distances between aircraft.

Each State has a role to play in building a suitable framework for the region and with their full support the biggest aviation market might also achieve the best ATm infrastructure.

ENVIRONMENT

Aviation’s impact on the environment was already making the headlines by the time of Airspace’s first issue in 2008. But as then Chairman of the CANSO Environment Workgroup, Phil Stollery, noted, ANSPs had, until that time, “got off comparatively lightly”.

“ANSPs are service providers to airlines and airports and this means they have not been directly in the public eye on environmental issues,” he said. “But ANSPs have a significant part to play and ought to be highlighting their contribution publicly.”

The ATM industry has made huge strides to reduce its environmental impact since then. CANSO was quick off the mark and facilitated many of the improvements. In 2007, CANSO members agreed an Environmental Code of Practice, which called for ANSPs to recognise the need to deliver air traffic services in ways that mitigate the impact of aircraft operations on the global environment.

Then in January 2008 NATS became the first ANSP to set itself a target for a reduction in emissions from aircraft under its control. Just a few months later, CANSO joined industry partners in committing aviation to carbon neutral growth from 2020 and halving 2050 emissions compared with 2005 levels.

Much has happened since. Performance-based navigation, free route airspace, continuous descent approaches and a switch to greener facilities are among the myriad examples of ATm promoting greener skies. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was launched in 2016, which was a major milestone towards the fulfilment of the fourth pillar of aviation’s strategy to reduce its emissions.
A decade ago, ICAO was leading a global initiative to introduce performance-based navigation (PBN). The long-term aim, Airspace noted, was to create global harmonisation of navigation specifications “so that operators can take advantage of modern avionics to improve both flight efficiency and environmental performance”.

PBN has now moved airspace management forward to trajectory-based operations, with many examples throughout the world. In Queenstown, New Zealand (pictured), Airways has delivered enormous benefits to the aviation sector and the local economy through PBN procedures. Capacity increased, pilot and controller workload reduced, and on-time performance improved.

At that time, to assist in its implementation in Asia Pacific, CANSO opened an office in the region. A South China Sea project was launched in collaboration with IATA. An early issue of Airspace noted the airline association considered ADS-B as “the preferred surveillance technology to replace radar for the air transport industry”. Airspace reported that “the coordinated implementation of ADS-B in this area would provide more efficient routing and operations as well as increased airspace capacity at a time when forecast traffic levels are likely to exceed existing ATS system capacity.”

Ground-based ADS-B has proved a boon to the ATM industry and is now widespread, facilitating safety and efficiency worldwide. Attention has now moved to the skies, with space-based ADS-B expected to be operational in 2018.

Alliances and cross-border cooperation were just coming to the fore when Airspace started in 2008. Three countries signed the COOPANS agreement in 2006 to capitalise on the shared experience of operating Eurocat systems to harmonise software upgrades. The Irish Aviation Authority, Naviair, and LFV agreed to converge their architecture requirements to meet future operational needs. “Equipment supplier Thales is under contract to establish a common platform that will be available in 2010 and will eventually lead to all participants using identical systems,” an article in the magazine noted.

COOPANS has now implemented the same software build at all seven area control centres (ACC), across the five ANSP members (Austro Control and Croatia Control have since joined). COOPANS has structured the development and deployment process around joint activities such as common specification, operational documentation, validation, training materials and generic safety cases.

Other alliances show the strength of partnerships across the ATM industry. There is the Borealis Alliance, the A6 Alliance, iTEC, functional airspace blocks and many other collaborations of a less formal nature.

All these forms of cooperation are enabling the industry to tackle the major issues of the day, from seamless skies to the standardisation of new technologies.
Unmanned aircraft systems might seem like a new phenomenon, but CANSO has been aware of their impending impact for some time. In early 2009, Airspace featured an article from EUROCONTROL that noted “the rapid evolution” of UAS.

Back then drones were fewer in number, were larger than now and were primarily operated by governments and their agencies. EUROCONTROL established the UAS ATM Integration Activity in 2008 to coordinate several areas of the Agency’s expertise into a consolidated UAS ATM network integration work programme.

“The UAS ATM Integration Activity will be undertaken on the basis of a two-stream approach along two parallel timelines,” the article said. “Stream 1 deals with the ATM integration of UAS in the short-medium term (up to 2020) while Stream 2 will support the integration of UAS in the context of SESAR for the longer term.”

The article concluded that it is “highly likely” that the future ATM system will need to accommodate UAs in all classes of airspace.

That “highly likely” has evolved into “absolutely certain” although exactly how drones will be integrated into existing airspace is still being debated.

Autonomous operations mean UAS will require a new traffic management (UTM) system quite different from today’s model. That is to be embraced by ANSPs. The UTM environment can be a proving ground for new processes, new technologies, and a new concept of operations for all airspace users.
Mervyn Harris, Nokia’s Director, Air Traffic Management, Transportation and Sales, says the mindset surrounding much of ATM must change before meaningful progress can take place.

"ANSPs are burdened with legacy systems," he says. "But there are products that can unburden them, without the need for a dramatic switchover. It is possible to interface with legacy systems before gradually introducing an IP environment. It does not have to be an all or nothing approach."

There are many advantages to this tactic, including savings in time, training and money. But, says Harris, it is a starting point only and the drive to a modern architecture is vital. “Any new solution will work better in an IP environment as that is the environment for which they are designed,” he informs.

Many new applications – from automatic dependent surveillance – broadcast (ADS-B) to system-wide information management (SWIM) – thrive in an IP environment. Harris says ANSPs must therefore make the switch away from proprietary legacy systems if they are to keep pace with the demands being placed on the industry.

He argues that these new technologies are essential for a number of reasons, beginning with safety and moving through to greater efficiency and extra capacity.

Securing funding

One challenge is prising the necessary funding from governments’ fingers. In fact, getting money for new technologies is becoming harder as governments around the world juggle with a plethora of competing requests.

Outsourcing is a case in point. Many ANSPs are still sceptical about the concept even though they often step beyond the boundary of their core focus – the safe separation of aircraft. Upgrading and implementing the technical infrastructure is one part of the business that could be handed over to partners with the relevant expertise.

The move to new communication infrastructure also needs timely regulation to ensure that implementation is not slowed down, especially regarding cyber protection, resilience and contingency planning. “There are plenty of guidelines, but I think that there is a case for something more specific,” says Harris.

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Part of the solution, Harris suggests, may be new ANSP business models. “Commercial or corporatised ANSPs seem to be strong organisations and are generally deploying the latest technologies,” he says. “But moving to that stage requires a complete mind-set change for governments and their ANSPs and that is never easy,” he says. “In fact, it is probably the most difficult task facing the industry.”

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**DFS DEPLOYS INDRA’S iCAS ATM SYSTEM**
Karlsruhe control centre is now handling en-route flights over Germany with the next-generation iCAS system developed by Indra in collaboration with DFS Systemhaus.

It is DFS’s first step in unifying the technology systems employed across its control centres.

The system will also be implemented at Amsterdam’s control centre and, ultimately, at all ANSPs in the iTEC alliance.

**ADS-B TO BE DEPLOYED IN WESTERN AND CENTRAL AFRICA**
Areon and the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA) will bring real-time air traffic surveillance to high-trafficked, terrestrial African corridors using space-based ADS-B.

The agreement comes as Areon passes a midway point of system development, conducting its fourth launch and deployment of space-based ADS-B payloads hosted on-board the Iridium® NEXT satellite constellation.

**DENMARK ENHANCES AIRSPACE SURVEILLANCE**
NAVIAIr has successfully completed installation and onsite testing of Comsoft Solutions’ Quadrant Sensors across Denmark.

This enables high accuracy multilateration coverage enhancing surveillance and airspace safety while reducing operational costs.

**CREATING A UNITED AFRICAN AIRSPACE**
Air Traffic and Navigation Services (ATNS) SOC Ltd and L’Agence pour la Sécurité de la Navigation Aérienne en Afrique (AsECnA) have signed an MoU.

It provides for cooperation in air navigation-related services between ASECNA and ATNS, paving the way for South-West cooperation in African airspace management.

**NATS WINS SMART DIGITAL TOWER CONTRACT FOR CHANGI AIRPORT**
The Civil Aviation Authority of Singapore has awarded NATS a contract to develop a smart digital tower prototype for Changi Airport, the largest and most complex airport in the world to try the technology.

A smart digital tower, equipped with a range of assistive functionalities and features, is expected to enhance air traffic management and the safety of runway and ground operations, and to increase operational efficiencies at the airport.

The trial will employ advanced camera and video stitching tools from Seardin Technologies to provide an enhanced view of the airport with live operational data overlaid as a heads up display.

**SITAONAIR AND DECEA EXTEND ATS DATALINK SERVICES IN BRAZIL**
Brazil’s Department of Airspace Control (DECEA) is working with SITAONAIR to expand ATS datalink services for its main airports in Rio de Janeiro and São Paulo.

Further enhancing aviation safety and efficiency, this initiative will play a central role in the wider transformation and modernisation programme taking place across Brazilian airspace and airport infrastructure.

**LFV ESTABLISHES NEW REMOTE AIR TRAFFIC SERVICES**
In December 2017, Sundsvall Timrå Airport became the country’s second airport to have remote air traffic control when the airport’s tower was closed down and the air traffic control service was transferred to LFV’s control centre.

LFV has also signed an agreement with Swedavia that establishes remote air traffic services for four other Swedavia airports; Kiruna, Umeå Airport; Åre Östersund; and Malmö.

The joint remote tower centre for these will be located at Stockholm Arlanda Airport in connection with LFVs current air traffic control centre, enabling improvements in technology, coordination and efficiency.

**ERA SIGNS CONTRACT FOR WORLD’S LARGEST PLANNED AIRPORT IN CHINA**
ERA has won an international tender to supply and install its multi-sensor surveillance system, NEO, at Beijing’s forthcoming Daxing Airport, due to be operational in 2019.
Designing the Skies of the Future with UTM

Unmanned Aerial Vehicles (UAVs) are transforming the skies. Leonardo has a vast experience of Air Traffic management and is able to ensure safe and productive integration of UAVs into civilian airspace with an innovative UAV Traffic Management System (UTM), providing the complete range of services, including: public register of drones, communication, route and mission planning, dynamic geofencing, ground-based safety nets and contingency management capabilities.

Inspired by the vision, curiosity and creativity of the great master inventor – Leonardo is designing the technology of tomorrow.

Visit us at  World ATM 2018 – Hall 10 Booth 333
Aireon will harness next-generation aviation surveillance technologies that are currently ground-based and, for the first time ever, extend their reach globally to provide safety benefits to all stakeholders.

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