

# UNLEASHING THE POTENTIAL OF BIG DATA

## **INTERVIEW**

Captain Akinkuotu, Nigerian Airspace Management Agency

## **SPOTLIGHT**

Focus on Latin America

Improving weather forecasts

SWIM cybersecurity

Human performance

Separation standards

ADB SAFEGATE on integration

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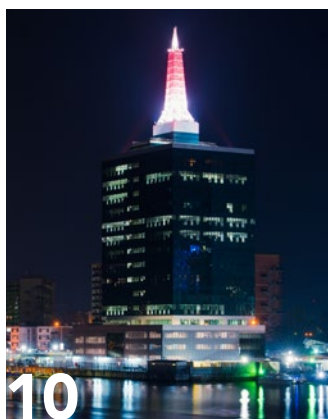
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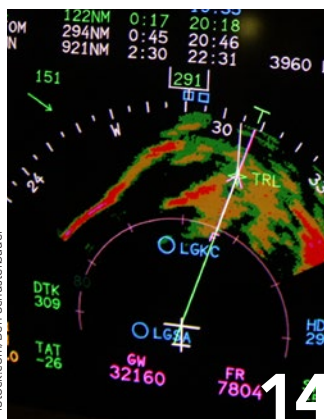
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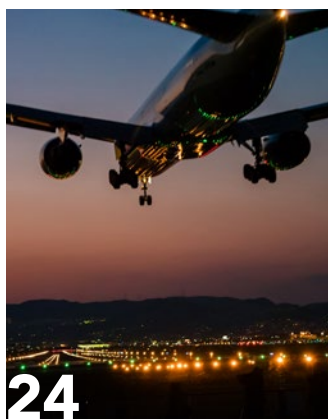
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As the air traffic management industry looks ahead to a future of continued air transport growth, we must also consider carefully the processes, procedures and strategic measures required to manage this demand efficiently and effectively.

High demand needs to be met with high functionality and performance, and as is usually the case, this is not something that can be done in isolation. Industry partnerships are the very foundation of flexible and secure operations and it is these networks on which we must rely now more than ever.

Air flow traffic management (ATFM) and collaborative decision-making (CDM) are two important mechanisms for managing and facilitating air traffic growth efficiently and effectively. Each is based on the basic principles of the proactive engagement of industry partners and maintenance of shared processes and procedures.

Put simply, the role of ATFM is to aggregate information on demand, capacity, and constraints at airports and airspaces in a consistent manner. This helps to better understand fluctuating needs and requirements and inform the operational decisions that need to be made. In conjunction, CDM enables stakeholders to effectively contribute to the decision-making process itself through pre-planned agreed upon procedures. This ensures decisions are timely and accurate, as well as transparent, and based on the information provided by participating stakeholders.

Taking this one step further, airport collaborative decision making (A-CDM) demonstrates that not only are airlines important stakeholders in the decision-making processes required for more effective operations but also that aerodromes operators, aircraft network operations, air traffic controllers, ground handling agents, and air traffic flow managers have a role in improving coordination.

So whether we are talking about ATFM, CDM or A-CDM, collaboration and exchange of information between all stakeholders is essential to efficiently managing operations. Such coordination delivers improved operations by reducing flying times, ground delays, and congestion, but it also enhances safety performance, cost effective operations, and environmental sustainability. Ultimately, by working together through such collaborative initiatives, the industry can ensure airport and airspace capacity is fully optimised, both now and in the future.

As very well highlighted at the Global ATM Summit and 22nd AGM, effective management and analysis of information and data is the key to the future of efficient ATM operations. Whether that is using big data to understand cross-industry trends and outlooks, or more effectively harnessing intelligence from day-to-day operations and information exchange, the aviation value chain can derive a lot of power from its partnerships, working together with one purpose and one goal.

Building such strong relationships and boosting global interoperability through shared objectives and frameworks is a key focus for both the CANSO Africa Conference 2018 and CANSO Latin America and Caribbean Conference this autumn. Each will draw on perspectives from ATM across the globe, provide insight into the potential of high-growth aviation markets and demonstrate the added value that seamless ATM operations can provide to airspace users.

I encourage you to think closely about how you envisage the future of ATM operations and how the industry can best meet the challenges that we face. Rather than acting alone, surely we must look constantly for opportunities to invite everyone to the table? Whether it is new technology, new comers to the industry or improved best practices, we have the tools and expertise available to help overcome obstacles and manage increased demand. But only together can we make sure that this happens on a global scale.

Jeff Poole  
CANSO Director General

# Knowledge is power



Credit: NATS

The insights unlocked by analyses of big data will enable aviation to handle the huge surge in demand.

**The term 'big data' might have been invented for aviation, such is the wealth of information held in the air transport value chain.**

From flight operations to online activity, there is little data that the industry has not collected about its operations and customers. In fact, it is estimated that 75% of flight data globally is openly available, although there are regional variations.

"The ATM industry must utilise data to provide the critical information and consistent key performance indicators needed to ensure safety, performance and sustainability," says Jeff Poole, CANSO Director General. "Digitisation and effective use and sharing of data in the ATM industry has the potential to transform global ATM performance, bringing huge benefits for airlines and other airspace users in terms of increased efficiency and enhanced safety."

ATM has made a good start. Speaking at the CANSO Global ATM Summit 2018 in Bangkok, Oliver Pulcher, Director Corporate Development, DFS, explained that – due to the wealth of data available – the predicted flight time between Frankfurt and Los Angeles can be accurate to within a minute, bringing all manner of advantages to air traffic control, airports, airlines and passengers.

Frankfurt also uses data to optimise the early morning arrival sequence, speeding up or slowing down individual aircraft to

ease fuel burn and emissions. That's a win-win-win for airlines, the environment and the passengers, who have their expectations managed through precise arrival times.

Moreover, Pulcher pointed out, thanks to machine learning, it is possible for a system to continue to build on its understanding and so make better decisions on a daily basis.

## Business intelligence

EUROCONTROL's Maastricht Upper Area Control Centre (MUAC), meanwhile, is improving the efficiency of its air traffic management operations through the Sector Opening Table Architect, a post-operational analysis and business intelligence tool.

The Sector Opening Table Architect integrates big data into operational activity to maintain safety while further improving controller and sector productivity. It is part of the wider ATC2ATM programme, which aims to find common ground between capacity management and air traffic control functions to achieve even greater efficiency.

Using big data, post-operational analysts are able to report on the efficiency of the capacity planning process and past air traffic regulations and on periods of exceptional controller workload. The reports are analysed and converted into proposals that are

displayed, via the Sector Opening Table Architect, to both air traffic control planners and tactical staff.

This process ensures streamlined feedback from post-operational analysis into both the tactical decision-making process and future planning. The Sector Opening Table Architect also offers an integrated comment mechanism that allows planners, tactical staff and post-operational analysts to collaborate more closely.

Data sets have been in use at MUAC for years, but the Sector Opening Table Architect integrates a wider range of data. This optimises the number of air traffic controllers throughout the day and ensures that airspace configurations better meet the expected traffic demand.

The tool is being developed to also include historical controller workload reports, assumed traffic loads, traffic bunching and clustering, unanticipated traffic, weather data and slot adherence data, among much else.

## Delving deep

NATS, the UK ANSP, is similarly exploring how big data can benefit not only the organisation but also airspace users. It reports that an analysis of actual flown data versus the flight plan revealed one airline carried an unnecessary 550kg of fuel. The extra fuel was carried in anticipation of flying at lower altitudes but studying the various data sets proved that planes were not in fact flying at lower altitudes.

NATS has also shared how airlines can harness the power of real-time data to assess their flight time and on-time arrival performance against other operators. Using data associated with a single city pair, including taxi times and other factors, performance gaps are identified. Deeper delving into the data can uncover other insights, such as how airlines perform when flights are delayed.

At the CANSO Global ATM Summit, NATS' CEO, Martin Rolfe, and its Head of Systemised Airspace and Airport Integration, Brendan Kelly, revealed further developments. Rolfe noted that NATS uses a performance optimiser that merges the multitude of data sets into a simulator to test airspace management decisions. Previously, it was intuition and experience that held sway and only once the day had ended was it possible to judge what had or had not worked.



Credit: EUROCONTROL

ATM operations at MUAC are being enhanced using big data analysis.



Credit: NATS

Big data has been integrated into airspace design.

"Now," said Rolfe, "the aim is to make every single day the best day we ever had."

Kelly explained how big data has been integrated into airspace design to provide the platform for success. Whereas ANSPs traditionally come up with two or three designs, by funnelling the various requirements and data from the complete aviation value chain – even including local communities that want to limit noise at particular times – computer simulations ran through 25,000 iterations to get to the best-balanced solution. At that point, humans are able to take the design and fine tune it.

## Few and far between

Despite such developments, it is generally agreed – a point emphasised at the CANSO Global ATM Summit – that ATM is behind the curve in exploiting the benefits of big data.

Estimates suggest that every day, some 2.5 exabytes (2.5 quintillion bytes) of data are produced. By the 2020s, annual data will be in the zettabyte range (1 zettabyte is 1000 exabytes). Aviation, even a single flight, makes a notable contribution to that total. Yet, ATM's utilisation of the insights provided by big data are too few and far behind.

A number of concerns have been highlighted. The first is that, although data collection is straightforward and commonplace, it is not so easy to know what might be relevant to any analysis.

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Airlines can harness the power of real-time data to assess their flight time and on-time arrival performance against other operators. Using data associated with a single city pair, including taxi times and other factors, performance gaps are identified. Deeper delving into the data can uncover other insights, such as how airlines perform when flights are delayed.

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**safety and flight efficiency  
are paramount to us**





ATM is at the start of the big data transition and ready to implement the right digital culture. A service-centric business model founded on evidence-based decisions awaits. Data is not new, but the value proposition presented by big data is. Vast opportunities lie ahead for those that embrace the change.

Information has finite timelines and must be kept fresh. As Rolfe noted: "You need to know which bits of data to keep."

Data can be corrupted deliberately by a cyberattack but more usual is redundant data, produced under conditions different to the prevailing circumstances. An airport might have changed its taxiway configuration, for example, or perhaps aircraft types have altered or the weather in one data set was unusually bad.

Assuming the data is relevant, the next problem is how to share it across the aviation value chain. There is a technical challenge. Data has long been hidden inside the legacy systems of various stakeholders, making it not only invisible to partners but also to other departments within the same organisation.

Technically, this is surmountable with cloud and open architecture. But creating dedicated databases and paying for bespoke data services is prohibitively costly for many, especially smaller ANSPs.

More awkward are issues of commercial sensitivity and political reluctance. Aviation remains fiercely competitive and sharing data is not the norm. And that competition is taking place against a backdrop of increasing protectionism and geopolitical tension.



Credit: DFS Deutsche Flugsicherung GmbH

Attracting new talent to the ATM industry is essential.

"How can we use big data to enable new processes in areas such as cross-border hand-offs?" asked Don Thoma, Aireon CEO. "Air traffic flow management must be done on a global scale. Aviation needs to have a global application."

Related to all of this is that data is no use in itself. It must be analysed, and the insights provided threaded into real-time decisions or forward planning.

One reason why this is so troublesome in ATM was emphasised by Graeme Sumner, CEO of Airways New Zealand. "Globally the workforce is aging and digital culture challenges many traditional ways of working," he says. The talent gap must be addressed and talent must be attracted to the industry.

### Advocate for change

Big data analytics will have a huge impact on air traffic management and is likely to act as a real advocate for change. ANSPs will be able to improve the service they offer airlines, make better use of airspace, enhance safety, reduce emissions and save time and money across the value chain.

"We are in transition," explained Rudy Kellar, NAV CANADA. "We are shifting from how to why. And there are basically two reasons why: enhancing safety and improving productivity for ANSPs or other stakeholders."

ATM is at the start of the big data transition and ready to implement the right digital culture. A service-centric business model founded on evidence-based decisions awaits. As many at the CANSO Global ATM Summit pointed out, the industry "didn't know what it didn't know".

Data is not new, but the value proposition presented by big data is. Vast opportunities lie ahead for those that embrace the change. ➤



Enhancing safety and improving productivity are key issues for big data.

Credit: iStock.com/LVINUS

# Bringing prosperity to Africa

The work being done by the Nigerian Airspace Management Agency typifies African efforts to improve airspace efficiency across the continent.



Credit: NAMA

**African aviation is making solid progress. The continent's airlines continue to improve safety, many countries have committed to a more collaborative environment and infrastructure at key African hubs is being shaped to handle future demand.**

Promoting trade and tourism across the continent in a safe and sustainable manner will generate enormous benefits. Already, the industry supports 6.8 million jobs and generates \$72.5 billion of economic activity in Africa. But even greater prosperity awaits if African skies are opened up to improve air travel within the continent.

## Lagos hub

In 2017, African airlines saw traffic rise 7.5% compared with 2016, according to the International Air Transport Association. The airline load factor jumped to 70.3% and though this remains behind the global rate, combined with a seat capacity increase of just 3.6%, it should be seen as a positive trend.

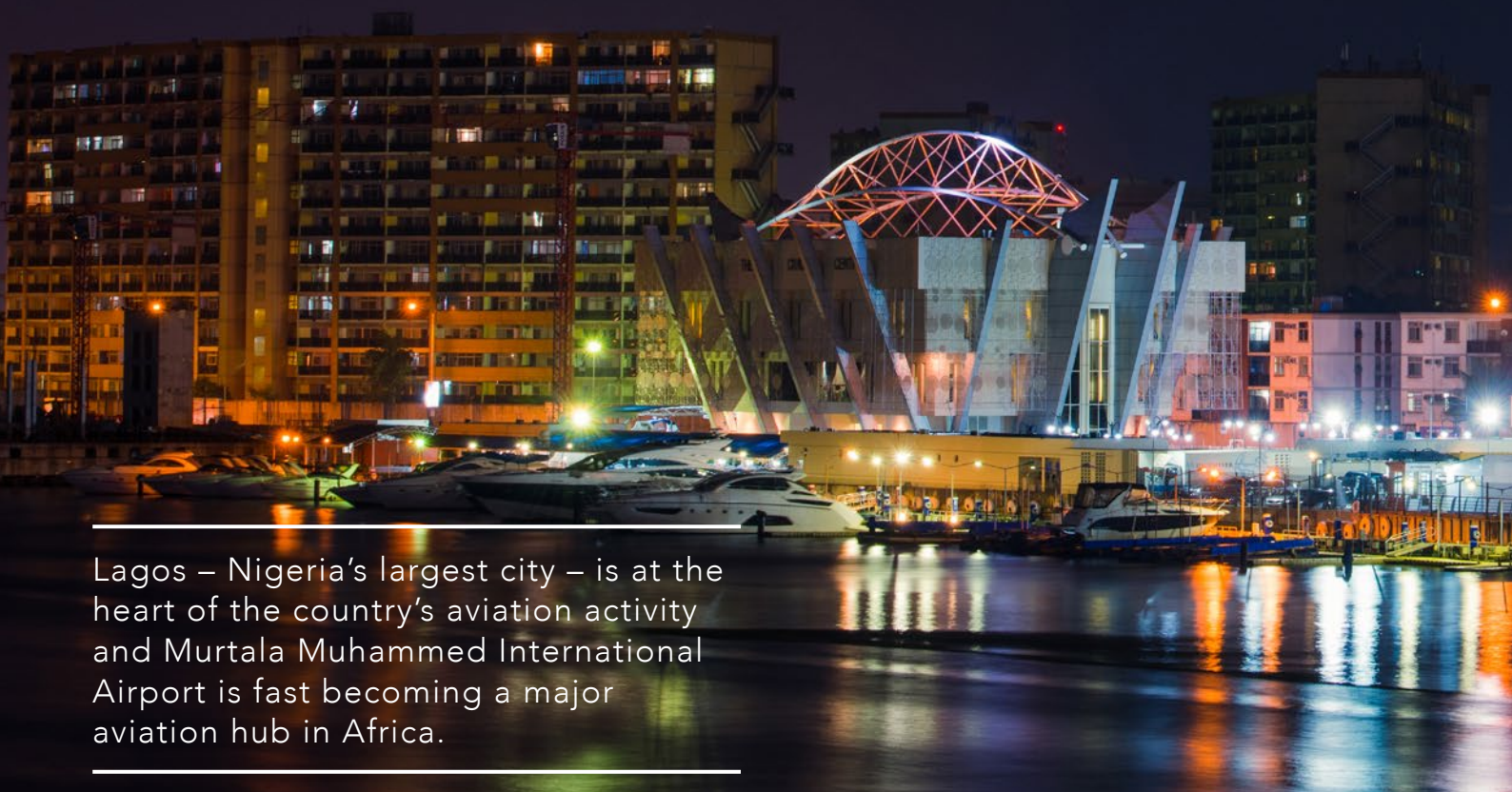
One of the strongest markets is Nigeria, boosted by oil price rises in recent months. In fact, in the first half of 2018 traffic grew 10%.

Captain Fola Akinkuotu, Managing Director of the Nigerian Airspace Management Agency (NAMA), says the ANSP stands ready to handle this marked increase in business.

"To cope with this dynamic trend, the agency has embarked on a gradual and systematic overhaul of the communication, navigation and surveillance air traffic management (CNS ATM) systems, replacing them with modern versions," he says.

"Efforts are being made to boost our current manpower to cope with the growth and areas of capacity shortfalls are being addressed."

Lagos – Nigeria's largest city and served by Murtala Muhammed International Airport – is at the heart of the country's aviation activity. Akinkuotu is fully aware that it is fast becoming a major aviation hub in Africa with a number of major airlines serving the



Lagos – Nigeria's largest city – is at the heart of the country's aviation activity and Murtala Muhammed International Airport is fast becoming a major aviation hub in Africa.

city, including the big three from the Gulf. This activity will doubtless be boosted by new national airline, Nigeria Air beginning operations at the end of the year.

Akinkuotu notes that the airport handles an average of 600,000 passengers monthly. To increase efficiency, NAMA has divided the Lagos sub-flight information region (FIR) into east and west sectors. This sectorisation will enhance airspace utilisation and increase capacity.

NAMA has successfully deployed two Jotron high-powered very high frequency long-range communication radios in Lagos West and Lagos East Area Control Centres. The installation provides not only safer airways but also critical resilience for airspace users. The system has its own integrated power supplies to cover an eight-hour emergency communication window should a total power outage occur.

“Test transmissions have been conducted on the system by air traffic control officers with aircraft flying at different flight levels,” Akinkuotu says.

“Contact has been established for a distance of up to 220 nautical miles at different flying levels of the upper airspace and this conforms with the VHF propagation predictions submitted for scrutiny during the design phase of the project.”

The new system will also provide VHF back-up for Kano en-route East and Kano en-route West.

In a second phase of the project, NAMA will install repeater stations in strategic locations to extend the range of the radio systems.



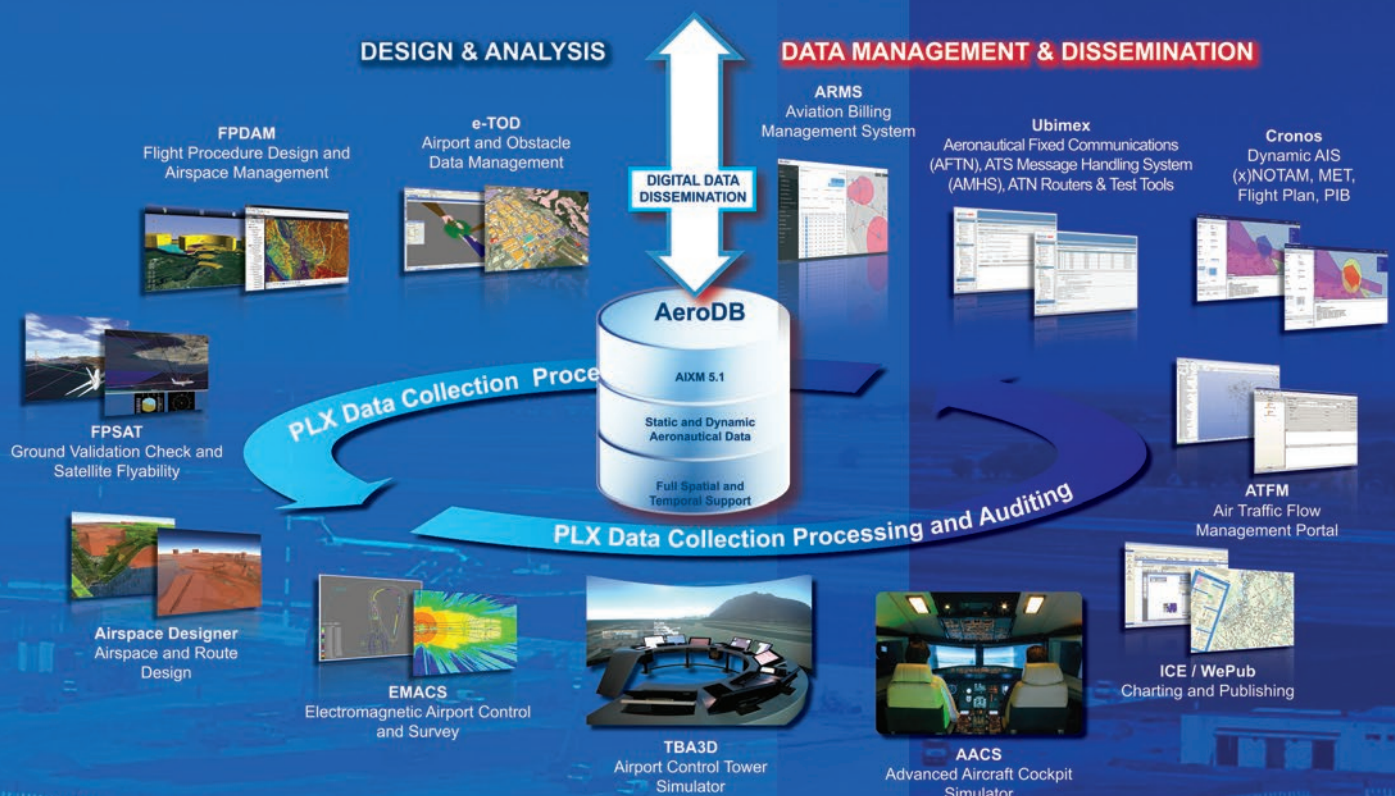
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Credit: NAMA

With air traffic projected to double over the next 15 years, quality service provision is essential.

The project is just one of many improvements that NAMA has made in recent years. Category III instrument landing systems have been installed at major airports as has very high-frequency omnidirectional radio range employing the Doppler principle (Doppler VOR) – a means of ensuring greater accuracy. Multilateration – an ability to locate aircraft with greater precision – has been implemented in the Gulf of Guinea and a host of performance-based navigation operations are helping NAMA to cope with air traffic growth.

### Training in collaboration

Technologies are only one side of the equation, however. Attracting enough air traffic controllers is equally vital to ensuring quality service provision. NAMA conducts regular recruitment exercises to mitigate any shortfalls and increase numbers as appropriate.

“Prospective applicants are taken through a rigorous recruitment process,” says Akinkuotu. “Successful candidates are then sent to the Aviation Training Organisation (ATO). On successful completion

of the course at the ATO, candidates are sent to any of the major airports to commence on the job training.”

The ATO is in full compliance with ICAO guidelines. One example of this is ICAO’s TRAINAIR PLUS programme, which promotes the use of collaboration for providing safe, secure, and sustainable global air transport.

Akinkuotu says regional cooperation among ICAO member States has been going on for a long time. The ICAO Western and Central African Office is primarily responsible for promoting ICAO policies and standards and recommended practices and furthering the implementation of ICAO’s Global Air Navigation Plan.

NAMA also takes part in Regional Air Navigation meetings and the African Planning and Implementation Regional Group. On top of this, it actively participates in workshops, seminars, conferences, symposia and exchange programmes throughout Africa.

### Funding issue

The work demonstrates the efforts within Africa to maintain a safe, coordinated and high-performance air navigation system.

But Akinkuotu insists that there is much more to be done. “The main challenge is the issue of funding,” he notes. “The next generation of CNS ATM systems are very costly to purchase and install.”

States working together could again be the answer. “Better collaboration will enhance economic efficiency and transparency while facilitating access to funding for aviation infrastructure and other investment needs, such as technology transfer and capacity building,” Akinkuotu continues.

Until this happens, the NAMA MD fears the potential of African aviation will remain largely untapped. The development rate of some States in the region is still too slow. That leaves a lot of business on the table.

“Air traffic is projected to double in the next 15 years,” Akinkuotu concludes. “Think how this will contribute to the economic growth of Africa.” ➔

### Safety first

Nigerian Airspace Management Agency is committed to rank among the safest ANSPs not only in Africa but the world over.

Objectives include:

- quality service provision in line with international standards
- achieving a capacity increase to better manage air traffic growth and simultaneously reduce delays
- a reduction in cost for airspace users

Safety is embedded in all the agency’s operations, part of a policy of proactive management rather than reactive compliance with regulatory requirements.

Training, for example, is built to instill and maintain meaningful safety leadership skills while the Just Culture principle of non-punitive and open safety communication is well established.



© NASA

## Climate change will have an impact on aviation and understanding new weather patterns will be vital to efficient operations.

**A combination of meteorological science and operational expertise is needed to better understand how air traffic management (ATM) will be affected by the ongoing changes in weather patterns.**

Studies show that climate change is having a number of effects. Here are increases in turbulence and storm activity, shifts in the jet streams towards the poles and a higher ice content at altitude.

As temperatures rise there will be more air quality issues, reducing range and payload capabilities. Slow-moving convective storms and lightning strikes will force more and longer airport shutdowns while higher surface temperatures will affect take-off performance.

Dr. Herbert Puempel at the World Meteorological Organization (WMO) Commission for Aeronautical Meteorology and Co-Chair, ET-Aviation, Science and Climate notes that there are also highly regionalised changes. A Russian Federation study shows large differences in temperature changes in its regions, for example, and the Alps and Arctic are also strongly affected.

Furthermore, longer-term projections about the effects of climate change may actually happen sooner than expected. Puempel believes that the predicted state of the weather in 2100 – complete with the concerns mentioned above – may occur temporarily and regionally any time soon.

Indeed, Wolfgang Bretl, Head of Munich area control centre (ACC), advises that an Alpine Weather Workshop has been set up

to monitor the weather situation in the Alpine area. The ACCs at Vienna, Padova, Zurich, Karlsruhe and Munich are involved with the aim of enhancing coordination and communication processes between ACCs during extreme weather conditions.

### Responding to change

In Europe, weather-related delays have increased for five consecutive years. In the FABEC airspace block in Central Europe – consisting of the ANSPs of Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland – adverse weather is the second most frequent cause of delays after capacity constraints. Local thunderstorms have turned especially severe in spring and summer.

FABEC airspace covers 1.7 million km<sup>2</sup> and handles about 5.5 million flights per year – 55% of European air traffic – so any service disruption and lost airspace capacity is felt acutely across the continent.

Two new initiatives are leading FABEC's response. First, new procedures are in place for aircraft re-routings based on ad-hoc flight plans to avoid local thunderstorms. A flight from Munich to Madrid, for example, might use a longer routing via Italy and the Mediterranean Sea instead of a shorter flight via France.

Second, FABEC is working with the MET Alliance, a consortium of leading European meteorological service providers, to investigate the impact of adverse weather conditions on air traffic management.

The MET Alliance is still in its formative stages and further analyses on the impact of weather need to be done before any results are properly established.

The MET Alliance is looking into such topics as the development of thunderstorms in recent history, the evolution of the jet stream over Central Europe, changes to icing altitudes and the intensity and the vertical and lateral evolution of turbulence.

MET Alliance members are being asked if specific and concrete changes have been observed over the last three to five years.

## Energy increase

Alexandre Allard, Senior Advisor Meteorology at Belgocontrol, a member of the MET Alliance, says that because weather patterns are complex, changing and localised, only general consequences of global warming can be identified. "This means that the impact of global warming on a regional scale can hardly be forecast and that one has to be very cautious when trying to draw conclusions from the few quantitative studies available."

What is known is that an increase in the mean temperature of the atmosphere results in an increase of releasable energy, heat and energy being related. Allard explains that means weather extremes will become more likely and/or more severe. Thunderstorms will be fiercer, for example.

And because global warming will primarily concern higher latitudes, the temperature difference between the tropical and polar zones will be reduced. A possible consequence of this is a weakening of the jet stream, causing weather to be stuck in place. So that thunderstorm hanging over the airport may last a lot longer.

## Pilot information

For air traffic management, it is not just about predicting changes in weather patterns more accurately. It will be just as vital to get detailed information to pilots en-route to mitigate weather-induced operational issues.

## MET Alliance

MET Alliance was formed by:

- Austro Control
- Belgocontrol
- Deutscher Wetterdienst (Germany)
- The Royal Netherlands Meteorological Institute
- Met Eireann (Ireland)
- Météo France
- MeteoLux (Luxembourg)
- MeteoSwiss

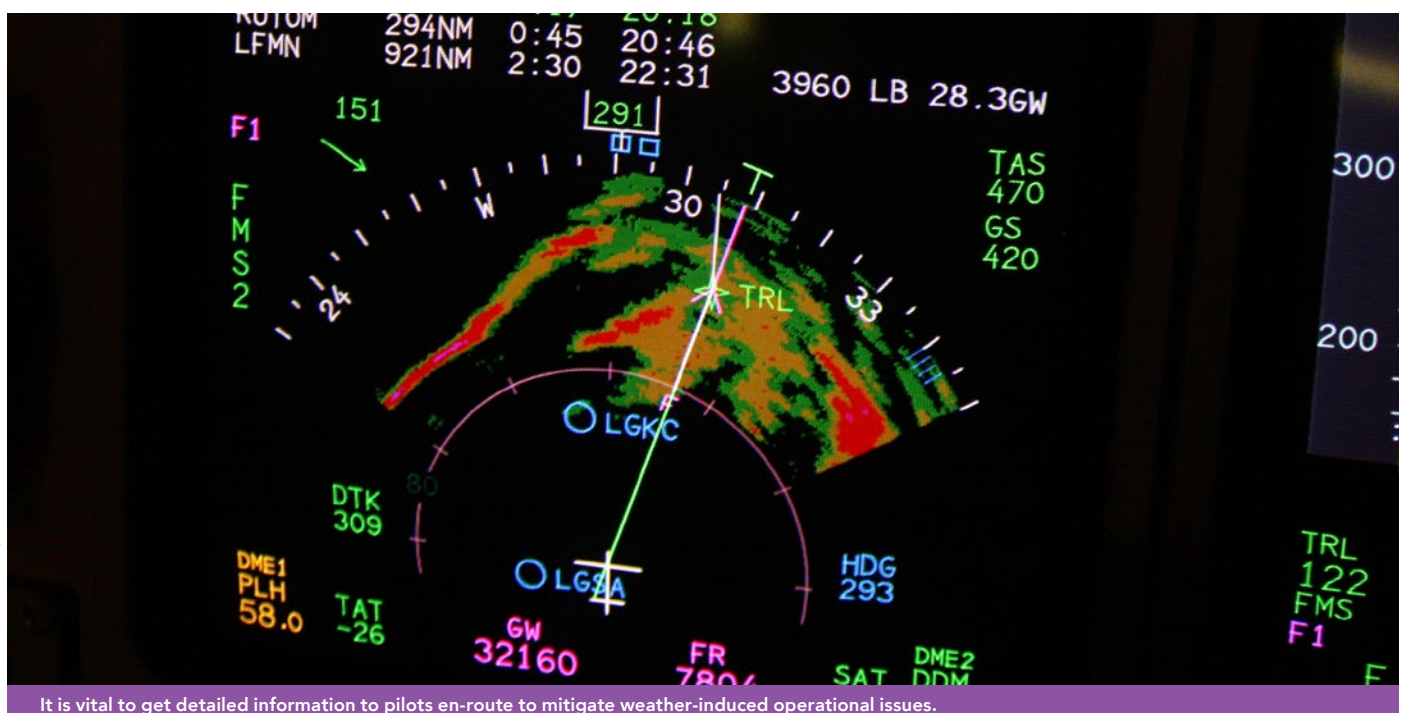
Improvements in on-board weather radars will be vital. These are a primary source of real-time information about precipitation zones and convective activity, including related turbulence and icing phenomena and the presence of hail or wind shear.

"Development continues to improve the capabilities of these radars, which could be ideally complemented by other on-board systems for the detection of lightning and so forth," Allard says.

Research is also ongoing into improving the way the latest available meteorological information is transmitted to the cockpit. "Traditional channels of communication like ATIS/VOLMET (Automatic Terminal Information Service/meteorological information for aircraft in flight) should be complemented by new graphical, impact-oriented and easy-to-use products via an electronic flight-bag," Allard suggests.

"Special attention should also be paid to the training of pilots in the field of aeronautical meteorology and the use of on-board weather radar to ensure that the additional weather information is correctly interpreted," he adds.

Climate change will affect aviation. Understanding the new weather patterns will be an important step towards developing solid mitigation measures and improving operational efficiency. ➤



It is vital to get detailed information to pilots en-route to mitigate weather-induced operational issues.

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- Cost efficient replacement of existing ground based ATM Surveillance assets
- GADSS compliance - 15/1 min



# Answering regional needs

Javier Vanegas, Director Latin America and Caribbean Affairs, CANSO, examines the collaborative efforts that are improving safety and service levels in the region.



Credit: CANSO

All air navigation service providers (ANSPs) in the Latin America and Caribbean region strive to offer world-class service. Of course, each airspace is unique. However, it is necessary that for each phase of flight ANSP customers receive a consistent, high-quality service that meets their expectations and requirements so that the transition from one airspace to another is almost seamless.

With air traffic expected to rise significantly in the Latin America and Caribbean region, ANSPs at a regional level are working individually and with each other to boost efficiency, improve operational safety and support the development of Latin America and the Caribbean generally.

For example, in October 2017, Brazilian ANSP, DECEA, implemented performance-based navigation (PBN) in the Southern region and in the entrance to the west sector of TMA-Sao Paulo, resulting in 350 routes with new PBN procedures. Airports in the south are also complying with required navigation (RNAV) and PBN procedures. These developments have brought significant improvements to the operational effectiveness of air traffic management.

By the same token, Mexican ANSP, SENEAM, published 211 new PBN procedures in 2017 and is designing new PBN procedures for ten more airports to be published in 2018.

With air traffic expected to rise significantly in the Latin America and Caribbean region, ANSPs at a regional level are working individually and with each other to boost efficiency, improve operational safety and support the development Latin America and the Caribbean.

And in July 2018, CANSO supported and organised the third ICAO/IATA/CANSO PBN Harmonisation, Modernisation and Implementation Meeting for the North American, Caribbean and South American regions. The meeting analysed and agreed to optimise 34 regional/interregional RNAV routes, enhancing the regional route structure.

All changes should be published in the Aeronautical Information Regulation and Control (AIRAC) cycle of 8 November 2018, entering into effect on 31 January 2019. This meeting is an excellent example of collaboration and coordination having a positive impact on air navigation safety and efficiency in the region.



Credit: iStock.com/nikpal

The region is overcoming barriers to communication.

## CADENA participation

And the region is making good progress with its collaborative efforts in air traffic flow management (ATFM). The CANSO ATFM Data Exchange Network for the Americas (CADENA) implementation group is increasing its regional participation. We recently welcomed the ANSP of Colombia, Aerocivil, as a member of CADENA.

While developing PBN procedures in Argentina and following close collaboration between EANA and DECEA, it was calculated that about 420 flights cross Argentina's borders with Bolivia, Brazil, Chile, Uruguay, and Paraguay daily. Working towards overcoming barriers and coordinating a seamless airspace is in everyone's interest. Therefore, in the first regional ANSP meeting held in Puerto Iguazu in April 2017, EANA, DECEA, Paraguay and Uruguay suggested supporting a regional ATFM centre.

The measures described above are a clear indication that regional ANSPs are working hard to transform ATM performance. Nonetheless, these measures also depend on the ability of an ANSP to make decisions and reach autonomy. ANSPs are heavily investing in modernising their air navigation infrastructure on the ground and in the air.

## ATFM in Argentina

As for Argentina, host of the CANSO Latin America and Caribbean Conference, the first half of 2018 has seen a notable traffic increase compared with the first six months of 2017.

EANA has made significant improvements in its services to cope with the extra demand. The implementation of ATFM within the Ezeiza Flight Information Region (FIR), allows EANA to establish the balance between demand and capacity of the air traffic management system, ensuring safety, and ordering and streamlining air traffic.

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In the region, most ANSPs are still owned by States and the regulation and air navigation service provision still fall under the same umbrella. However, whether they are State-owned, corporatised, or part-privatised, ANSPs should be allowed to operate in an autonomous environment.

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In the first phase, the ATFM service is being provided within the Ezeiza FIR airspace jurisdiction, maintaining the balance between demand and capacity mainly in the Buenos Aires Terminal Sector and in sectors or airports where it is known or assumed that demand will exceed capacity.

And at Ushuaia airport, EANA recently modernised its air traffic control tower and its operational building. Also, it published new PBN approach procedures for Mar de Plata, Puerto Madryn and Trelew airports.

Even here though, EANA's achievement on PBN was a collaborative effort across the region. DECEA supported EANA by introducing new capabilities that helped EANA's PBN design team to produce not only new instrument charts but also concepts of operation.

## Business models

In the region, most ANSPs are still owned by States and the regulation and air navigation service provision still fall under the same umbrella. However, whether they are State-owned,



Credit: IATA/ICAO/CANSO

Third ICAO/IATA/CANSO Performance-Based Navigation Harmonization, Modernization and Implementation Meeting for the North American, Caribbean and South America

## CANSO in the region

CANSO organised an interactive session on runway safety within the framework of the 9th ALTA Safety Summit. The session reviewed runway safety incidents videos and discussed mitigation strategies to prevent such scenarios from occurring.

CANSO is about creating value for its Members, and the CANSO SEANS-Safety evaluation supported and played a big part in the Safety Management System (SMS) certification for two CANSO Members in the region. The Dutch Caribbean Air Navigation Service Provider (DC-ANSP) and Instituto Dominicano de Aviación Civil (IDAC), of the Dominican Republic, were awarded the certificates by their respective civil aviation authorities.

The involvement of CANSO was important as DC-ANSP has been a participant in the *EUROCONTROL/CANSO Standard of Excellence Measurement Questionnaire* since 2016. The results of the questionnaire provided a measure of where DC-ANSP stood in its Safety Management System development. The involvement of SEANS-Safety was very helpful in gauging progress and ideas for improvement. The SMS certificate award was the end of one journey and the beginning of another which will lead to SMS excellence.

IDAC Air Navigation Directorate (DINA) learned many lessons from the SMS and senior management was committed to the process from the beginning. Throughout the implementation process IDAC made changes in its documentary sources and created new processes to ease SMS implementation.

corporatised, or part-privatised, ANSPs should be allowed to operate in an autonomous environment and be separated from the regulator.

There are many examples of this. EANA is a State-owned agency, and is separated from the regulator, and the State allows full autonomy. This has enabled EANA to move quickly into improving the service provided by Argentina into a world-class offering.

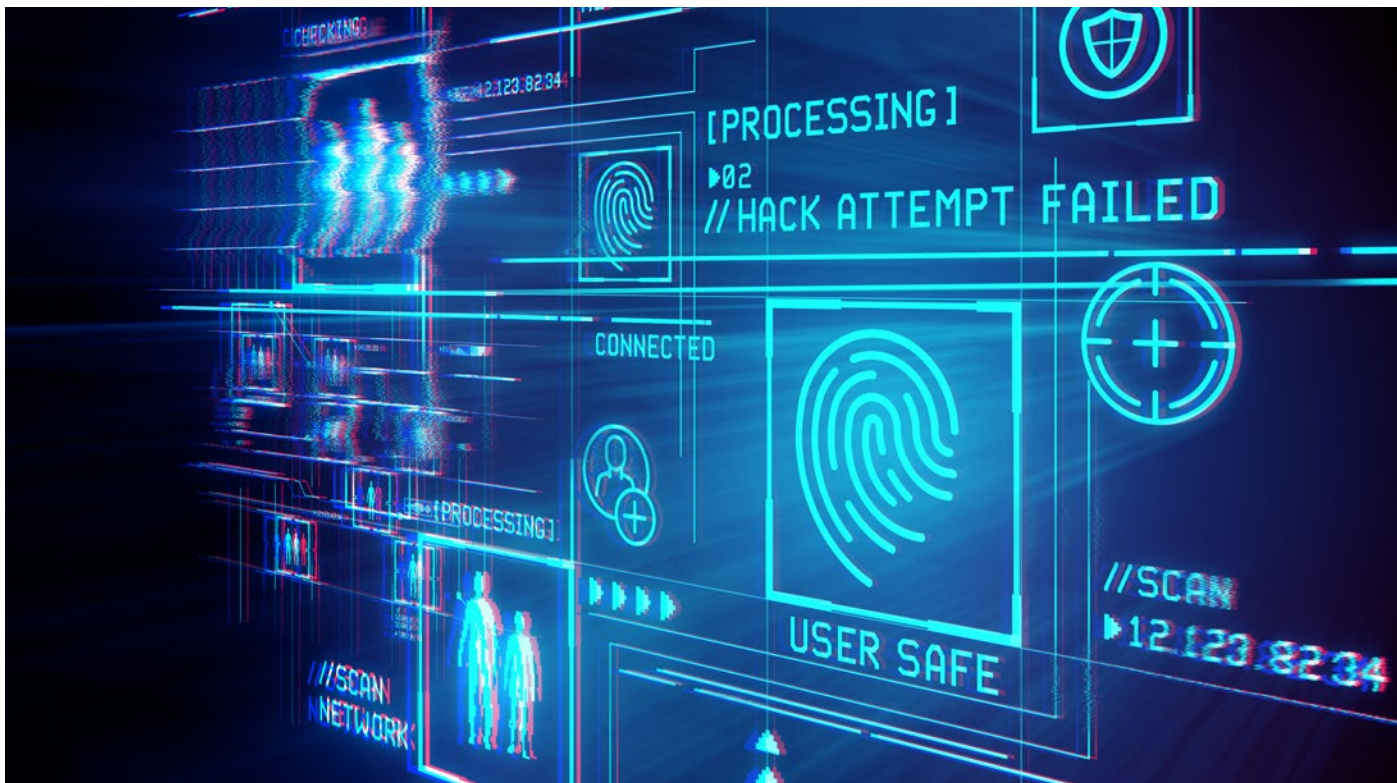
There is a lot to do, implement and enhance, but the separation and autonomy is a fundamental starting point.

Policymakers should consider the various elements of good governance that drive ANSP performance, including the separation of regulation from service provision. The industry needs all stakeholders at a global, regional and local level to work closely together to achieve the common objective of safe, efficient and sustainable air transport. ➤

*The CANSO Latin America and Caribbean Conference, hosted by EANA, takes place on 5-7 November in Buenos Aires, Argentina. Its theme is 'Innovation, integration and investment in air traffic management'. For more information, please visit [canso.org/canso-latin-america-and-caribbean-conference-2018](http://canso.org/canso-latin-america-and-caribbean-conference-2018)*



# Information exchange to benefit all



Credit: iStock.com/solarseven

Securing system-wide information management will be a challenge, but its transformation potential makes implementation worthwhile.

**System-wide information management (SWIM) represents a fundamental shift in air traffic processes.**

Although often described as “the ATM Intranet”, SWIM is not a single system but rather a service-driven concept based on the free exchange of information throughout the network. Using service-oriented architecture (SOA), open mainstream technologies, agreed standards and common definitions should ensure all stakeholders are accessing, sharing and processing the same information for the benefit of the customer.

In short, quality data is delivered to the right people at the right time. The result will be a more efficient, cost-effective and customer-focused ATM industry.

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Compared with classic systems and protocols, SWIM is a major leap in security and reliability, both by employing state-of-the-art technologies and best practices, and by the decentralised design.

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## Interpreting recommendations

The sheer scope of SWIM means there is still a long, hard road ahead, however. Simply implementing SOA is not enough to guarantee interoperability. The various stakeholders have different needs, different business models and different financial and technical expertise.

A number of competing requirements are possible, including, but not limited to:

- Security versus performance
- Reliability versus cost
- Reliability versus pace of change

Security, for example, is seen by some as conflicting with SWIM's open architecture and array of connection points.

“The SWIM Yellow Profile (see panel, page 21) contains a promisingly wide range of security and resilience requirements,” says Matt Shreeve, a cybersecurity expert at Helios. He warns, however, that on closer inspection, many of these so-called requirements are actually only recommendations or options, which alone will not give adequate assurance to stakeholders that enough resilience is being built into SWIM. So, further collaborative work on compliance and mutual assurance is needed.

The sheer diversity of service providers and users – everything from a small general aviation aerodrome to major suppliers on a worldwide basis – means SWIM standards are vital, but so too is the consistent application of standards.

Shreeve cites patching – a mainstay of protecting commercial off-the-shelf (COTS) technology like SWIM – as an example. It is only a recommendation. Similarly, protection from denial of service attacks, which is essential for public networks, is optional.

“Of course, the SWIM deployment architecture and individual service providers may well build in these and other measures needed for resilience, but there is no guarantee that they will,” says Shreeve.

“SWIM is not a single system, and there is a risk that the security requirements may be interpreted differently.”

Meanwhile, the SWIM Blue Profile, intended for real-time information exchange, is still under development. Significant efforts will be needed to make it robust and resilient, and, again, collaboration will be key.

### A major leap forward

Setting up SWIM from scratch does carry advantages too. Josef Jahn, SWIM System Architect, Frequentis AG, notes that though the shift from traditional point-to-point connections towards a service driven ecosystem increases the potential attack surface, “in contrast to many traditional ATM systems and standards, SWIM tackled security as one of the main aspects of design from the very beginning”.

He continues: “From the authentication of communication parties to validation and encryption as well as resilience against vulnerability exploits, security was never seen as just a network issue. Compared with classic systems and protocols, SWIM is a major leap in security and reliability, both by employing state-of-the-art technologies and best practices, and by the decentralised design.”

Shreeve agrees that, if deployed and operated properly, then SWIM could reduce overall cyber risk since many insecure legacy

SWIM Profiles		
Profile Name	Scope	Key Elements
Yellow Profile	<ul style="list-style-type: none"> <li>➤ Based on the Web Services stack of standards running over Internet and sufficiently secured.</li> <li>➤ Deployment options kept open as possible.</li> <li>➤ Wide variety of interactions, flexibility and affordable for the service consumer.</li> <li>➤ Usable out-of-the-box with mainstream tools.</li> <li>➤ No real-time or near real-time uses.</li> <li>➤ Non demanding high availability.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Yellow Profile consists of different parts: “Core”, “Messaging+”, “Advanced” and “Security+”.</li> <li>➤ The Web Services family of protocols based on SOAP (SOAP 1.1 and 1.2, WSDL 1.1 and 2.0, WS-Security 1.1).</li> <li>➤ Message level security controls.</li> <li>➤ Transport level security controls (TLS 1.0, TLS 1.1 and TLS 1.2).</li> <li>➤ The AMQP v1.0 protocol.</li> <li>➤ Cryptography (PKI X.509 v3, XML Encryption, XML Signature and ECRYPT II).</li> </ul>
Blue Profile	<ul style="list-style-type: none"> <li>➤ Primarily Real-time or near real-time uses (best effort also supported).</li> <li>➤ Demanding high availability with severe constraints with respect to the available resources.</li> <li>➤ Technical solution as much as possible supported out-of-the-box.</li> <li>➤ Secured interactions (different security levels).</li> <li>➤ Running over trusted and untrusted networks.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Blue Profile consists of different parts: “Core” and “Flight Data Domain”.</li> <li>➤ The Web Services family of protocols based on SOAP (SOAP 1.1, WSDL 1.1).</li> <li>➤ OMG Real-time Publish-Subscribe specifications (DDS v1.2 and DDS-I v2.1).</li> <li>➤ Transport level security controls (TLS 1.0).</li> <li>➤ Message level security controls (OMG DDS Security).</li> <li>➤ Cryptography (PKI X.509 v3, and ECRYPT II).</li> </ul>
Purple Profile	<ul style="list-style-type: none"> <li>➤ High latency and/or low bandwidth conditions.</li> <li>➤ No Real-time or near real-time uses.</li> <li>➤ Need to minimize the communication overhead and transport connections number.</li> <li>➤ Technical solution as much as possible supported out-of-the-box.</li> <li>➤ To enable proper information sharing in scenarios where availability of end-to-end connectivity over the communication infrastructure is intermittent and unpredictable.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Purple Profile consists of different parts: “Core” and “Messaging Bridging”.</li> <li>➤ Advanced Message Queuing Protocol (AMQP) (version 0-9-1).</li> <li>➤ Transport level security controls (TLS 1.0, TLS 1.1 and TLS 1.2).</li> <li>➤ Cryptography (PKI X.509 v3, XML Encryption, XML Signature and ECRYPT II).</li> </ul>

Source: SESAR Joint Undertaking

# You can rely on us

As a trusted supplier to air navigation service providers and airport operators, we plan and implement turnkey communications solutions from the microphone to the antenna.

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 solace.



The Internet technology-based IT operations common today in many other industries must be adopted by ATM.

protocols would be replaced. And though SWIM is based on open technologies, it is at least securable and could lead to a modern, well-understood information sharing mechanism.

The hard work will be in establishing trustworthy information sharing through strong-but-inclusive governance and harmonised compliance regimes.

### Trusted sources

In this regard, Shreeve believes the next couple of years will be critical. If the non-technical work involving governance and compliance is completed and supports greater security, then ATM will have taken a big step forward.

The key, says Shreeve, is that SWIM services should include the means to demonstrate their integrity: through technical means, such as cryptographic checks, and non-technical means, such as service compliance and assurance evidence. This is a logical advance on today's situation where, for example, Aeronautical Information Publications are openly available, but still trusted.

The sheer diversity of service providers and users – everything from a small general aviation aerodrome to major suppliers on a worldwide basis – means SWIM standards are vital. But so too is the consistent application of these standards. “A pragmatic approach builds confidence slowly through progressive deployment and use,” suggests Shreeve. “This is especially important given ANSPs concerns over using the internet and public networks for sharing operationally critical data.”

Jahn concurs that the information exchange models and service definitions are of equal importance to technical standards and will be essential to true interoperability.

### ATM cybersecurity

Helios' Matt Shreeve says there is a lot of talk about cybersecurity issues and funding, but more action is needed.

He applauds the awareness and early cooperation demonstrated by the many working groups and documents in recent years. But this must lead to practical action on an industry-recognised set of detailed risks, “including difficult-to-secure legacy technologies such as voice and automatic dependent surveillance – broadcast.”

### Sharing information

The list of ATM stakeholders that would benefit from sharing information through the SWIM concept includes:

- Pilots – all aspects of flight
- Airport Operations Centres – managing departures, surface movements, gates and arrivals
- Airline Operations Centres – building schedules, planning flight routings and fuel uplift, ensuring passenger connections and minimising the impact of any delays
- ANSPs – organising and managing airspace
- Meteorology Service Providers – providing weather reports and forecasts
- Military Operations – planning missions and blocking airspace to conduct training operations.

“SWIM compliance needs to be independently verified to prevent it from becoming a mere bullet point on a feature list,” he notes. “There is a risk of solution providers offering “SWIM compliant” products and solutions, which fulfil parts of the SWIM specifications, but do not achieve interoperability.

“The same is true for security, where often a network firewall is seen as sufficient to fulfil some of the requirements.”

Jahn believes users need to see SWIM not just as a regulatory requirement but as a chance to drive down integration costs, provide and monetise new services, as well as enable competition in a business in which products traditionally come with a complete vendor lock-in.

### ATM adoption

Ultimately, collaboration is the key to success of the SWIM concept. The industry must move from bilaterally negotiated interfaces to a cost-efficient network-oriented exchange of information. The Internet technology-based IT operations common today in many other industries must be adopted by ATM.

Once SWIM is implemented, new opportunities in how information is shared and used await (see *big data* article, page 10).

Moreover, commercial off-the-shelf technologies will speed up implementations times, bring down costs and increase the overall flexibility of the ATM system. ➤

# An intelligent approach

Separation standards on approach and departure are being refined but need to be brought into a cohesive structure for airspace capacity to benefit.

**To get more capacity into airspace, traditional distance-based separation standards are being replaced.**

Technology has made possible a number of safe alternatives. Minimum pair separation, for example, is able to reduce the distance between aircraft through enhanced positional accuracy.

Another separation standard relates to wake turbulence, which forms behind an aircraft and can particularly affect arrivals and departures. To reduce the limitations imposed by wake turbulence the existing three aircraft categories – light, medium and heavy – have become six. The idea is to make this recategorisation (RECAT) even more granular and cover all possible aircraft pair combinations. This pair wise separation system will evolve through RECAT 2 and RECAT 3, due to come online at European airports in 2020 and 2022 respectively.

Airports using RECAT, including Paris Charles de Gaulle, Leipzig-Halle, London Heathrow and Vienna, report a notable increase in hourly movements.

Time-based separation (TBS), meanwhile, has been live at London Heathrow since March 2015. Managing aircraft separation by time rather than distance is especially beneficial on days with strong headwinds. If a headwind is strong then it takes an aircraft longer to cover a fixed distance. Therefore, if you continue to separate aircraft using the traditional stipulated distance, the landing rate will suffer.

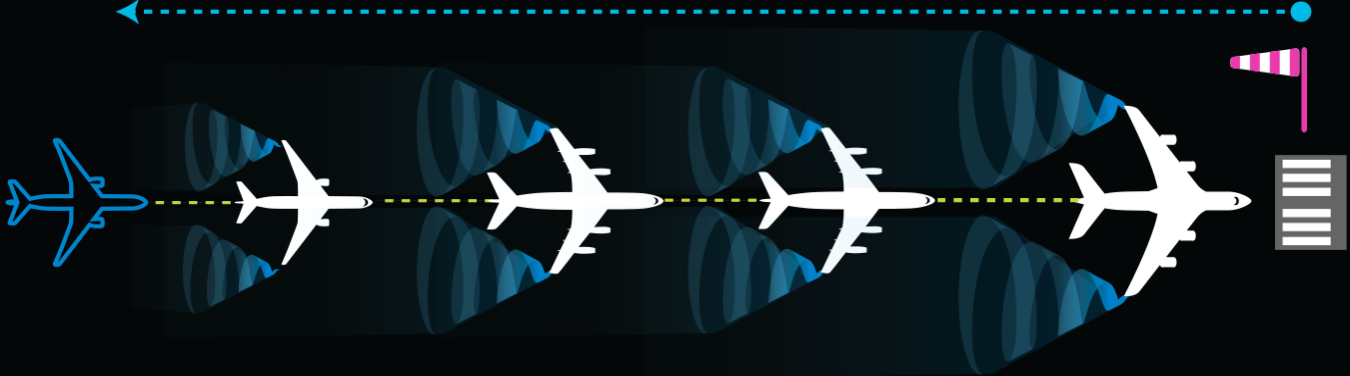
Usually, two “heavy” aircraft are 90 seconds apart – the normal amount of time taken to cover the required four miles of separation. But in a 35-knot headwind, it takes the aircraft 107 seconds to fly the four miles. That extra 17 seconds adds up over the course of a day and capacity is lost.

If 90 second intervals are taken as a guideline rather than four miles, however, then no time – and hence no capacity – is lost.

In a 20-knot headwind, TBS provides an extra 20 movements per day, stretching to an extra 49 movements in stronger winds compared with pre-TBS movements.



## STRONG HEADWINDS



Medium	Heavy	Heavy	Super heavy
<del>5 NM</del>	<del>4 NM</del>	<del>6 NM</del>	
4.2 NM	3.4 NM	5.1 NM	
<del>135 secs</del>	<del>107 secs</del>	<del>100 secs</del>	
113 secs	90 secs	135 secs	

Wake vortices dissipate quicker so separation distance can be reduced safely.

Time-based separation offers significant time savings over traditional distance-based separation standards.

Credit: NATS

## Coherent whole

All these separation standards are delivering demonstrable benefits. Merging them into a coherent whole is the next step. What happens on a windy day at London Heathrow, for example? Do TBS or wake turbulence standards hold sway?

Andy Shand, General Manager Customer Affairs at NATS, says this is the issue that the introduction of its Intelligent Approach tool is intended to address. Intelligent Approach has the various rules and standards built into its software, so an approach controller automatically knows the most constraining separation affecting each pair of aircraft.

"With enhanced TBS (eTBS), the second phase of Intelligent Approach, all of the separations are time-based rather than distance-based, so they are adjusted for headwind/tailwind on the approach from 3,000ft down to runway threshold," explains Shand.

"The tool then shows the approach and tower controllers the most constraining separation standard by displaying a dynamic separation indicator to the controller. Typically, this standard is driven by wake separation requirements and with eTBS we use the RECAT EU wake categories."

In some cases, the most limiting factor is runway occupancy. The Intelligent Approach tool incorporates runway occupancy times for each category tailored to the airport and runway. If this is the limiting factor, the tool displays a runway occupancy indicator to the controllers.

Controllers can also override the system if, for example, there is degraded braking action or low cloud necessitating a higher minimum separation standard. The tool will still show wake indicators as appropriate.

## Punctuality improvement

Intelligent Approach is proving very effective, says Shand. "Since TBS/eTBS has been implemented we have seen a reduction both in wake turbulence encounters and go-arounds," he notes. "In terms of service improvement, the benefits far exceeded our original business case. Air traffic flow management delays due to headwinds have reduced 62%. With eTBS, we have seen on average more than two additional landings per hour versus the previous distance-based separation, and airborne holding has decreased by 115,000 minutes."

According to the airport, end-to-end punctuality has improved 1.5% and that figure is expected to rise given eTBS was only introduced in March 2018.

Importantly, pilots are comfortable with using reduced separation standards. NATS organised extensive briefings with airlines and the airport before introducing the new procedures. And since the system went live, there has not been an increase in radio transmissions, which would have been indicative of more questions to the controller.

Having a tool in place has helped simplify the introduction of new separation standards, according to Shand. RECAT-based time intervals have been introduced on departures to great success, but the next step is to replace wake categories with static pairwise separation. Shand anticipates this will deliver more than two additional landings per hour.

"As the appropriate tools are developed, more can be done without compromising safety – pair wise separation on arrival, for example," concludes Shand. "We remain focussed on the safety case for all these changes and are committed to continuing to deliver benefits in safety, capacity and resilience." ➔

# A pan-European outlook

Traffic increases in Europe could mean further increases in delays unless governments provide the support ANSPs need.

**Air traffic capacity shortages and delays in Europe must be addressed by stronger cooperation and the timely delivery of solutions.**

"It is now widely recognised that the unprecedented growth in air traffic in Europe will create challenges of insufficient capacity and an unacceptable increase in delays unless urgent new actions and initiatives are taken," says Jeff Poole, Director General of CANSO.

"CANSO and its Members are playing their part through new investments, technologies and processes," he continues. "However, the step changes that are needed to address the capacity and delay challenges can only be achieved by removing the present constraints to a true pan-European approach to airspace management – with a greater sense of urgency."

In EUROCONTROL's 2018 *Challenges of Growth*, four possible future scenarios are presented:

- **Global Growth** is characterised by strong global growth with technology used to mitigate sustainability challenges
- **Regulation and Growth** features moderate growth regulated to reconcile demand with sustainability issues
- **Fragmenting World** postulates a world of increasing tensions and reduced globalisation
- **Happy Localism** considers a fragile Europe increasingly, but contentedly, looking inwards.

The report suggests that Regulation and Growth is the most likely outcome. In this scenario, Europe will host 16 million flights annually by 2040, a 53% increase on 2017 figures.

Global Growth remains a possibility, however, and would cause the greatest capacity challenges. This scenario would see nearly 20 million flights by 2040, an 84% increase on the 2017 total.

To cope, airports are expanding their facilities, with 111 planning a 16% increase in capacity between them, allowing for 4 million extra aircraft movements.

The top 20 airports are doing the bulk of the development, though, according to *Challenges of Growth*. They are planning to accommodate 28% more passengers or 2.4 million movements.

The crucial point, however, is these airport expansion plans are not enough. By 2040, under Regulation and Growth, 1.5 million flights or 8% of demand will go unaccommodated. That is 160 million passengers unable to fly. In Global Growth, the gap is 3.7 million flights or 16% of demand.

*Challenges of Growth* continues: "Even with 1.5 million flights unaccommodated and therefore lost, the network remains highly congested. The number of 'Heathrow-like' airports operating near capacity for much of the day climbs from six in summer 2016 to 16 in 2040, or even 28 in Global Growth.



Credit: Fraport AG

All stakeholders must work together with a renewed sense of urgency on delivering the objectives of a Single European Sky.



The growth of air traffic in Europe has been unprecedented.

"We have modelled delays from all causes, and find that in the summer, these would jump from 12 minutes to 20 minutes per flight in 2040. In particular, the number of flights delayed by 1-2 hours increases by a factor of seven, which means around 470,000 passengers each day delayed by 1-2 hours in 2040, compared with around 50,000 today."

### No quick fix

Delays stem from various causes, including lack of capacity both in the air and on the ground, technical problems with aircraft, airport congestion and bad weather.

They are already getting worse. In summer 2018, delays have more than doubled compared with summer 2017 and reached 47,000 minutes per day, according to EUROCONTROL data.

Alexandre de Juniac, Director General and CEO of the International Air Transport Association accepts that there is no quick fix for this year. "But the needed solutions are well-known," he says. "With the correct investment and planning by governments and ANSPs we can, and must, make next year better."

In its *Performance Review Report* (PRR) for 2017, the independent Performance Review Commission (PRC) of EUROCONTROL notes air traffic in Europe reached 10.6 million flights, the highest level on record.

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Airports are expanding facilities, with 111 airports planning a 16% increase in capacity between them, allowing for 4 million extra aircraft movements. The top 20 airports are doing the bulk of the development, planning to accommodate 28% more passengers or 2.4 million movements in the future.

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Overall, 5.3% of flights were affected by en-route ATFM delays in 2017 (up from 4.8% in 2016) with an average delay of 16.5 minutes per delayed flight.

The PRC chairman, Ralph Riedle, notes: "While the continuous improvement in cost-efficiency is to be welcomed, if we take the economic view, combining provision and delay costs, we see that a significant part of the cost-efficiency savings are being offset by the sustained increase in ATFM delay costs. This reflects concerns expressed by the PRC in previous reports that delays would increase again, unless sufficient attention was focussed on capacity planning and deployment."

### CANSO support

CANSO and its Members will continue to focus on reducing those delays which are genuinely addressable by air traffic management. But effective cooperation between all stakeholders needs to start now if capacity is to grow with demand; and if delays and congestion are to be avoided.

Already, developments under the first phase of SESAR, which targets busy airports at peak hours, could reduce the most-likely 2040 capacity gap by 28%.

CANSO Member ANSPs in Europe, meanwhile, invested €6.2 billion between 2011 and 2016 in new ATM infrastructure. They continue to take steps to reduce delays and improve efficiency, such as collaborative decision-making, air traffic flow management, greater flexibility for aircraft to fly their chosen routes and implementing new technologies and procedures.

CANSO also welcomes and strongly supports the joint call of the European Commission and the European Parliament for EU Member States to resume discussions on improving European airspace.

A key step will be ensuring adequate funding for ATM infrastructure expansion and modernisation. States also need to implement smarter regulation that encourages performance improvements. Perhaps most importantly of all States need to ensure a pan-European approach with more cross-border cooperation.

It is not an easy fix. Air traffic controllers take time to train and develop, and funding and implementing new infrastructure has an even longer timeframe.

In addition, as airlines insist that charges are kept as low as possible, ANSPs have been careful not to provide more capacity than the agreed forecast requirements. It means that in the short and medium term, it is difficult to increase ATM services to handle extra traffic.

"CANSO believes strongly that a coordinated approach across all stakeholders can create the step changes that are necessary in the management of European airspace and deliver the biggest benefits," says Poole.

"We are therefore urging all stakeholders, in particular Member States, to work together with a renewed sense of urgency on delivering the objectives of a Single European Sky; invest in modernising ATM infrastructure; and enact facilitating regulation that is performance-based rather than prescriptive. We welcome the joint call for action from the European Commission and the European Parliament and we are committed to work with them, States, industry and other stakeholders to ensure Europe's airspace has adequate capacity and is fit for purpose now and in the future." ➔

# Responding to requirements for new training methods

Training must be made more efficient and appealing if the industry is to attract the number of air traffic controllers required.

**Air traffic controllers (ATCO) must manage surging traffic demand while maintaining and improving the industry's enviable safety record.**

For some, the fact that ATCOs have successfully negotiated these twin commitments for many years is a sign that the existing ATCO training model is not broken. Others, however, point to new technologies, new procedures and a new digitally-savvy generation of recruits as proof that training methodologies must necessarily be re-invented.

Anne Kathrine Jensen, CEO of Entry Point North, says that there is an increasing focus on how the company trains ATCOs rather than what they teach them. The latter is largely regulated and so is simply a matter of ticking the right boxes and covering required ground. The former, however, must prepare future controllers for a fast-changing work environment.

Training is therefore under constant development, taking into account the expectations of new generations regarding training, the needs arising from technological development in air traffic management and a multitude of trends in how ANSPs are organised and collaborate with aviation partners.

Potential new recruits to the air traffic management (ATM) industry are already accomplished in the digital world. Smartphones, tablets, and laptops provide instant access to global information. Not only are millennials comfortable with real-time data from a variety of sources but they even expect it.

Training has to keep pace with such developments to attract recruits to the industry and to keep them engaged during the initial stages of their career.

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Aviation has always been a dynamic industry and the pace of change is increasing. ANSPs are forging new business models, technology is experiencing exponential progress, and service demands climb ever higher.

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## Simulator exercises

At Embry-Riddle Aeronautical University in the United States, students now practice in en-route and terminal radar labs using Kongsberg Geospatial's I-SIM ATM Technology that replicates US air traffic control centres. "The I-Sim ATM simulator provides the most realistic opportunity for our students to experience what it's like to work traffic in an en-route or terminal radar environment," says Dr. William Coyne, Embry-Riddle professor and program coordinator for Air Traffic Management.

Embry-Riddle's air traffic control program is just one of a small number of colleges and universities granted FAA designation as a Collegiate Training Initiative school and many of the graduates in the programme do get hired for initial air traffic control training at the FAA Academy.

Advanced simulation training – a nod towards gamification and virtual reality, both of which resonate with younger generations – is seen throughout the world.

The United Arab Emirates' airspace restructuring project gave the region an airspace completely based on performance-based navigation (PBN) with a navigation specification of RNAV-1. More than 250 air traffic controllers undertook simulation exercises to allow them to handle the advanced new system.

## Cultural needs

The technological angle is only part of the human equation in formulating new training programmes, however.

"ATC Training at Entry Point North is continuously developed and adjusted to follow up on the background and expectations of course participants and customer needs," says Jensen.

"When designing and delivering training, we not only adjust towards the millennials' approach, but also take into account different cultures in order to help every student to reach their potential. For us, it is very important to know who are the course participants."



Credit: Entry Point North

It is vital to incorporate a regional focus within global training standards.



Credit: Airways New Zealand

Increasing traffic volumes means increased demand for trained staff.

The cultural aspect has become crucial as more and more training companies become involved in offering a wide variety of classes on a worldwide scale.

Airways New Zealand, for example, has taken its expertise to the Middle East. Aside from work in Saudi Arabia, Kuwait and Bahrain, it is installing and deploying a Total Control LCD tower simulator and two radar/non-radar simulators at facilities at Beirut International Airport in Lebanon.

The simulators will imitate a full air traffic control flight information region using high-fidelity 3D graphics and replicate potential weather conditions.

"We are proud to partner with DGCA as they work to enhance their ATC training using our highly advanced simulation technology," says Sharon Cooke, CEO, Airways Training. "We're equally proud to have Airways technology and expertise being installed in a region where air traffic movements are growing rapidly yet there's a critical gap for the training of air traffic controllers."

Importantly, Airways' Total Control simulation technology speeds up ATC training, significantly reducing on-the-job training time. Jensen agrees that given the increased pressure to train enough air traffic controllers to meet demand, this is another vital development.

"A lot of work will be put into more efficient training that can help the industry to reduce costs but still achieve a high degree of knowledge and skills in future ATM staff," she says. "Increasing traffic volumes means increased demand for trained staff."

### First among equals

Jensen believes that the modern ATCO needs "perception, accuracy, flexibility, team orientation and self-knowledge skills".

Of those qualities, flexibility is perhaps first among equals as new technologies and procedures come online.

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Advanced simulation training – a nod towards gamification and virtual reality, both of which resonate with digitally-savvy younger generations – is now seen throughout the world.

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"Students need to be open-minded, reflective and responsible for their own training," Jensen notes. "Most of them want this and it is also what they are used to in other types of training."

That way, says Jensen, students learn to easily adapt to new situations. Training on traditional tower operations can be translated into remote and/or digital tower operations, for example, if the student has the right approach. There will be many similar ATM upgrades ahead for the ATCO to negotiate.

Team orientation, meanwhile, will come to the fore along with such technologies as airport collaborative decision making and system wide information management. Cooperation with partners, and especially airspace users, will become an integral part of the job.

Aviation has always been a dynamic industry and the pace of change is increasing. ANSPs are forging new business models, technology is experiencing exponential progress, and service demands climb ever higher.

Training ATCOs for this vibrant future – and understanding that the potential of younger generations might not be reached in the classroom alone – requires fresh thinking.

Because something is not broken does not mean that it cannot be improved. ➤

# Improving the information flow

Christian Onselaeere, CEO, ADB SAFEGATE, says collaboration and global standards are the keys to unlocking greater efficiency in air traffic management.



Credit: ADB SAFEGATE

**The dynamic nature of aviation should be embraced, according to Christian Onselaeere, CEO, ADB SAFEGATE. As he puts it: "There has probably never been a more exciting time to be in air traffic management."**

"Digitisation and new technology are changing the face of aviation and air traffic management," he adds. "New technologies entering the ATM world from other industries are opening up huge opportunities to transform airport performance globally and improve safety."

Onselaeere lists fully integrated air traffic control (ATC) solutions, remote towers, airport collaborative decision making (A-CDM),

Efficiency gains are fundamental to the ability to meet future air traffic demand and incorporate such new concepts as free route airspace, or extended arrivals management. These concepts only work if different stakeholders cooperate with each other.

data analytics, automation and voice recognition software as just a few of the paradigm-shifting developments being implemented by the industry.

## Operational makeover

Many of the advances are designed to increase capacity. Often, solving growth-related challenges will mean changing key airport processes and systems, or even establishing a full operational makeover. As many airports have reached their geographic boundaries due to physical or environmental limitations, the traffic increases can no longer be managed by traditional means but rather must be managed by raising operational efficiency through stakeholder cooperation.

"More and more decisions on future traffic flows and how to handle the tremendous increase in movements are handled at the air traffic / apron control level," says Onselaeere. "ATC is a central part in the airport set up and decisions are being centralised at the ATC level."

Onselaeere believes that the silo thinking of the past – when different parts of the airport, such as the terminal, airfield and tower, worked independently – is finally being eradicated. "We now see that the former silos are starting to talk to each other and work together to create a unique view of the airport or to agree on a common strategy going forward," he says.



Credit: iStock.com/Mirrorimage-NL

Collaboration based on global standards promotes efficiency and can help unlock the potential for traffic expansion.



Integrating information will lead to better service provision.

Credit: iStock.com/Rathke

In many respects, this is a logical evolution as small improvements are gradually implemented. Aircraft get to know if gates at the terminal are free, ground teams get to know when parts of the airfield can be maintained or if traffic on the apron is particularly busy.

But evolution is being turned into revolution by intense competitive pressures. According to Onselaeere, whoever best understands how different solutions can be integrated into one overriding view or approach will emerge as the winner in the long run.

We believe that the introduction of airport collaborative decision making (A-CDM) and functional airspace blocks is proof that collaboration between stakeholders is the key to future success," he notes. "The efficiency gains are fundamental to the ability to meet future air traffic demand and incorporate such new concepts as free route airspace, or extended arrivals management. These concepts only work if different stakeholders cooperate with each other."

### Follow the Greens

ADB SAFEGATE is supporting greater collaboration by offering solutions that integrate information from the airfield, gate and tower into single systems. Operational benefits are obtained through access to data that supports tactical and strategic decisions.

"We are also a driver of the Follow the Greens concept, we are continuously improving our advanced visual docking guidance system to create faster turnaround times and we are developing a set of analytics solutions that will give the airport and the airline full transparency on what is happening at the airport so as to create new forms of efficiency at the airport," Onselaeere says.

The ADB SAFEGATE CEO is so adamant about the way forward that if he could change one thing about commercial aviation tomorrow, it would be to improve the information flow, so that information about late flights, missed connections and so forth is communicated earlier to all stakeholders and also to passengers.

"The information is already there," he insists. "However, it is fragmented and communicated too late, which leaves a bad impression for a high-tech industry.

"Imagine one integrated operational process from approach to departure! When all parts of the airport communicate they can work seamlessly together as one. This would provide the necessary

### Global standards

Onselaeere says CANSO's vision to transform global air traffic management performance and deliver seamless airspace globally dovetails perfectly with ADB SAFEGATE's own aspirations to enable airports to operate more safely, efficiently and sustainably.

"We partner with airports and airlines to analyse their current structures and operations, and jointly identify and solve bottlenecks," he says. "With CANSO's reports and various case studies on relevant industry topics to increase a seamless experience, I believe that the industries' stakeholders are a bit closer to sharing information.

"Global standards are important to guarantee that the same safe and proven procedures are applied around the world," he adds. "They will allow developing countries to meet the traffic increases that they are confronted with in the future. Regions like Africa or Latin America now realise that they will need to upgrade their infrastructure to meet future traffic volume, and having standards is the best way to realise harmonised air traffic in a cost-efficient way."

operational support for a seamless, optimised procedure that guides aircraft during approach and landing, taxiing to the gate, and back out again, across the airfield to the departure runway – tailored to maximise the airport's throughput and safety."

To make this a reality, such a solution would integrate and intelligently support or automate many different guidance and traffic control functions, including tower control systems, airfield lighting, docking control and gate management. With aircraft time on the ground ideally limited, airports can fully utilise capacity and safely handle more traffic with their existing facilities.

"At ADB SAFEGATE we believe airports can do more with what they already have, and we can help unlock the hidden potential for airport traffic expansion," Onselaeere concludes. "There are ways to expand efficiency instead of infrastructure when we enable all parts of an airport to work together as one to increase airport performance, from approach to departure." ➔

# Digitisation, Big Data and ATM



All images: CANSO

Delegates enjoy a colourful Welcome Reception sponsored by NATS.

A record-breaking 272 delegates from 105 organisations attended the CANSO Global ATM Summit and 22nd AGM. CANSO's flagship Member event, it was kindly hosted by AEROTHAI in Bangkok, Thailand, with lead sponsor Aireon, on 10-13 June.

The event brought together industry experts and innovators for lively discussions about the importance of digitisation and big data in ATM. Members also had the opportunity to find out more about ways to participate in CANSO during dedicated sessions with CANSO programme managers and region directors.



Mr. Arkhom Termpittayapaisith, Minister of Transport, Royal Thai Government welcomes delegates to Thailand.



Delegates network and find out about the latest ATM innovation in the Summit's exhibition area while enjoying refreshments sponsored by Northrop Grumman and NAV CANADA.



 **canso**  
GLOBAL  
ATM SUMMIT  
AND 22<sup>nd</sup> AGM

**BANGKOK**  
10-13 June  
**2018**



Delegates feedback on questions relating to the emerging patterns of ATM data and the practical implications for the ATM industry.



Captain Pongtorn Thepkanjana, Executive Vice President, Operations, Thai Airways gives the airline view of growth.





Brendan Sobie, Chief Analyst, CAPA - Centre for Aviation, explores the key global economic and market trends affecting aviation and the outlooks for growth rates globally and by region.



Mark Cooper, CANSO Executive Committee Associate Member Representative and Partner - Aviation Technology, Deloitte, moderates a panel session on big data, digitisation and their implications, including perspectives from SITAONAIR, Helios and NATS.



CANSO holds one-to-one sessions for members to discuss global and regional activities.



Lead sponsor Aireon provide the latest in space-based ADS-B developments.



AEROTHAI treats delegates to an evening of cultural activities and traditional performance at the Nai Lert Heritage Home.

**➤ INDRA COMPLETES FIRST SIMULATION TEST TO CONTROL THREE AIRPORTS FROM A SINGLE REMOTE POSITION**

AVINOR, in collaboration with Indra and Indra Navia, has successfully completed the first test in a series of validations within the SESAR 2020 Programme to manage traffic in multiple airports simultaneously from a single remote position.

The testing platform, based on Indra air traffic management systems, utilised a fully integrated 3D tower environment recreation of three Norwegian airports, Røst, Haugesund and Bodø with simulated traffic, and assessed air traffic control officer capability when providing simultaneous air traffic services to three aerodromes from an integrated controller working position.

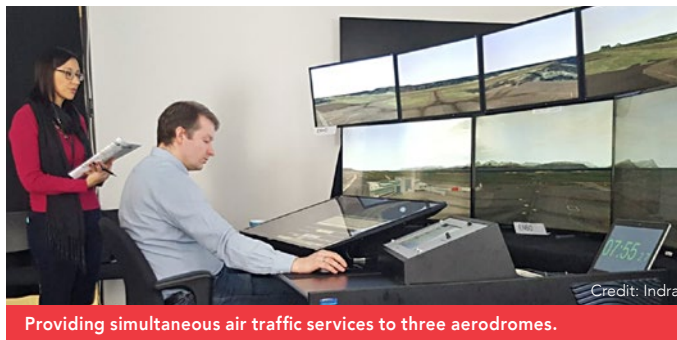
**➤ AIREON COMPLETES SEVENTH SUCCESSFUL LAUNCH**

Aireon has completed a seventh successful launch and deployment of its space-based automatic dependent surveillance-broadcast (ADS-B) payloads, hosted by the Iridium® NEXT satellite constellation. 65 Aireon payloads are now in orbit as the global air traffic surveillance service nears debut.

In May, NATS took an equity stake in Aireon, and is currently consulting with its customers about introducing the satellite technology for use over the North Atlantic.

**➤ NATS REPORTS BIG CARBON AND FUEL SAVINGS**

More than 200,000 tonnes of aircraft CO<sub>2</sub> emission was saved last year as a result of airspace management improvements,



according to the latest figures released by NATS.

The reduction equates to more than £30m in enabled annual fuel savings for airlines in the last year and an overall cut of 6.4 percent in CO<sub>2</sub> per flight since 2008, equating to 1.5m tonnes of carbon dioxide each year.

The improvements are the result of finding better, more fuel and carbon efficient ways of using UK airspace, including the use of more direct routes and improved vertical profiles, the use of continuous instead of stepped climbs and descents, and the introduction of new air traffic management technologies and processes.

**➤ MILESTONE FOR EUROPEAN AIR TRAFFIC MODERNISATION**

Inmarsat and the European Space Agency (ESA) have successfully completed a first test flight using the world's most advanced aviation satellite technology for their Iris programme.

The public-private partnership aims to enable secure, high bandwidth datalink communications over Europe. Based on a number of real-time communication exchanges completed between the cockpit and flight control facility over continental and oceanic airspace, the evaluation is a significant step forward in realising more precise flight

surveillance and efficient air traffic management.

**➤ AIRWAYS SELECTS ROHDE & SCHWARZ FOR ATC VOICE COMMUNICATIONS**

Airways New Zealand has selected the R&S VCS-4G IP-based voice communications system from Rohde & Schwarz for air traffic control communications throughout New Zealand airspace.

The technology will support Airways New Zealand as they move towards a new one-centre, two-location operational model across its Auckland and Christchurch locations.

**➤ ADACEL SYSTEMS COMPLETES SRI LANKA SIMULATOR PROJECT**

Adacel Systems Inc. has completed installation and site acceptance testing for an air traffic control tower and radar simulation system at the Sri Lanka Civil Aviation Training Center.

The Adacel multi-position control tower and radar simulators accommodate both individual and team training in the control tower and radar disciplines and can be operated independently or in a fully integrated mode.

The systems will be integrated into the Sri Lankan ATC training program and will allow their air traffic controllers to have access

to tools that will promote the development of the essential skills to perform in accordance with international standards. The project was completed with the assistance of local agent Access International (Pvt) Limited.

**➤ AVIATION INDUSTRY DEMONSTRATES SESAR SOLUTION FOR SEAMLESS ATM ACROSS EUROPE**

Members of the SESAR Four Dimensions Trajectory Management (4DTM) project have conducted an initial demonstration of flight object interoperability (FO IOP), a solution that aims to enable control centres across Europe to share complete information about air operations in real time.


Collaboratively developed by Indra, Leonardo and Thales, implementation will improve the data transfer between control towers and thereby significantly increase the efficiency of air traffic management throughout the continent.




**➤ SWISS U-SPACE PLATFORM TO POWER TRAFFIC MANAGEMENT**

skyguide and AirMap have successfully demonstrated Swiss U-space, the first nationwide drone traffic management system in Europe.

skyguide is the first to deploy U-Space, Europe's vision for a robust digital infrastructure to support safe and secure access to European skies for millions of drones.

In the demonstration, drones performed a wide variety of commercial tasks. Each drone received live information about airspace and traffic, and published live positioning and flight path information to an air traffic management dashboard.

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### About ATNS

Air Traffic and Navigation Services SOC Limited (ATNS) provides **air traffic, navigation, training and associated services** within South Africa. ATNS is also responsible for Air Traffic Control throughout the **African Indian Ocean (AFI) region**, comprising approximately **10% of the world's airspace**. ATNS operates from nine ACSA and 12 other aerodromes, and is a **globally competitive employer of choice**.





# SPACE-BASED ADS-B

## MAKING GLOBAL AIR TRAFFIC SURVEILLANCE A POWERFUL REALITY



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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