

IMPROVING ATM NETWORK PERFORMANCE

Skyway

magazine



Flying responsibly

THE AGENCY'S FOCUS
ON ENVIRONMENTAL
PERFORMANCE

Interview: Dr Fang Liu, Secretary General of
the International Civil Aviation Organization

Taking the long way round:
why airlines don't fly the shortest routes



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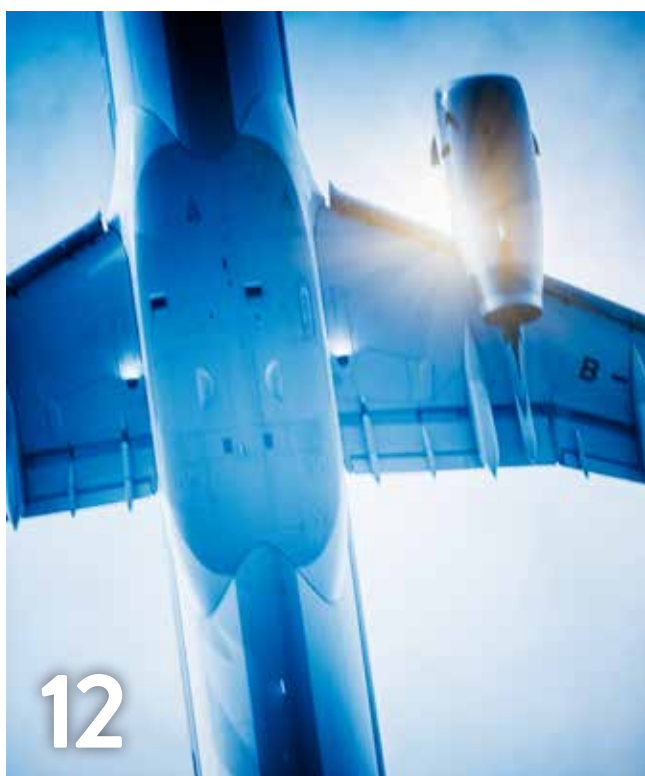
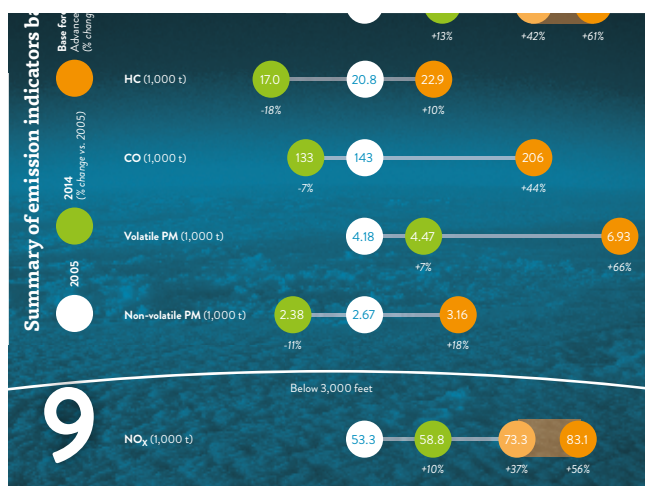
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WAYPOINTS



Performance Review Commission publishes 2015 European performance report...

THE PERFORMANCE REVIEW Report (PRR) 2015 has been published by the independent Performance Review Commission (PRC) of EUROCONTROL. It gives an assessment of European air traffic management (ATM) performance in 2015 across the key performance areas of safety, capacity, environment and cost-efficiency.

Safety is the primary objective of air navigation services (ANS). Overall, ANS safety continues to be high in Europe with one accident with ANS contribution in 2015. However, there is scope for further improvement in order to maintain or even further improve safety levels in Europe.

Controlled flights in Europe increased for the second year in a row in 2015. However, the +1.5% growth in traffic in 2015 was not homogenous throughout the network and traffic flows were affected by the continuing Ukraine crisis and industrial action by air traffic controllers.

En-route air traffic flow management (ATFM) delays in the EUROCONTROL area increased for the second year in a row to reach 0.73 minutes per flight in 2015.

"The performance deterioration was mainly attributed to ATC capacity issues

and confirms the PRC concerns that ATFM delays could increase when traffic grows again if insufficient focus is being put on capacity planning and deployment" warns Ralph Riedle, PRC Chairman.

Despite further progress in the implementation of free route airspace in 2015, horizontal en-route flight efficiency deteriorated in 2015 after the continuous improvement over the past years.

European ANS cost-efficiency performance improved for the second year in a row in 2014, the latest year for which actual costs data is available. Compared to 2013, real en-route costs per service unit decreased by -5.0% and terminal unit costs decreased by -2.3%. ■

...and 2016 cost-effectiveness benchmarking report

THE EUROCONTROL PERFORMANCE Review Commission (PRC) has published its fourteenth ATM Cost-Effectiveness (ACE) Benchmarking Report. The ACE Report analyses the cost-effectiveness and productivity of 37 European air navigation service providers (ANSPs) in 2014, the latest year for which actual financial data are available, based on information submitted in July 2015. The report also

examines changes in their cost-effectiveness over 2009-2014, with a strong focus on underlying performance drivers such as air traffic controllers' productivity, employment costs and support costs. In addition it provides an outlook of the performance planned over the five-year cycle covering 2015-2019.

This year, the report presents a ten-year analysis of the changes in ANSPs' cost-effectiveness and its main economic drivers over 2004-2014. This covers the period before and after the economic recession (2004-2008); it aims at providing an understanding of how the pan-European ANS system reacted to the global recession which affected the aviation community in 2009. Over this ten-year period, ATM/CNS provision costs rose by +0.4% p.a. which was significantly less than the +1.4% p.a. increase in traffic (measured in composite flight-hours). As a result, unit ATM/CNS provision costs decreased by -1.0% p.a. (real terms) between 2004 and 2014.

"ANSP management, ATM policy makers, regulators and NSAs should pay particular attention to the findings of the ACE report in order to identify potential areas for improvement, and also to understand how cost-effectiveness performance evolved over time," says Ralph Riedle, the PRC Chairman.

At system level, the analysis shows that ATM/CNS provision costs remained fairly constant in 2014, while traffic increased by +2%, resulting in a decrease in unit ATM/CNS provision costs (-2%) compared to 2013. As a result, 2014 records the lowest unit costs level achieved since the start of the ACE benchmarking analysis in 2001, the year when the Permanent Commission of EUROCONTROL adopted specific economic information disclosure requirements for monopoly ANSPs. However, in 2014, ATFM delays increased somewhat, denting the overall economic cost-effectiveness result. Ralph Riedle further recognises that "looking ahead, with traffic set to grow even if in a moderate way, it is key that ANSPs continue to manage their costs, while also providing sufficient ATC capacity to achieve a balanced result for their customers." ■

Welcome to Morocco and Israel: our two new Comprehensive Agreement States

EUROCONTROL SIGNED COMPREHENSIVE Agreements with the Kingdom of Morocco and the State of Israel on 29 April and 2 June 2016, respectively.

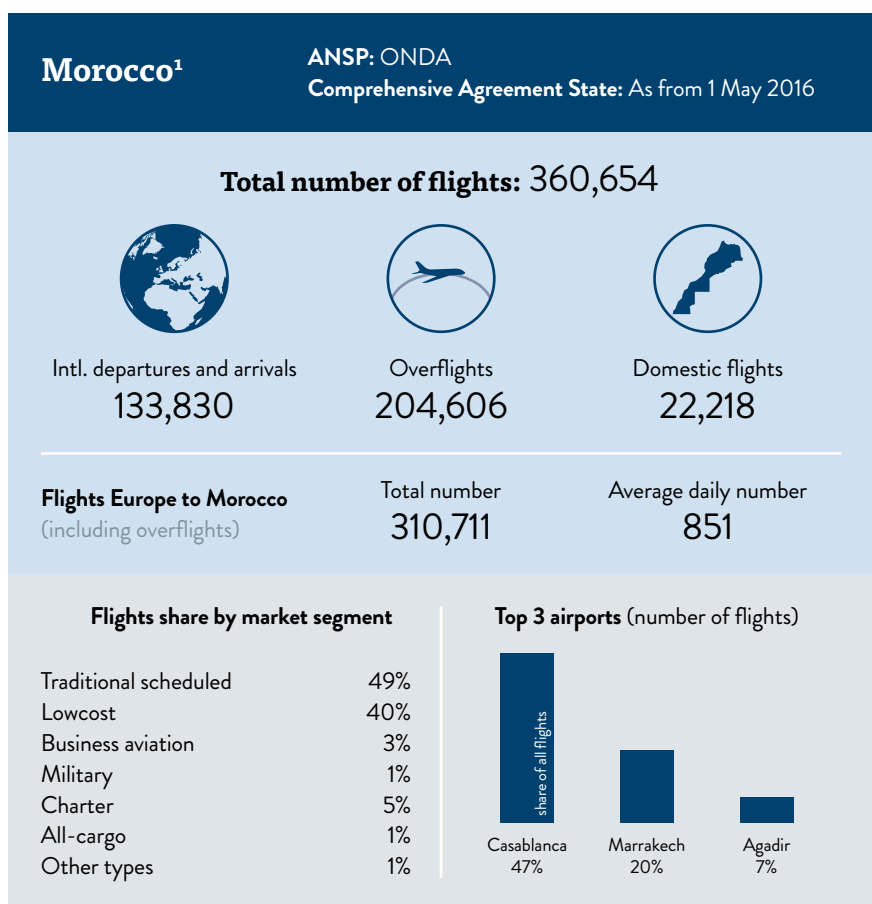
These agreements allow for an even closer working relationship with these two countries and strengthened co-operation in the field of aviation. In particular they support improved crisis management, more organised and harmonised management of traffic flows, improved predictability in planning of daily operations, improved safety of operations and a wider network approach to all developments such as airspace design, infrastructure coordination and management.

The Agreements will support implementation of Single European Sky procedures in the two countries following Israel and Morocco's signature of Euro-Mediterranean Aviation Agreements with the EU.

Morocco

AT THE SIGNING CEREMONY in Marrakech, Mr El Aoufir, Director General of ONDA (Office National Des Aéroports) noted: "With the signature and entry in force of this agreement, it is not only that our country achieves a global first – in

Mr Samir Berrakhl, Director of Air Navigation, and Mrs Nadia Benzakour, Communication and PR Manager, from the Office National Des Aéroports (ONDA), representing Morocco at its first Provisional Council session, on 23 June 2016, in Brussels.



that EUROCONTROL has never before signed such an agreement with a country outside Europe – but it also recognises the performance of the Moroccan air traffic management services and is consolidating a mutually desired and beneficial partnership between ONDA and EUROCONTROL".

On the same occasion, Frank Brenner, Director General of EUROCONTROL, said: "Nearly 850 of the 33,000 daily flights in Europe today pass through Morocco's airspace. That means that Morocco is an extremely natural partner for EUROCONTROL, both as a result of the flow of flights, but also as a result of our existing relationship and common approach to ATM. And of course, we do not forget

the tremendous support and cooperation shown by Morocco in times of crisis and disruption."

The Comprehensive Agreement will bring significant operational advantages to the airlines and passengers including improved crisis management, more organised and harmonised management of the traffic flows between North Africa/ the Canary Islands and the European continent.

Israel

AT THE SIGNING CEREMONY in Jerusalem, Mr Israel Katz, the Israeli Minister of Transport and Road Safety, said: "The signing of this Agreement has not been taken for granted, and I congratulate EUROCONTROL who persisted in advancing the process despite the difficulties. As a result of the agreement, the State of Israel will benefit from the professional aviation services provided by EUROCONTROL that will significantly contribute to the safety and efficiency of civil aviation. Thanks to this agreement Israeli passengers will be able to travel quickly and efficiently without any delays."

"With more than 300 flights a day moving between our areas, we have been coordinating air traffic flows for a

¹EUROCONTROL Statfor, 2015



number of years. And of course we have also worked closely together to manage crisis events,” said Frank Brenner, Director General of EUROCONTROL. “Israel is an extremely natural partner for EUROCONTROL, both as a result of the flow of flights, but also as a result of our growing trust and interdependency. So we are particularly pleased to be expanding our co-operation and our relationship with Israel by signing this Comprehensive Agreement today.”

Air traffic between Israel and Europe has been growing at over 9% a year for the past three years. This growth poses ongoing challenges to international civil aviation and underlines the need to improve

Israel's first participation at the Provisional Council session on 23 June 2016 in Brussels. From left: Udi Baroz, Deputy Director General Operations at the Israel Airport Authority (IAA), and Joel Feldschuh, Director General of the Israeli Civil Aviation Authority.

ties between regions in order to ensure flight efficiency and safety in airspace and airports that are growing more crowded every year.

The Comprehensive Agreement will bring significant operational advantages to airlines and passengers moving between the two regions. ■

Slovenia Control and EUROCONTROL successfully complete shadow operations

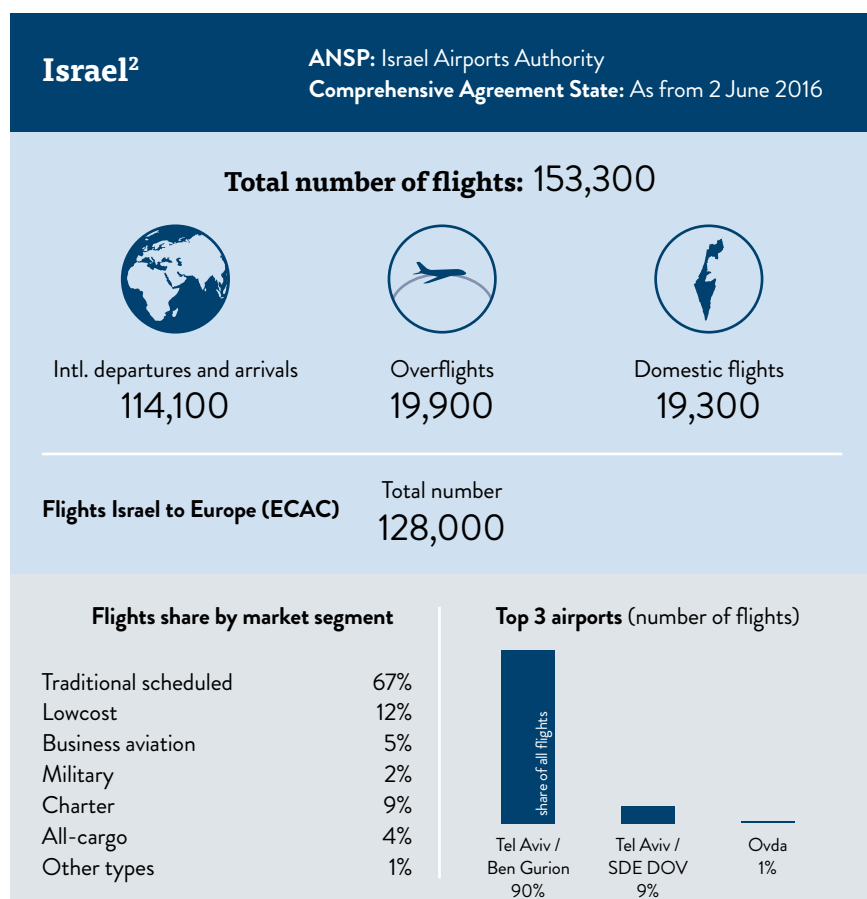
SHADOW OPERATIONS OF LIVE air traffic under the responsibility of Ljubljana Area Control Centre have successfully been conducted at Slovenia Control, using the remote data provided by the operational ATM system at EUROCONTROL's Maastricht Upper Area Control Centre (MUAC). These shadow operations are part of the 'ATM Data as a Service' (ADaaS) project and are an essential step towards the concept of data centres developed in support of the Single European Sky.

Co-financed by the European Union's Connecting Europe Facility (CEF) to the tune of €2.45 million, the three-year ADaaS project between Slovenia Control and MUAC aims at contributing to the Single European Sky by deploying new technologies and best practices. With the successful completion of these shadow operations, representing Phase 1 of the ADaaS Demonstrator, expert teams from both air navigation service providers were able to overcome, in a limited time period, the operational and technical challenges inherent to such an innovative approach in the ATM environment.

The ADaaS Demonstrator uses local radars, tracking and safety net services, but is fed by remote Flight Data Processing System services from MUAC. In addition, the MUAC controller working positions/human-machine interface have been deployed within Slovenia Control.

The successful shadow operations pave the way for Phase 2 of the ADaaS Demonstrator, to be validated in the first quarter of 2017, which aims to demonstrate the use of an open interface between the MUAC Flight Data Processing System and the Slovenia Control controller working positions/human-machine interface.

The final architecture of the demonstration (Phase 3 of the ADaaS Demonstrator) will contain a distributed Flight Data Processing System in two locations (MUAC and Slovenia Control) and can serve controller working positions/human-machine interfaces either remotely or locally. It is planned for the third quarter of 2017. ▶



²Source: Israel Airport Authority



Shadow operations at Slovenia Control, using the Maastricht Upper Area Control Centre (MUAC) air traffic management system.

Phase 3 will provide essential data on how to deploy a state-of-the-art data centre from which an ATM Data Service Provider (ADSP) can deliver services to Air Traffic Service Units (ATSUs) with proper contingency and disaster recovery. ■

EUROCONTROL and GCAA begin real-time flight data exchange

ON THE BASIS OF the cooperation agreement between the General Civil Aviation Authority of the United Arab Emirates (GCAA) and EUROCONTROL in October

2015, real-time flight data exchange has been successfully implemented on 6 June 2016 between both organisations.

"Real-time updates of departure times and other trajectory information is now being exchanged between the operational systems of EUROCONTROL Network Manager and the UAE main air traffic control centre on the major traffic flows between Europe and the UAE. This is a significant contributor to realise the Global Air Traffic Flow Management Concept, where the different parts of the world connect and exchange these very important data," says Frank Brenner, Director General of EUROCONTROL.

Currently there are already about 400

flights a day between the two regions and an additional 150-200 aircraft as overflights. Traffic is currently growing at 3.6% a year.

"The full implementation of this co-operation agreement will bring substantial benefits to the predictability of these traffic flows as all ATM actors will have much more accurate information on these flights," said Joe Sultana, Director Network Manager at EUROCONTROL. "ATM predictability is a major enabler of capacity and the 64 air traffic control centres in Europe and the European airports will directly benefit from the receipt of these updated trajectory information."

This data exchange is the central part of the Collaborative Global ATFM concept that is being promoted by EUROCONTROL and fully supports the ICAO Global Air Navigation plan which requires global interoperability of information and the seamless management of major traffic flows across ATM regions. ■

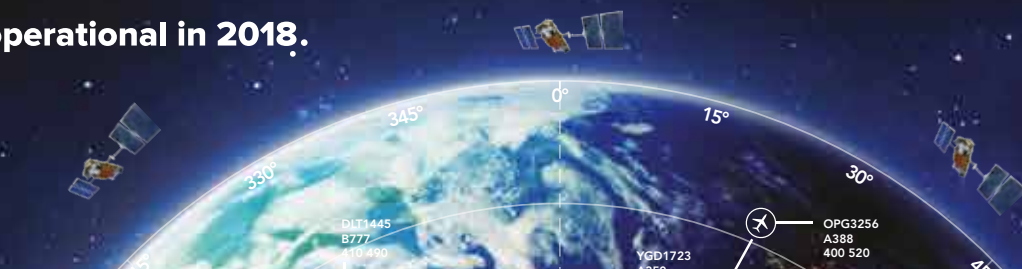
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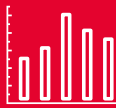


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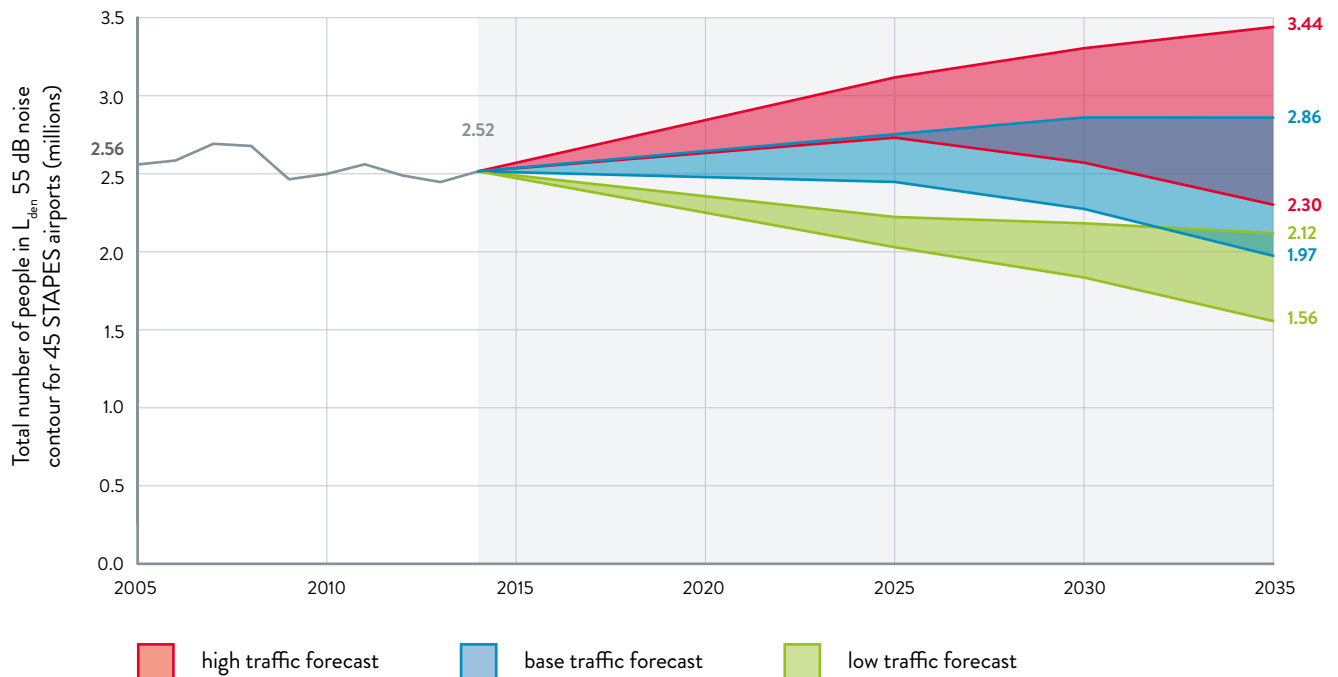




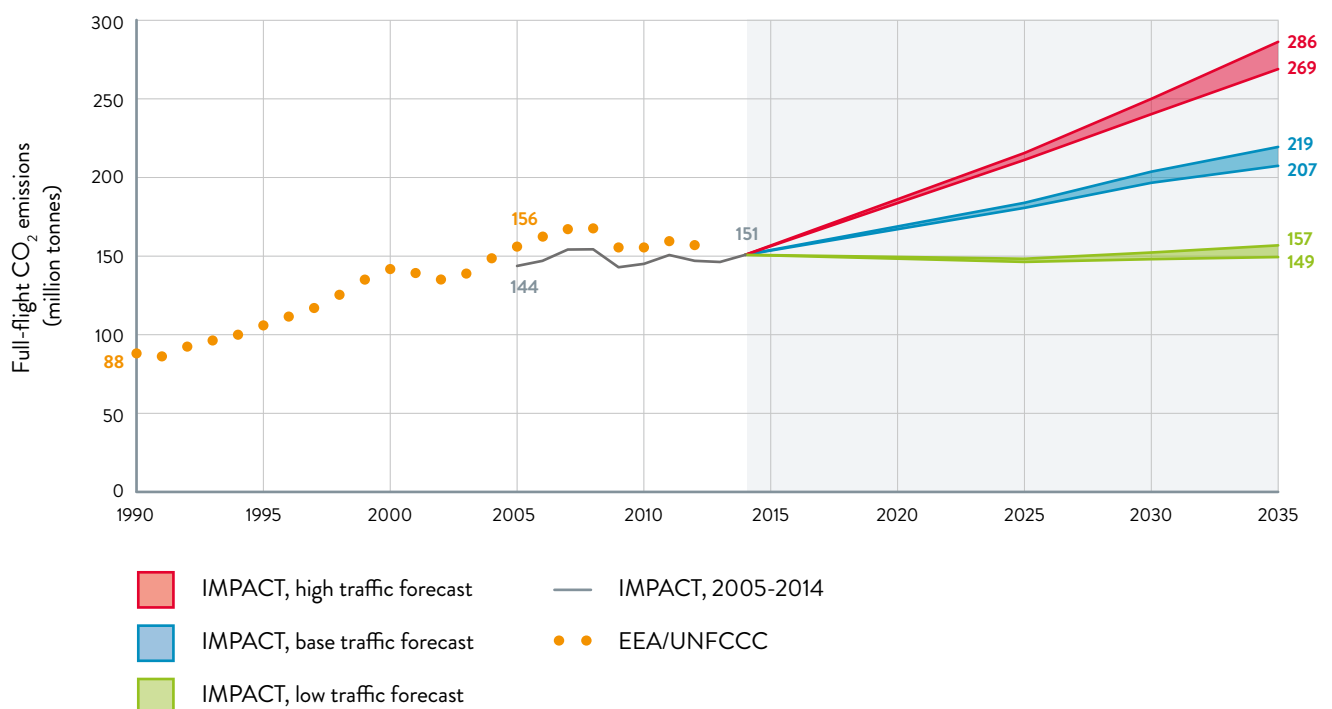
DATA

THE FOLLOWING DATA HAVE been sourced within the European Aviation Environmental Report 2016¹ prepared by the European Environment Agency, the European Aviation Safety Agency and EUROCONTROL.

Future technology improvements could stabilise overall aircraft noise exposure in the 2035 timeframe



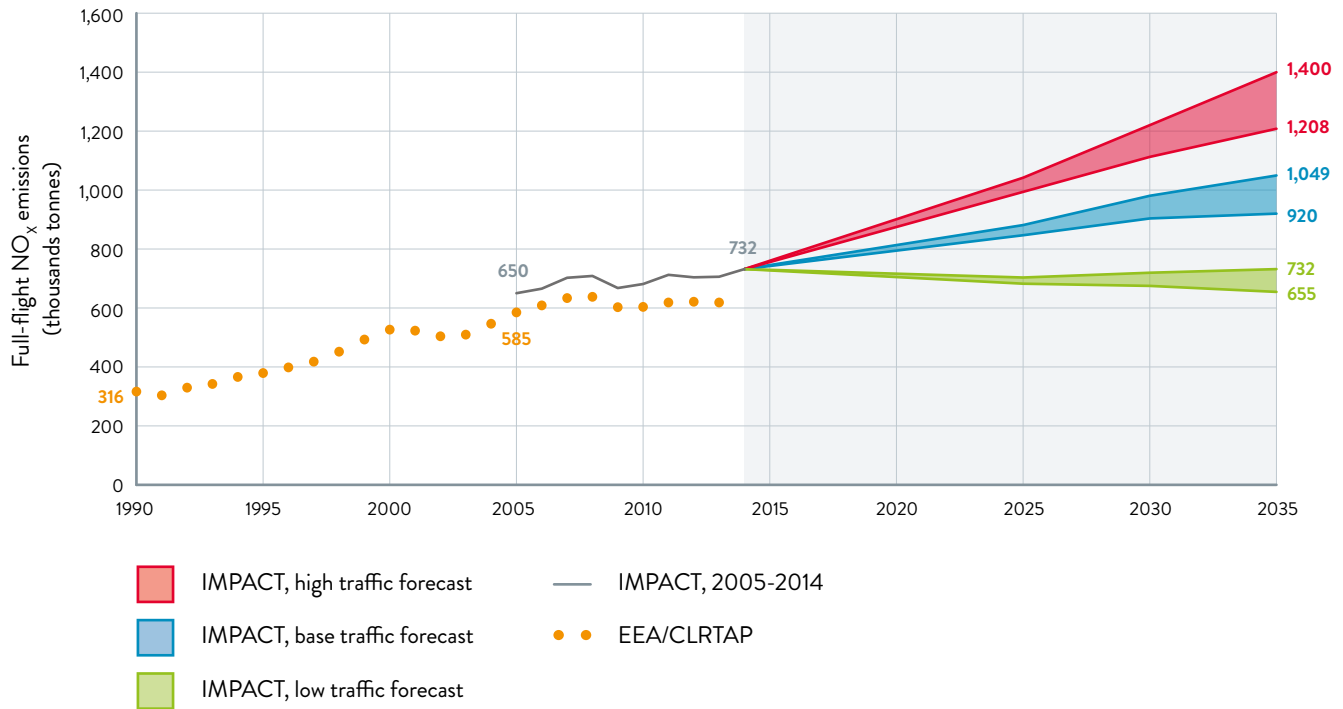
After remaining stable between 2005 and 2014, aircraft CO₂ emissions are likely to increase further



¹<https://www.easa.europa.eu/eaer>

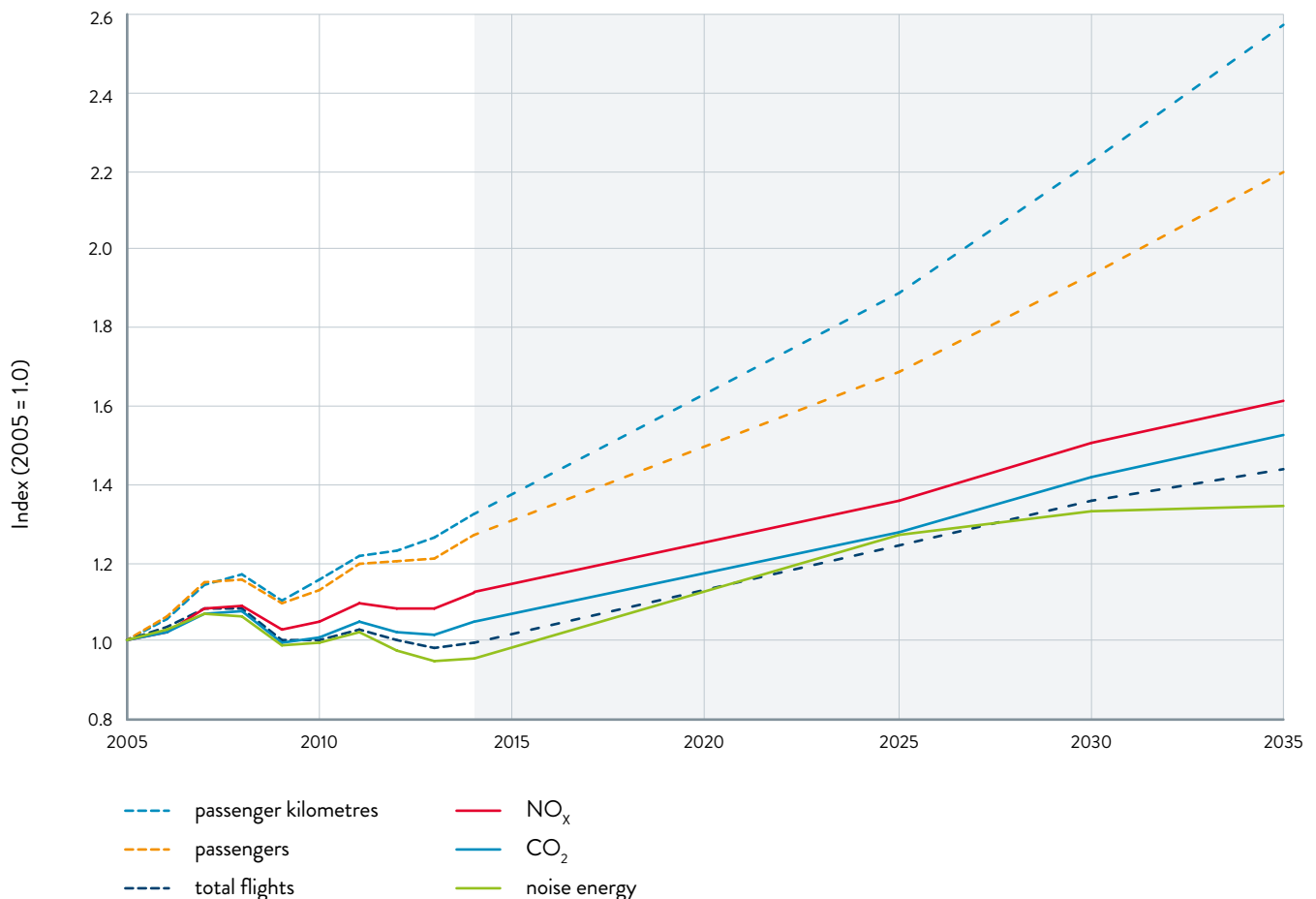
L_{den} stands for Day-evening-night sound pressure level

NO_x emissions are likely to increase in the future, but advanced engine combustor technology could help mitigate their growth



For each traffic forecast, 'advanced' and 'low' technology improvements rates are applied to new aircraft deliveries from 2015 onwards. The upper bound of the range reflects the 'low' technology improvement rate, and the lower bound is the 'advanced' technology improvement rate.

Noise and emissions forecast to grow more slowly than passenger kilometres



Forecast years are for the base (most likely) traffic and low technology improvement scenarios.

Summary of emission indicators based on IMPACT data

Base forecast 2035
Advanced – Low Technology
(% change vs. 2005)



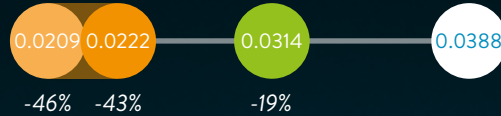
2014
(% change vs. 2005)



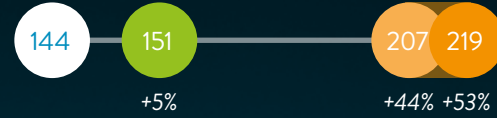
2005



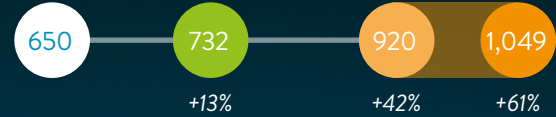
Average fuel burn (kg) per passenger kilometre



CO₂ (Mt)



NO_x (1,000 t)



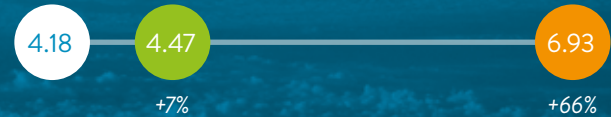
HC (1,000 t)



CO (1,000 t)



Volatile PM (1,000 t)

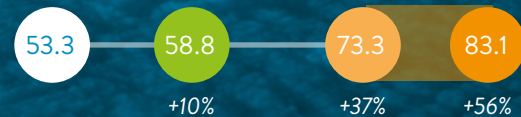


Non-volatile PM (1,000 t)



Below 3,000 feet

NO_x (1,000 t)



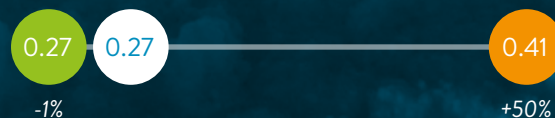
HC (1,000 t)



CO (1,000 t)



Volatile PM (1,000 t)



Non-volatile PM (1,000 t)





DEADLINE APPROACHES FOR AVIATION CARBON **FOOTPRINT CAP**

EUROCONTROL is due to release by the end of this year its first detailed assessment of the aviation industry's forecast environmental footprint in Europe. It will play a valuable role in assessing what all aviation stakeholders will have to do to meet industry and government targets for controlling greenhouse gas emissions.

One of the biggest challenges facing aviation today is to develop by 2020 technologies and procedures which will allow the global civil aviation industry to grow without increasing its carbon footprint. When the International Civil Aviation Organization (ICAO) set this target back in 2009 many experts believed it to be aspirational rather than realistic. But since then the nature of the industry has changed to such an extent that many believe the target can be achieved after all. What is surprising is that the changes have come about not through disruptive technologies such as biofuels or all-composite aircraft but from more subtle factors, such as gross domestic product performance and fleet optimisation tools which closely match aircraft size with passenger demand.

Whatever else the aviation forecasters in 2009 might have foreseen, few would have predicted that in some parts of the world increased passenger demand for air travel would be accommodated by fewer flights. According to the European Aviation Environmental Report 2016¹, prepared by the European Environment Agency, the European Aviation Safety Agency and EUROCONTROL, passenger numbers in Europe increased 25% between 2005 and 2014, while the number of flights fell by 0.5%.

"Aircraft are becoming bigger and with more seats in the cabin," says Andrew Watt, Head of the Support to SES-related Policies Unit within the EUROCONTROL Directorate Pan-European Single Sky. "Load factors are higher and aircraft are flying longer routes. So we are increasingly decoupling passenger kilometres from the number of movements and that means the system is becoming more efficient."

This factor alone will not be enough to provide a carbon neutral growth future for the industry and the main environmental gains in aviation performance will still have to be delivered primarily by new designs of aircraft and engines alongside the availability of sustainable alternative fuels.

But air traffic management (ATM) efficiency improvements are now starting to play an increasingly important role in reducing the industry's emission and noise exposure levels. In 2014 emissions level were still at 2005 levels, partly because of the economic downturn of 2008.

EUROCONTROL has had a vital role in the process, gathering vital data, building capacity among stakeholders to deal with environmental challenges and strongly supporting initiatives with the potential to reduce environmental impact, most notably the Single European Sky ATM Research (SESAR) programme (see EUROCONTROL's *Environmental Initiatives* panel on page 16).

According to the 2016 European Aviation Environmental Report: "It is expected that, between 2015 and 2018, the planned European deployment of 'Block o' of the Aviation System Block Upgrades, facilitated through the SESAR Deployment Phase, could result in fuel savings of between 0.8 to 1.6 million tonnes per year, equivalent to 2.5-5.0 million tonnes of CO₂."

The report also highlights the significant improvements which individual ATM flight efficiency programmes will deliver, for example free-route operations – an initiative which EUROCONTROL has pioneered for many years – have been identified as the single most important en-route airspace improvement programme for the coming years. If free-route airspace operations were fully implemented across Europe, says the report, the distance saved could amount to approximately 46,300 km per day (16.9 million km per year), representing annual savings of 45,000 tonnes of fuel and 150,000 tonnes of carbon dioxide.

"We are increasingly decoupling passenger kilometres from the number of movements and that means the system is becoming more efficient."



Andrew Watt, Head of the Support to SES-related Policies Unit within the EUROCONTROL Directorate Pan-European Single Sky

Key performance indicators: Europe's aviation traffic 2005-2014²



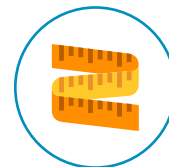
Number of flights

2005:	8,890,000
2014:	8,850,000
Change:	-0.5%



Distance flown

2005:	13,100,000,000 km
2014:	14,600,000,000 km
Change:	+11%



Mean distance per flight

2005:	1,480 km
2014:	1,650 km
Change:	+12%



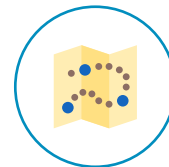
Passengers on commercial flights

2005:	590,000,000
2014:	740,000,000
Change:	+25%



Passenger flight load factor

2005:	70.2%
2014:	76.7%
Change:	+9%



Passenger kilometres

2005:	1,040,000,000,000
2014:	1,370,000,000,000
Change:	+32%



Mean fleet age

2005:	9.6 years
2014:	10.3 years
Change:	+7%

¹<https://www.easa.europa.eu/eaer>

²European Aviation Environmental Report 2016

The environmental benefits of ATM efficiency improvement programmes

Continuous Descent Operations (CDO)



60 kg fuel saving in descent

Arrival Manager (AMAN) during peak hours



50 to 100 kg fuel saving per arrival

Advanced Surface Movement Guidance and Control System (A-SMGCS) during peak hours



5 to 24 kg fuel saving per taxi-out phase during busy periods, bad weather and at night

Required Navigation Performance Authorisation Required Approaches (RNP AR APCH)



300 to 500 kg fuel saving per missed approach / diversion due to improved access to runways

Airport Collaborative Decision Making (A-CDM)



12 to 36 kg fuel saving in the taxi phase per flight

Source: 2016 European Aviation Environmental Report

ONE KEY ROLE WHICH EUROCONTROL has taken on within its task to develop a portfolio of environmental information gathering and mitigation measures (see “Measuring, monitoring, mitigating: tools to improve environmental performance” in this issue) has been to develop a set of robust, environmental-impact forecasts which industry stakeholders can use to assess the future environmental impact of their operations, and begin the process of ensuring their own organisations will have policies in place to meet the targets which have been agreed at government level.

“We want to be able to provide data of record, as unbiased and as independent as possible, following best practice with methodologies that have been stress-tested and approved within ICAO,” says Andrew Watt. “The idea has been to provide a comprehensive suite of impact assessment capabilities that cover noise, local air quality, fuel burn and greenhouse gas emissions. The next phase is going to be looking at things like particulate matter, helicopter noise, third-party risk.”

At the end of 2016 EUROCONTROL will publish its first environmental forecast to accompany its long-term traffic forecast. The key to this is the Aircraft Assignment Tool developed collaboratively by EUROCONTROL, the European Commission and the European Aviation Safety Agency (EASA), to generate and map a future fleet onto the traffic forecast. This data is then injected into the EUROCONTROL IMPACT integrated aircraft noise and emissions modelling platform to generate the environmental forecast – which will initially focus on CO₂ emissions. It is based on a joint effort, with EASA and the European Commission, to provide policy makers and stakeholders with accurate forecasts on the real impact on the environment of the European civil aviation industry’s growth scenarios. The first such forecasts were published in the European Aviation Environmental Report, covering 32 States³, which the new forecast will expand to the 44 ECAC States.

“With this and subsequent updates we will start to see the reality of long-term trends in comparison to what has been forecast, and that’s a comparison that

THE **FUTURE** OF MANAGING AVIATION’S ENVIRONMENTAL **FOOTPRINT** WILL NEED TO BE BASED ON RELIABLE **DATA**, REALISTIC **TARGETS** AND EFFECTIVE **MEASUREMENT**.



AIR TEMPERATURE -1°C



SUNSET IN
0.3 HOURS

will be used, probably, by the European Commission in its aviation and environmental strategies to assess the way things are going and to see if there are any changes required to regional and global performance targets," says Andrew Watt.

The future of managing aviation's environmental footprint will need to be based on reliable data, realistic targets and effective measurement, with industry given the tools to make the changes it needs to manage its own commitments for carbon neutral growth.

"At the Paris COP 21 meeting (the United Nations Conference on Climate Change) in December 2015, agreement was reached to increase efforts to maintain a temperature rise below 2°C and try and get it down to 1.5°C," says Watt. "They put in place, essentially, a management system through which States declare what they are going to do, they do it, then somebody comes along and reviews it, to check on progress, and then new, tighter targets may be set. I think, to a degree, that's what we're starting to see in ICAO as well."

So the 64 million dollar question is: what will happen in Europe over the next few years? How fast is Europe's aviation environmental footprint really growing?

The detailed data is still being crunched but early indications are that despite the introduction of a new generation of aircraft, more seats per aircraft, longer average distances flown and the availability of more efficient fleet optimisation tools, aviation-related carbon emissions in Europe are likely to rise, if only modestly, as growth

³European Union (EU) and European Free Trade Association (EFTA) States

"The number of passengers is increasing more rapidly than before but there is now a definite separation between revenue passenger kilometre growth and flight growth."



Dr David Marsh
Head of the Forecasts and
Network Intelligence Unit

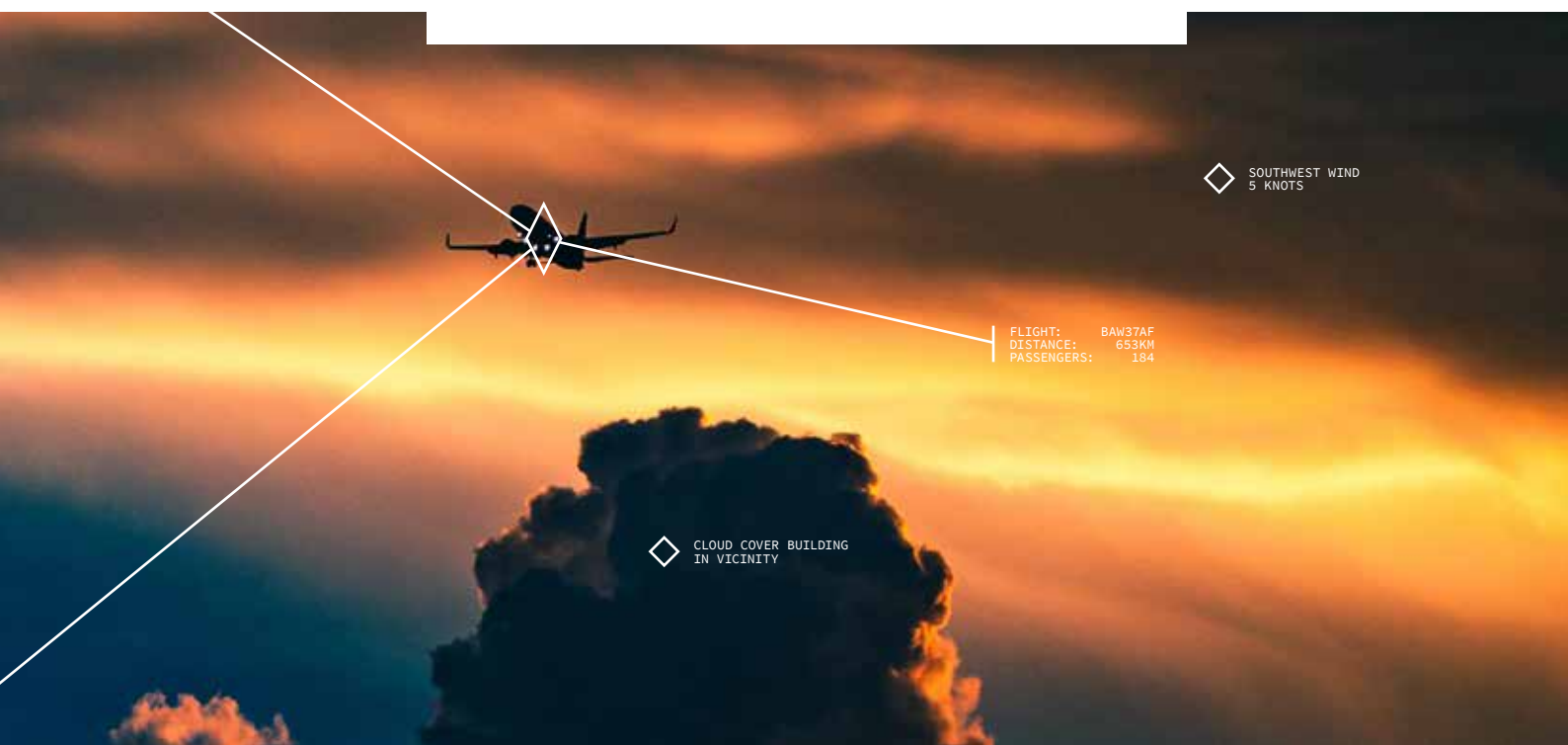
continues in the core areas of the continent. Medium-term forecasts suggest traffic will grow on average between 1.5% to 2% per year over the next seven years.

"The number of passengers is increasing more rapidly than before but there is now a definite separation between revenue passenger kilometre growth and flight growth," says Dr David Marsh, Head of the Forecasts and Network Intelligence Unit. "They are currently not going in different directions, but they're definitely growing at different rates. The fact that load factors are increasing means airlines are able to absorb the real demand without adding too many frequencies. We are not identifying any unexpected events, trends or factors which are likely to boost further traffic growth."

So there is still much more to be done. But there is little doubt of the industry's determination to tackle the challenge – and EUROCONTROL's pivotal role in helping stakeholders reach their goal of controlling emissions while satisfying the demands of customers.

"In 2013 ICAO's environment committee adopted the Chapter 14 Noise Standard," says Andrew Watt. "We had the Carbon Dioxide Standard at the environment committee this February, plus the particulate matter

standard, and we hope that the ICAO Assembly this year will come up with an agreement to go ahead with the global-market based measure. There are also voluntary measures that have been agreed industry wide. I don't think there's any other industry with such a comprehensive set of measures in place to try to tackle its environmental impact." ■



◇ SOUTHWEST WIND
5 KNOTS

FLIGHT: BAW37AF
DISTANCE: 653KM
PASSENGERS: 184

◇ CLOUD COVER BUILDING
IN VICINITY

EUROCONTROL's environmental initiatives

Adapting aviation to a changing climate

EUROCONTROL provides organisations with a single entry point to key resources on climate resilience, as well as a toolkit of questions and case studies to help initiate a climate risk assessment. The questions work as a checklist for aviation organisations to begin to assess whether climate change impacts will be a risk to them. The case studies provide examples of how some organisations are already adapting to the potential impacts of climate change, describing the measures they are taking and sharing their knowledge and experience.

Collaborative Environmental Management (CEM)

EUROCONTROL published the Collaborative Environmental Management (CEM) Specification in September 2014, setting out a unique collaborative approach to managing environmental impacts. The CEM specification supports and facilitates the already considerable efforts being made by airports, aircraft operators and air navigation service providers to deal with the environmental impacts of their daily operations. It formalises collaboration among the core operational stakeholders at airports by setting out generic high-level requirements and recommended practices, necessary to establish CEM working arrangements.

EU Emissions Trading Scheme (EU ETS)

EUROCONTROL provides information on which the EC bases its annual publication of the list associating aircraft operators to the States that have to administer them. EUROCONTROL also supports States in complying with the ETS legislation through the provision of data from the ETS Support Facility that has been in operation since 2011. It is currently used by 25 States, who have recently agreed to continue to use it until the end of 2021 at least. Support is also provided to aircraft operators, through the supply of data files that can be used in the verification of their emissions. Underpinning all of this is the "Small Emitters Tool", a statistical model that is used to estimate fuel burn and emissions, and whose internal parameters are updated annually to reflect real operating conditions, thanks to the invaluable provision of fuel burn data from aircraft operators.

Environmental aspects of airport and air traffic operations

Environmental protection is embedded in all EUROCONTROL's operational activities. There is one specific operational project with a clear environmental focus – Continuous Descent Operations (CDO), previously called Continuous Descent Approach (CDA). CDO was established with IATA, the Civil Air Navigation Services Organisation (CANSO) and ACI EUROPE in order to meet the SESAR IP1 baseline requirement to have CDO widely available throughout Europe.

Modelling tools to measure the environmental impact of aviation

Working with ICAO and the European Civil Aviation Conference (ECAC) environmental groups, EUROCONTROL has developed three key applications to model the main environmental impacts of air traffic movements, covering fuel burn/greenhouse gas emissions; local air quality and noise impact. Each of these EUROCONTROL modelling tools is part of the approved suite of assessment models used by ICAO's Committee on Aviation Environmental Protection (CAEP) to assess future regulatory policy options such as introducing tighter aircraft noise and emissions standards, and future trends. The IMPACT platform has been developed to combine and enhance these capabilities to provide users with a cloud-based solution through which they can upload data to EUROCONTROL for processing, based on the latest internationally agreed impact assessment methodologies.

Research (SESAR)

In Phase 1 of the SESAR Research and Innovative programme, environmental aspects have been addressed transversally under two types of projects: environmental research projects (16.03.X) and a support and coordination project (16.06.03). The four environmental research projects were:

- **Project 16.03.01** dealing with the development of the environment validation framework (Models and Tools);
- **Project 16.03.02** dealing with the development of environmental metrics;
- **Project 16.03.03** dealing with the development of a framework to establish interdependencies and trade-offs with other performance areas;
- **Project 16.03.07** dealing with future regulatory scenarios and risks.

EUROCONTROL was responsible for managing four of the five environmental projects for the Transversal Areas work package.

Training

EUROCONTROL provides and maintains online and classroom-based training courses on environment issues for ATM professionals, covering aviation in an environmental context, regulatory requirements and operational mitigation measures in particular. The environmental training provides participants with an in-depth view of aviation's contribution to environmental issues. It allows them to establish what ATM can do to enable the sustainable development of the industry. The courses are delivered by environment and training experts through the Institute of Air Navigation Services in Luxembourg.



NETVIZ

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Featuring CODIS Products



New technologies at the service of air transport

Safe and efficient air navigation requires the deployment of supporting technologies for both controllers and pilots. These must be deployed in a coordinated manner to allow new operational concepts to be put into service to offer more efficient services to customers.

ENAIRE, as an air navigation services provider, has set out a very ambitious strategic plan for its facilities, to support the evolution of new procedures and technologies, respecting the strategic criteria of safety, efficiency, quality and innovation, to ensure compliance with the service provided within the regulatory framework.



SACTA screen – Air traffic control system

SACTA has been installed in ENAIRE's control centres, terminal areas and towers, providing information and complete management of flight plans, surveillance, processing and display of aeronautical and weather information. It has simulation capabilities, operational tools and a control position capable of integrating all the information necessary for the provision of the air traffic control service.

SACTA is also being developed within the common requirements flight data processing managed within the iTEC consortium and SESAR. In coordination with its iTEC partners DFS, NATS and LVNL, a new common and interoperable controller position is being developed to comply with the Single European Sky strategy.

Work is under way to incorporate new functionalities, already introduced in the control centres of Madrid, Barcelona and Palma de Mallorca, to improve arrivals (AMAN) and departure



Tower's controller position

management (DMAN) in the control towers of Madrid, Barcelona, Palma de Mallorca and Málaga. This new functionalities will contribute to an optimization of the capacity of the airspace, while collaborative decision-making (A-CDM), will also contribute to the optimization of coordination processes at operation at airports between all the actors involved in them. This A-CDM function is already in use in Adolfo-Suárez Madrid-Barajas and Barcelona-El Prat airports and will soon be installed in Palma de Mallorca.

Electronic flight strip operations have been operational in Málaga since 2012 and are now in operation at Palma de Mallorca, as part of a nationwide roll-out programme.

In addition, safety networks are being introduced to help controllers improve their decisions-making processes.



Screen with displays information (electronic flight strip operations project – Palma de Mallorca)

ENAIRE has implemented new functionality into its MET/AIS system, offering web-based access capability for flight plan information processing.

The implementation of Voice Over IP (VoIP) technology is also being prioritised. It has been installed in the Canarias ATC centre and will gradually being rolled out within other centres.

ENAIRE is working on new data link services, one of the major pillars of the future ATM system. Future ATM communications

will rely on a general increase in the use of digital media for communications, which will help improve security and reliability of information and foster automation, a key tool in the gradual improvement in productivity and capacity. A reduction in pilot-ground voice communications bandwidth from 25 to 8.33 kHz in compliance with the Regulation (EU) 1079/2012 is under way, reducing the spacing between VHF frequencies and making more frequencies available.

ENAIRE operates its own terrestrial communications network (REDAN). Future developments and needs related to data interchange will be incorporated gradually. The evolution of the communications network will allow other deployment projects to be achieved, such as the introduction of Voice Over IP technology and complete integration within the communications networks of other European providers within the pan-European network project PENS. ENAIRE is now well-positioned for the implementation of advanced pan-European ATM voice and data services.



Voice communication antennae ground/ground
(Madrid Tower Control)

In the area of aeronautical messaging, ENAIRE has an Integrated Automatic Message Retransmission Centre, which handles all national aeronautical messages, air traffic, Network Manager aeronautical communications and messages between the EUR/NAT region and the CAR/SAM and AFI regions. Its update, currently under way, will provide ENAIRE with an updated aeronautical voice switching system, to manage future aeronautical messages with new formats, as well as compatibility with SWIM to adapt it to the new aeronautical environment which is being defined as part of the Single European Sky.

ENAIRE is committed to continuous updating of the air surveillance network equipment by the gradual deployment of Mode S radars which permit interoperability of systems and facilitate transfers between adjacent control centres, as well

as surface surveillance systems at airports in coordination with Spanish airport company, Aena, S.A. The future implementation of ADS-B will allow zones not covered by radar to be monitored, facilitating optimization of the surveillance network. ENAIRE is currently carrying out an ADS-B test and performance validation campaign.

ENAIRE is also playing a fundamental role in the implementation of approach procedures based on satellite information from augmentation systems: the European Geostationary Navigation Overlay Service (EGNOS), and the local GBAS system. ENAIRE has already implemented the first EGNOS-based approach procedures, and the first GBAS-based precision approaches, in Málaga Airport in 2014, the second in Europe after the German station of Bremen, placing ENAIRE in a position of worldwide leadership in this technology.



GBAS system antenna (Málaga airport)

ENAIRE has a performance-based navigation (PBN) implementation plan which identifies future scenarios for establishment of this procedure to the benefit of all clients, including airports and airlines.

Through its active participation in SESAR and other European R&D programmes, ENAIRE is preparing the path for the future implementation of new concepts based on satellite navigation, such as advanced procedures based on current and future constellations and frequencies (GPS/Galileo multi-constellation and multi-frequency technology).



EGNOS system antenna (Gran Canaria)



FOCUS

Measuring, monitoring, mitigating

TOOLS TO IMPROVE
ENVIRONMENTAL
PERFORMANCE

Measuring the impact of aviation on the environment is an extraordinarily complex task. But the demand for increasingly accurate, objective data, to give substantive figures for environmental impact at global, regional and stakeholder levels becomes more pressing every year.



Which is a better environmental mitigation policy: one which prioritises noise reduction levels over global greenhouse gas emissions at an airport, or vice versa? Or how about one which can lower noise levels and greenhouse gas emissions but at the cost of degraded air quality?

Effective aviation environmental policies will only come about if regulators, researchers, airports, airlines and air navigation service providers (ANSPs) have a proper understanding of the overall impact of aircraft operations on the environment. And to achieve this, they need accurate and unbiased information. (See also: *Deadline approaches for aviation carbon footprint cap*, in this issue)

EUROCONTROL has developed a suite of tools to allow them to do exactly that.

“OUR LATEST TOOL, IMPACT, is really a modelling platform,” says Andrew Watt, Head of the Support to SES-related Policies Unit within the EUROCONTROL Directorate Pan-European Single Sky (SES). “It brings together the analysis of noise, fuel burn and greenhouse gas emissions, as well as aircraft emissions with local air quality effects. So if you are an airport wanting to analyse approach and departure procedures from an environmental perspective, for example, we can take a single set of operational data and estimate the noise impact, fuel burn, and the amount of pollutants emitted – and their impact on local air quality and greenhouse gas emissions, as well as their interdependencies. The same tool can be used to measure environmental outputs for an entire flight.

“It’s a cloud-based, web-accessed system, hosted on the EUROCONTROL IT infrastructure. You define the scenario that you want to analyse, upload your data, the system crunches the data and you can download the results,” he adds.

IMPACT provides an accurate, cost-effective way of estimating a number of different parameters at strategic and local levels. Historically, most environmental-impact modelling systems were fairly processor heavy and monitored just a single parameter. This set of core products has been combined and enhanced through a Single European Sky ATM Research programme (SESAR) development project. Users – ANSPs, airport operators, regulators, government organisations, research bodies – do not have any heavy upfront costs or software versioning issues to contend with, they merely have to sign an IMPACT licence agreement which should be available by the end of this year, once testing is completed.

It has been beta-tested by researchers working at

the EUROCONTROL experimental centre in Bretigny, France and partner organisations within SESAR.

“They have been using IMPACT to look at the trade-offs between noise and fuel efficiency at airports, examining continuous-descent and precision navigation approaches, where you’re trading off noise with fuel burn and emissions,” says Dr David Marsh, Head of the Forecasts and Network Intelligence Unit.

It has also played a key role in EUROCONTROL’s input into the 2035 aviation environmental forecast for European Union (EU) and European Free Trade Association (EFTA) States (See also: *Deadline approaches for aviation carbon footprint cap*, in this issue) and for compiling environmental data for the European Civil Aviation Conference (ECAC) to support ECAC States’ Action Plans for Emissions Reductions, which are submitted to the International Civil Aviation Organization (ICAO) every three years.

But modelling environmental impact is not the only way EUROCONTROL can help stakeholders to build internal capacity to deal with environmental risks. Take, for example, EUROCONTROL’s Specification on Collaborative Environmental Management (CEM), published in September 2014. It sets out requirements to create a “working arrangement” composed of core operational stakeholders at an airport – the airport operator itself, the ANSP and the key aircraft operator(s). This helps all parties to develop a holistic approach which coordinates their environmental mitigation actions at an airport. Adoption of the specification has been spreading, with ACI EUROPE recommending it as a means of managing noise impact at airports.

But within all these different systems there is no substitute for hard facts. The EUROCONTROL Base of Aircraft Data (BADA) is a database that describes aircraft performance in different phases of flight, allowing users to undertake trajectory modelling from take-off to landing, to determine fuel burn and emissions.

“It sits at the core of our impact assessment ▶

“They have been using IMPACT to look at the trade-offs between noise and fuel efficiency at airports, examining continuous-descent and precision navigation approaches.”



Dr David Marsh, Head of the Forecasts and Network Intelligence Unit

modelling,” says Andrew Watt. “It contains detailed information for almost every modern aircraft type in service and means for a fleet of aircraft flying into and out of an airport we can pretty accurately model the performance of the entire fleet, for noise and emissions. BADA is released worldwide on licence, and EUROCONTROL has several hundred customers.”

One of the largest and most strategically significant of all EUROCONTROL’s environmental monitoring tools is the PRISME data warehouse.

PRISME stores data on every flight in European airspace. It contains around 17 terabytes of data and goes back to 1996, recording data on the flight plan originally submitted by the aircraft operator, the flight plan approved by the Network Manager (NM) and the flight that was actually flown.

“Every night, out of our Network Operations Centre (NMOC), we have a data dump of all the flights that took place that day,” says Watt. “We process the data and convert it into something that can be read from an environmental perspective. We also have a database of the worldwide aircraft fleet and we are one of the few organisations in the world with the combined capability to analyse movement records of the fleet.”

EUROCONTROL has been working with the US Federal Aviation Administration (FAA) for almost 10 years to develop a database of global air traffic movements. Between them, the FAA and EUROCONTROL record about 60% to 70% of global traffic. To supplement this and obtain a worldwide view, the Agency uses data on daily flight movements from commercial providers, and by merging traffic information from all sources, EUROCONTROL and the FAA produce a database of global air traffic movements every year which is used by ICAO’s environment committee for analyses of trends and forecasts. The same expertise is also used as the basis for emissions inventories. The United Nations Framework Convention on Climate Change (UNFCCC) requires all States to submit their national greenhouse gas emissions inventories every year and domestic aviation is part of the national inventory. EUROCONTROL provides the calculations for all European Union States in concert with the European Environment Agency (EEA).

“Every year we provide the EU and the EEA with an aviation emissions inventory, which is then distributed among the EU States,” says Andrew Watt. “All the experts get together and look at what they have done within their own national inventories and they compare their figures with ours, to crosscheck. It improves the quality of the European Union inventory submitted to the UNFCCC and the work is funded by DG Climate Action.”

DG Climate Action and EUROCONTROL have also been working together for more than 10 years on the Emissions Trading Scheme (ETS), which obliges an

“It contains detailed information for almost every modern aircraft type in service and means for a fleet of aircraft flying into and out of an airport we can pretty accurately model the performance of the entire fleet.”



Andrew Watt, Head of the Support to SES-related Policies Unit within the EUROCONTROL Directorate Pan-European Single Sky

aircraft operator to report its emissions to its national administering authority. EUROCONTROL supports DG Climate Action to meet the European Commission’s (EC) obligations under the ETS legislation, for example publishing the “ETS List” that associates an aircraft operator to the State to which it must report its emissions.

EUROCONTROL also supports 25 European States in administering all the reports they receive from the aircraft operators. Its Emissions Trading Scheme Support Facility gives detailed information about flights flown by individual airlines, which of these flights should be included in the ETS, which flights should be excluded and what the emissions have been. At the same time EUROCONTROL also supports aircraft operators to comply with the ETS’ “simplified reporting” option. If an airline emits less than 25,000 tons of carbon dioxide a year it does not need to have its emissions independently verified. Instead, it can take data directly from EUROCONTROL and submit it straight to the regulator for approval. At least 250 aircraft operators currently use the service at a cost of just €400 for a year’s worth of data.

PRISME, BADA and IMPACT are also used as the basis for EUROCONTROL’s own airspace modelling work. When the NM is looking at a possible airspace redesign or route network improvement, fuel burn and greenhouse gas emissions can be accurately estimated. The Environment Team in Directorate Pan-European Single Sky and the navigation team in Directorate Air Traffic Management are collaborating to embed IMPACT in the toolkit being developed to support roll-out of Performance-Based Navigation, a key enabler for SESAR deployment.

“The next phase is going to be looking at things like particulate matter, helicopter noise, third-party risk, and the non-CO₂ climate change impacts of aviation emissions,” says Andrew Watt. “I think that’s where the modelling focus will be in the next five to ten years, to bring our ability to assess these up to the same level as we’ve reached with the classic impact assessment systems that we have now.” ■



Can you tell us a little bit more about your company?

Founded in 1959, Universal Weather and Aviation, Inc. began with customised weather forecasting for business aviation. That initial vision would continue to grow over the following half century. As business aviation expanded, Universal evolved, adding new services and solutions to meet the changing needs of a growing industry that relied on business aviation aircraft, regardless of location or length of trip. Universal now consists of 1700 employees around the world with its headquarters located in Houston, Texas. Universal is best known for providing complete trip support services for business aviation. Our clients count on us to help them navigate ever-changing regulations worldwide, overcome the unexpected, and make every mission a success.

How long have you been using the ETS Support Facility?

Universal began using the ETS SF in 2014 for the 2013 reports.

How is the ETS Support Facility helping your company?

Universal supports close to 300 operators to meet the EU ETS requirements, each with their unique operations and needs. The ETS SF helps us ensure that the reports are submitted to each of the operator's member state on time and with accurate information.

What are the main benefits that you enjoy as a result of using ETS SF?

One of the major benefits, not only Universal but all of our operators, is the accuracy of the data and the ability to utilise the reports generated by the ETS SF directly without having to go through a third party verification process. The requirement of having the data verified was time consuming, expensive and required many additional resources from us and the operators.

Would you recommend this tool and if so, why?

We would absolutely recommend this tool for the convenience of data accuracy and ease of use of the service to get the reports. EUROCONTROL's ETS team has been extremely helpful throughout each reporting year.

Is there anything you'd like to add?

The ETS SF has dramatically revolutionised the way Universal helps all of our operators meet the EU ETS requirements of reporting. We look forward to continuing our use of this service as long as the reporting requirements are in place.

Helping airports reduce their carbon footprint



Integrating airports into the European air traffic management network is a key factor in helping the management of aviation-related greenhouse gas emissions.

It is likely that all carbon emissions will come with a price tag in the future and airports, like the rest of aviation, will have to play their part in reducing the industry's environmental footprint. With this in mind, EUROCONTROL's Airports Unit is focused not only on improving safety and efficiency, but also on minimising fuel burn, gaseous emissions and noise impact.

Airport capacity is already recognised as one of the bottlenecks to future growth of Europe's air transport system (EUROCONTROL "Challenges of growth" 2013) and a number of programmes are underway to optimise the use of available airport capacity. Air navigation services play a key role in balancing traffic with available capacity, and integrating airports into the European network is proving to be a key way to help mitigate the looming capacity crunch and its environmental impact.

According to Paul Adamson, Head of the Airports Unit within the EUROCONTROL Network Manager (NM) Directorate:

"Airports are now responsible for almost as much overall delay as en-route, and hub airports are where the greatest threat is. We are looking for increased integration – more data exchange – between the airports and the Network Manager Operations Centre (NMOC)."

The Airport Unit has overseen a jump in the number of airports participating in Airport Collaborative Decision Making (A-CDM) in the last two years – doubling to more than 20. A-CDM requires airport partners including the airport operator, airlines, ground handlers and air traffic control to share data in real-time to support collaborative decision making. This leads to improved use of aircraft stands, more predictable aircraft movements, and less time spent queuing on the taxiway. The passenger also experiences better reliability and fewer missed connections.

Participating airports transmit improved pre-departure take-off time estimates to the NMOC and as a result, the Departure Planning Information (DPI) messages enable the NMOC to use the network's capacity more efficiently, for example making more effective use of slots and reducing delays.

A study published by Atlas Chase for



EUROCONTROL in April 2016 collected evidence from 17 A-CDM airports to determine the benefits at local and network level. Based on 2.2 million annual departures, A-CDM resulted in a 7.7% reduction in fuel burn across the airports, or 43,400 less tonnes of fuel. Carbon dioxide emissions fell by 102,700 tonnes and sulphur dioxide by 28,700 kg. This was caused by less taxi time (7% reduction) and fewer delays (10.3% reduction), saving an estimated €42.2 million. Some individual airports reported cost savings of €1 million from delays alone in 2015, including some less constrained A-CDM airports including Prague, Venice and Milan Malpensa.

While there are already some network benefits the study concludes departures from A-CDM airports experience on average one minute less flow-management delay than those departing from non-A-CDM airports – the Airports Unit has set a target of A-CDM implementation at 42 airports by 2019 to continue to accrue benefits at the wider network level.

In addition, the Airports Unit intends that a further 50 airports be integrated into the network within the same time period through implementation of Advanced ATC Tower procedures. This applies to medium or small airports able to submit a subset of DPI messages to NMOC, usually when the aircraft leaves the blocks. The information includes an accurate estimate of take-off time, taxi time and departure route. “Up to now, we’ve had to rely

“We are looking for increased integration – more data exchange – between the airports and the Network Manager Operations Centre (NMOC).”



Paul Adamson, Head of the Airports Unit within the EUROCONTROL Network Manager Directorate

on the flight schedule and flight plan data that do not necessarily always reflect operational reality. The first indication comes only when the flight is airborne, or the first radar contact,” says Paul Adamson. “It makes a difference if you can have good estimates of take-off time from a group of airports like the Greek Islands.” Currently there are 16 Advanced ATC Tower airports and EUROCONTROL is supporting additional airports by offering concept explanation, implementation planning and testing.

The Airports Unit enables coordination and support through the Airport Operations Team (AOT), which in turn convenes task forces addressing specific topics. The AOT includes representatives from airports, airlines and air navigation services providers (ANSPs) as well as national authorities, and undertakes to produce guidance material, simulation work and share best practise. EUROCONTROL also plans to integrate airports more directly into the network by installing a dedicated airports position in the operations room and is starting with a feasibility trial during July-September 2016. This concept has proved successful when similar positions for aircraft operators were added a decade ago, and more recently for the military, enabling information to be shared during early planning phases and increasing the opportunity for collaborative decision making.

An area of particular focus is the integration of the Airport Operations Plan (AOP) and the Network Operations Plan (NOP). AOP-NOP integration is a SESAR programme that envisages a single common rolling plan available to all stakeholders. “We encourage the airports to deploy an operations centre and link this with the NMOC. We need them to communicate in pre-tactical and tactical phases, for example to share weather-related issues,” explains Paul Adamson. “This is the next evolution of A-CDM where there is more integration and more data exchange between Airport Operations Centres (APOCs) and the NMOC.” This work also looks at how airports can include the NMOC in their contingency plans to ensure the network is kept up to date with unexpected events such as security incidents or outages.

ANOTHER EVOLUTIONARY STEP IN the integration of airports with the network will be the Centralised Service 1 (CS1), Flight Plan and Airport Slot Consistency. By optimising the use of airport slots this service will result in the better exploitation of scarce airport capacity and hence improved flight punctuality. This will further increase the delay reduction and associated reduction in CO₂ emissions. ▶

Airports are also recording substantial emissions reductions as a result of the introduction of Continuous Descent Operations (CDOs) and Continuous Climb Operations (CCOs). By allowing aircraft to fly a continuous descent (or climb), rather than a conventional stepped approach, the procedure requires minimum engine thrust, reducing noise emissions and fuel consumption. The UK has introduced CDOs at all its major airports including London where over 80% of arrivals make use of the procedure. NATS says by keeping aircraft higher for longer, it offers noise reductions of between one to five decibels per aircraft on the approach from between 25 to 100 miles from touchdown.

Paul Adamson says more than 100 major European airports operate CDOs, and at least 70 airports have published procedures that make them freely available. "There is community-wide acceptance of the environmental benefits so we are working on a way of measuring this." EUROCONTROL is creating a baseline of how many CDOs are being flown in order to monitor its impact. This involves looking at surveillance data from various sources and comparing this with rates of descent and flight profiles. Paul Adamson hopes to be able to quantify CDO benefits and encourage more widespread implementation. "We have more than 100 airports already, and we are targeting 200 by 2019. Our focus is on CDOs as these tend to be more complex than CCOs, but we are interested wherever we see the greatest benefit, and we will include CCOs."

THE MORE RECENT INTRODUCTION of new wake vortex categories under Europe's RECAT-EU programme is expected to have a positive impact on capacity and to reduce delays at busy airports. It redefines wake turbulence categories and their associated separation minima, leading to a reduction in separation minima for certain pairs of aircraft and increasing runway throughput. The first deployment at Paris/Charles De Gaulle at the start of 2016 could eventually enable the airport to handle an extra 29 aircraft movements a day. "The network benefits because you can move more aircraft through the system, with

most benefit when it is busy. You can recover from adverse conditions more quickly because you can catch up during the shoulder periods," says Paul Adamson. EUROCONTROL is running simulations with a number of airports and targets introducing the new measures at 10 airports by 2019.

Under the umbrella of SESAR EUROCONTROL the Airports Unit is also working on RECAT-2 which supports even more efficient spacing based on the characteristics of the lead and following aircraft. Pairwise separations can increase runway throughput between 5-10%, helping to address capacity limitations and in turn decrease airborne delays.

These precise separation criteria are also associated with part of the Time-Based Separation (TBS) tool, another SESAR concept developed by a team including EUROCONTROL, Heathrow Airport, NATS and Lockheed Martin and introduced at London Heathrow in March 2015. TBS uses live data from the aircraft to dynamically calculate the headwind effect on final approach to determine the optimal safe wake vortex separation between aircraft. NATS estimates the tool eliminates up to 80,000 minutes of delays each year previously experienced due to high winds, contributing to reduced fuel consumption and emissions.

Positive results are also associated with Advanced-Surface Movement Guidance and Control System (A-SMGCS), an important area of EUROCONTROL's activity since the 1990s. The Agency developed the baseline for A-SMGCS services and identified two functional levels of capability which ICAO subsequently adopted. A-SMGCS provides for enhanced safety and helps to maintain capacity in low visibility conditions. "Most major airports have implemented A-SMGCS, resulting in safety, capacity and throughput benefits." EUROCONTROL is working on revised guidance material that is due to be published in 2016 to assist more airports to deploy the technology. "The A-SMGCS documentation will include routing and planning functions that feature in SESAR developments and deployment plans," adds Paul Adamson. "There are also new technologies, such as camera and video, which might deliver the same accuracy and performance of traditional radar and multilateration."

In addition to preparing guidance material, the Airports Unit began a programme in 2015 to visit the network-important airports in order to discuss ways to improve operations. The meetings involve the airport operator, hub airline, ANSP including the flow management position, and NMOC technicians. Topics include performance during the preceding and forthcoming peak season, and new actions for the future. Visits to date include London Heathrow and Gatwick, Paris Orly, Frankfurt, with Amsterdam and Paris CDG next in line. "We are putting in place a more customer-oriented view. We need to ensure we have smooth, effective and efficient network in Europe and this means selling the concept not only to individual airports but multiple airports. If we can encourage others to deploy, it aggregates the benefits, including helping to reduce the environmental footprint," says Paul Adamson. ■

"We have more than 100 airports already, and we are targeting 200 by 2019. Our focus is on CDOs as these tend to be more complex than CCOs, but we are interested wherever we see the greatest benefit, and we will include CCOs."

Paul Adamson, Head of the Airports Unit within the EUROCONTROL Network Manager Directorate

European ANSPs pioneer environmental safeguards

Europe has become a focal point for developing and implementing multi-national, environmental improvement programmes such as free route airspace, continuous descent approaches and flexible use of airspace. But many air navigation service providers (ANSPs) are going above and beyond these strategic programmes. This is the editor's round-up of some recent innovative ANSP environmental initiatives.

Croatia Control Ltd (CCL) has completed the installation of solar panels on the roof of its parking lot, commissioning a 345kW photovoltaic (PV) power plant which will supply one-third of daily electricity requirements to the facilities at its headquarters in Velika Gorica, Croatia in summer. Besides an enhancement of the electrical power system, as well as positive effects of energy conservation and rational consumption, CCL also aims to raise social awareness through the use of renewable energy sources. CCL is one of the first air navigation service providers in Europe to use a renewable energy source generating this much electricity for its business operations. By implementing this project, CCL has made a direct impact on energy development and trends in the country contributing to electricity generation from renewable sources. This represents a huge natural resource and enables the production of electrical energy with a lower emission of fuel and gases.

In March 2016 **KLM Royal Dutch Airlines** launched a series of 80 biofuel flights from Oslo to Amsterdam operated with an Embraer 190 aircraft. In January this year, Avinor's Oslo Airport in Norway became the first international airport hub to supply biofuel directly from its hydrant system. For these specific flights, operated by KLM Cityhopper, sustainable jet fuel is delivered into the wings by separate fuel trucks, so Embraer can conduct measurements to gauge the efficiency of sustainable jet fuel compared to fossil jet fuel. The sustainable jet fuel is produced by Neste within the European Commission-funded Initiative Towards Sustainable Kerosene for Aviation (ITAKA) project and made available by Air BP and SkyNRG in close cooperation with Avinor.

Denmark's Naviar has carried out a major energy optimisation in its information technology (IT) department, where converting and replacing equipment has reduced total energy consumption in this area by 86%, or almost 700,000kWh (kilowatt-hours). This initiative has resulted in annual savings in energy costs of almost DKK 0.8 million and an annual CO₂ reduction of 310 tonnes.

The Times Building, which houses **Irish Aviation Authority's** head office, now uses an intelligent lighting system and centralised printing.

In December 2015 the **UK's ANSP NATS** became the first European ANSP to sign up to an international voluntary framework committing to transparently report its greenhouse gas emissions performance. NATS was one of the first aviation-related organisations to make this commitment and the 170th signatory to the United Nations Climate Conference COP21 initiative. The initiative is being led by the Climate Disclosure Standards

Board (CDSB) and the United Nations Environment Programme (UNEP Finance Initiative). NATS is implementing the Greenhouse Gas (GHG) Protocol to standardise how it identifies and calculates greenhouse gas emissions and will now also voluntarily report this information using the Climate Change Reporting Framework.

Germany's Deutsche Flugsicherung (DFS) has signed up to the German Sustainability Code. With this declaration, the company undertakes to meet the code criteria, making its sustainability strategy transparent for the outside world. Overall, the code ensures that the performance of DFS as regards sustainability can be easily compared with other companies.

Cooperation between **Sweden's LfV and Denmark's Naviar**, which was established in 2012, has resulted in flights within the joint Swedish-Danish airspace having the shortest paths in Europe, at a little over 1% longer than the straightest paths, says LfV. LfV has targeted an annual CO₂ reduction of 1,000 tonnes between 2014 and 2017. In 2014 the reduction was 1,185 tonnes.

Austria's Austro Control is developing satellite-based arrival procedures for helicopters based on "Point in Space" in cooperation with Austrian federal police, army and Austrian Automobile, Motorcycle and Touring Club, the first ICAO approach type that does not require an airport. Using satellite-based navigation (localiser performance with vertical guidance), the target is to facilitate special procedures for helicopter approaches to defined points, such as landing sites at hospitals, avoiding environmentally sensitive areas. This means that in future, low-level International Flight Rules (IFR) corridors could be created for incoming rescue service flights. Rescue helicopters would be able to fly from the scene of an accident to the nearest corridor and from there to the exact destination – such as a hospital – using low visibility procedures (LPV), even in poor weather conditions. ■

Solar Impulse

Making aviation environmental history

In late July Solar Impulse 2 (Si2) – the solar-powered aircraft of Swiss pioneers Bertrand Piccard and André Borschberg – completed the final leg of its round-the-world fuel-less flight. It left Abu Dhabi in March 2015 on the first part of its 22,000-mile (35,000km) flight, propelled solely by the sun's energy. It is a single-seat aircraft made of carbon fibre that has a 72m/236ft wingspan (larger than a Boeing 747) for a weight of 2,300kg/5,100lb (the equivalent of an empty family car). The 17,248 solar cells built into the wing power four batteries (38.5kWh per battery) that in turn power the four electric engines (13.5kW/17.5hp each) and the propellers with renewable energy. The plane is therefore capable of saving a maximum amount of energy during the day and flying throughout the night on batteries. Si2 requires zero fuel and has virtually unlimited autonomy: theoretically, Si2 could fly forever and is only limited by the pilot's sustainability.



INTRODUCING PERFORMANCE-BASED NAVIGATION PROCEDURES

How EUROCONTROL can help

Environmental savings offered by more flexible flight paths need careful planning to gain the support of local community organisations.

Europe's 25 busiest airports must implement Performance-Based Navigation (PBN) into the terminal manoeuvring area by January 2024, under the Commission Implementing Regulation (EU) No 716/2014. PBN-based procedures support more flexible route placement and take advantage of precise track-keeping capabilities on board modern aircraft. In addition to the safety benefits associated with advanced navigation, PBN creates shorter flight paths – as aircraft no longer need to adhere to routes based solely around ground-based navigational aids – and provides the opportunity to avoid populated areas. PBN also has a vertical element: it enhances safety and airport access by enabling approaches with vertical guidance to airports where precision approach aids do not exist. This is also beneficial to the environment, as the more efficient vertical flight profiles such as continuous descent and continuous climb operations

facilitated by PBN are quieter and use less fuel than conventional, stepped-flight paths.

Some airports have already introduced PBN procedures based on RNAV1, an International Civil Aviation Organization (ICAO) area navigation specification within the PBN package of specifications, while others have run trials based on RNP1 (another PBN specification). In the final approach segment, however, many European airports now offer RNP approaches (APCH) into the airport at some runway ends, as shown on the map. Another more sophisticated type of PBN approach procedure which caters, in many instances, exclusively for environmental mitigation, is based on the RNP AR APCH specification.

AIRPORT AND TERMINAL AREAS which have embraced PBN include busy hubs and regional airports from London's Heathrow, Gatwick and Stansted to Frankfurt, Dusseldorf and Munich, as well as Rome Fiumicino, Oslo

Gardermoen and Stockholm Arlanda. But PBN introduces fresh challenges that are only just beginning to be recognised.

Although PBN brings significant environmental benefit, it is not always possible to avoid overflying communities around major airports. It might be unpopular with those under the flight paths, some of whom experience an increase in overflights, leading to community opposition. When London Gatwick Airport ran a six-month trial with new westerly departures in 2014, the airport encountered considerable resistance from local residents previously not affected by noise. A new campaign group, Communities Against Gatwick Noise Emissions (CAGNE), was formed to represent the interests of all affected communities calling for equitable distribution of arrivals and departures.

The UK's Civil Aviation Authority (CAA) is exploring multiple noise mitigation

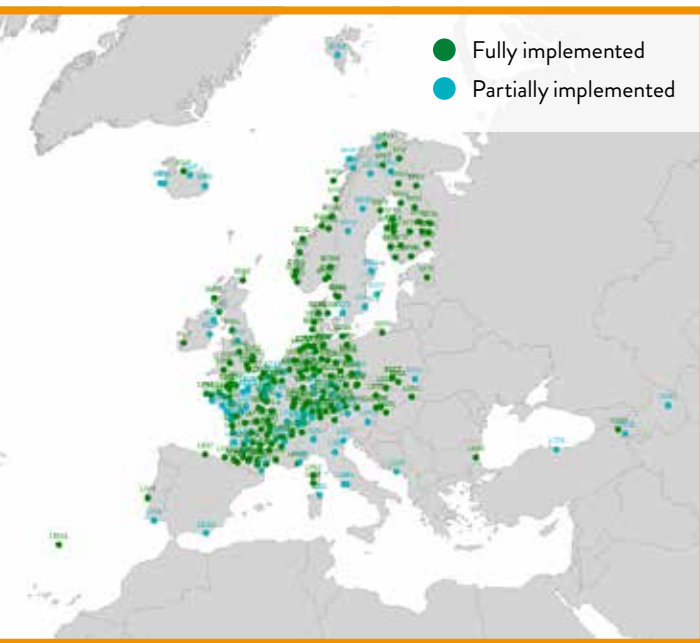


Figure one: Partially and fully implemented RNP APCH in Europe

“You have to engage with people and choose the best compromise that brings the benefit with the least impact.”

Rick Farnworth, Deputy Head of EUROCONTROL's Navigation and CNS Research Unit



options and has established a Community Engagement Board. Among concepts under review, the authority is looking at ways of avoiding populated areas for aircraft flying below 4,000 ft and also below 7,000 ft. Introducing multiple PBN arrival routes would serve to disperse noise emissions across a wider area, while steeper approaches and increased climb gradients could also help to reduce greenhouse emissions.

EUROCONTROL's Deputy Head of the Navigation and CNS (Communications, Navigation and Surveillance) Research Unit Rick Farnworth says that Gatwick is not alone in experiencing local opposition, with airports such as Frankfurt and Amsterdam Schiphol also encountering organised campaign groups when they consider new performance-based flight paths. “A route may be shorter and more fuel efficient, but if new people are affected by noise they will complain. The fact they have access to social media helps them to coordinate opposition more easily than they used to.” Farnworth says there needs to be a trade-off between introducing new procedures and the concerns of those

affected. “You have to engage with people and choose the best compromise that brings the benefit with the least impact.”

EUROCONTROL provides a number of tools and guidance material to support stakeholders, particularly air navigation service providers (ANSPs), when introducing new procedures. The PBN toolkit allows for information exchange and workshops which can include visits to ANSPs to discuss implementation and best practice, and there are plans to add web-based tools that enable stakeholders to share technical and operational information, education and training material, and methodologies for deployment. Over the past nine years, the Navigation Unit has worked closely with ICAO to spread awareness of PBN and its airspace implementation, launching for example the RNAV Approach Implementation Support Group (RAISG), and the Navigation Steering Group (NSG) which holds a joint meeting with the ICAO (European) PBN Task Force every year.

HOWEVER, JUST AS IMPORTANT as operations is the need to include the local community in the decision-making process, an area where EUROCONTROL's expert environment staff have some experience. “We think we can use the PBN tools as well as the environmental tools to engage with people and talk facts. We have tools to demonstrate how much noise is being reduced, or fuel consumption cut, based on different scenarios,” says Farnworth.

EUROCONTROL has published a Collaborative Environmental Management Specification which sets out how an airport can work with stakeholders to identify environmental challenges and work together to meet them. The manager responsible for EUROCONTROL's environmental activities, Andrew Watt, explains: “Airports may already have existing working arrangements that allow them to collaborate. This is about getting the operational stakeholders at an airport around the table to talk to each other. They need to further deepen trust in each other and understand each other's business drivers. It is about managing environmental risk.” The Specification has been adopted by Airports Council International (ACI) Europe as best noise-management practice.

The Support to SES-related Policies Unit has also developed a modelling platform called IMPACT (See also: *Measuring, monitoring, mitigating: tools to improve environmental performance*, in this issue); a software platform designed to model the airspace and assess the impact of various new procedures. Watt says: “We can measure fuel burn, greenhouse gas emissions and noise benefits, generated from a single procedure. The underlying methods and results have been stress-tested by the ICAO Committee on Aviation Environmental Protection which included undertaking analyses of the impact of the new Carbon Dioxide Standard, ▶

“They need to start to build trust in each other and understand each other's business drivers. It is about managing environmental risk.”



Andrew Watt, Head of the Support to SES-related Policies Unit, EUROCONTROL Directorate Pan-European Single Sky

adopted by the Committee in February 2016. Impact was used to crunch through the numbers in Europe for this initiative." The platform is also available via the Internet to eligible agencies, allowing users to input their own parameters and estimate the impact of particular routes. Current ANSP users include Germany's DFS and France's DSNA.

"One of the great things about PBN is that it can do almost what you want it to do in your airspace."

Franca Pavličević, Head of the EUROCONTROL's Navigation and CNS Research Unit

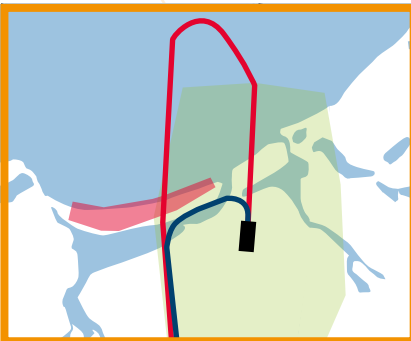


EUROCONTROL's Navigation and CNS Research Unit also offers software tools designed to support decision making. The PRISME database contains information about fleet capability in Europe, which when combined with flight-plan data reveals which aircraft use which airports and the likelihood of being able to take advantage of new procedures.

ALL THESE TOOLS ADD value individually, but they would deliver greater value if used together. The Head of the EUROCONTROL's Navigation and CNS Research Unit Franca Pavličević says: "When you develop an airspace scenario, you use these tools

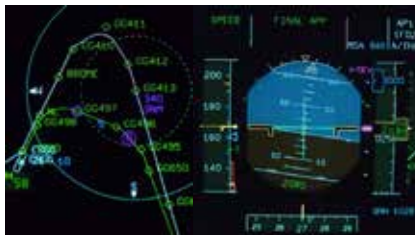
separately at the moment. We want to make them work together to build a modular tool-box that acts in an integrated way. EUROCONTROL published the first airspace design manual to incorporate environment guidance in 2005. Now the environment features in every step of the process." The Unit is assessing the viability of integrating the tools into a common platform, and establishing what States find useful. "People need to see it is the same problem that needs solving, rather than treating each item separately," Pavličević says. The Unit is seeking funding to support the development of a common platform.

"The environmental stakeholder was unrecognised for a long time. They are now recognised and they have to become part of the PBN solution with as much voice as other stakeholders. The extent to which that voice is heard is down to a number of different factors. These include the political agenda and the priorities laid down by politicians, including economic and cultural issues. For example, a solution that works in the UK is unlikely to apply to Turkey," says Pavličević. "One of the great things about PBN is that it can do almost what you want it to do in your airspace. The secret lies in working with all the people in the vicinity of the airport and exploiting PBN's benefits in achieving a common goal." ■



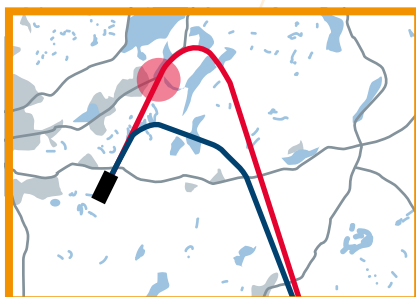
Riga introduces quieter, shorter approaches

Latvian airline airBaltic worked closely with Riga Airport to introduce an RNP AR approach path in 2014 that saves 30 km and three minutes' flight time. Flights avoid a populated area, use 70 kg less fuel and emit 220 kg less carbon dioxide as a result of new procedures designed by Airbus ProSky. The airline's fleet of Bombardier Q400 turboprop aircraft now fly quieter, shorter flight paths using on-board navigation capability, and the procedure is available for other suitably equipped carriers.



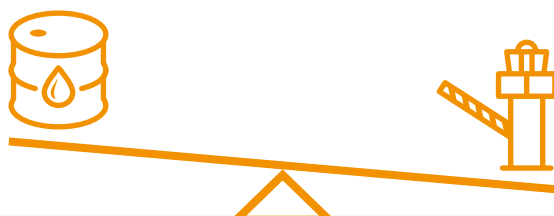
Vienna reduces noise emissions over populated area

Vienna published two new RNP Authorisation Required (RNP AR) approach procedures to Runway 16 in response to a community programme in 2015, aimed at reducing noise emissions over a populated area. In addition to cutting noise levels, the procedures offered a shorter flight path compared with the Instrument Landing System (ILS) approach, prompting Emirates Airlines to write to the airport signalling its approval of the new routes.



Gothenburg avoids noise-sensitive area

Gothenburg-Landvetter Airport has published two curved RNP AR approaches which shorten flight paths by as much as 11 nautical miles (nm), and avoid a community that was previously overflown. The collaborative project involving the airport operator Novair, Airbus and Swedish ANSP LFV, introduced the new procedures in 2011, resulting in environmental and efficiency benefits.



SHORTER ROUTES POSSIBLE WITH BETTER FLIGHT PLANNING

The last few years have seen airlines gradually reduce the distance they have to fly from origin to destination airport – but for further progress, aircraft operator flight planning systems will need to be updated to exploit new, fuel-efficient routes as they become available.

“If everyone flew the shortest routes available in the network, overall daily savings would range between 60,000 to 80,000 nautical miles; even if you factored in airlines flying the cheapest routes the savings would still be around 30,000 to 40,000 nautical miles.”



Razvan Bucuroiu

Head of Network Strategy and Development Division
in EUROCONTROL's Network Manager Directorate.

Razvan Bucuroiu is responsible for identifying some of the major disconnects between the way airspace managers plot the most fuel-efficient, environmentally responsible routes through European airspace and the routes which airlines actually fly.

“Looking at the operations of a medium-sized airline, I have found that if they had planned the best routes, taking into account airspace availability in the network, they would have saved between €15,000 and €20,000 a day,” he says.

So why are airlines flying so many fuel-inefficient, longer routes?

Many prefer to fly longer routes if it can save them money through cheaper air navigation charges. There are huge differences in these charges throughout Europe, despite air navigation service provider's (ANSPs) all offering the same thing – safe and efficient air navigation services (See also: *Lower charges or environment improvements – are the two compatible?* in this issue).

But that fact alone does not explain why so many airlines are flying so much further than their optimum trajectories, even when the cost of competitive air navigation charges are factored in. Many could be flying far more fuel-efficient routes than their filed flight plans suggest.

The last few years have seen some important improvements in airline route efficiency. The International Air Transport Association (IATA), Civil Air Navigation Services Organisation (CANSO) and EUROCONTROL jointly launched the Flight Efficiency Plan ►

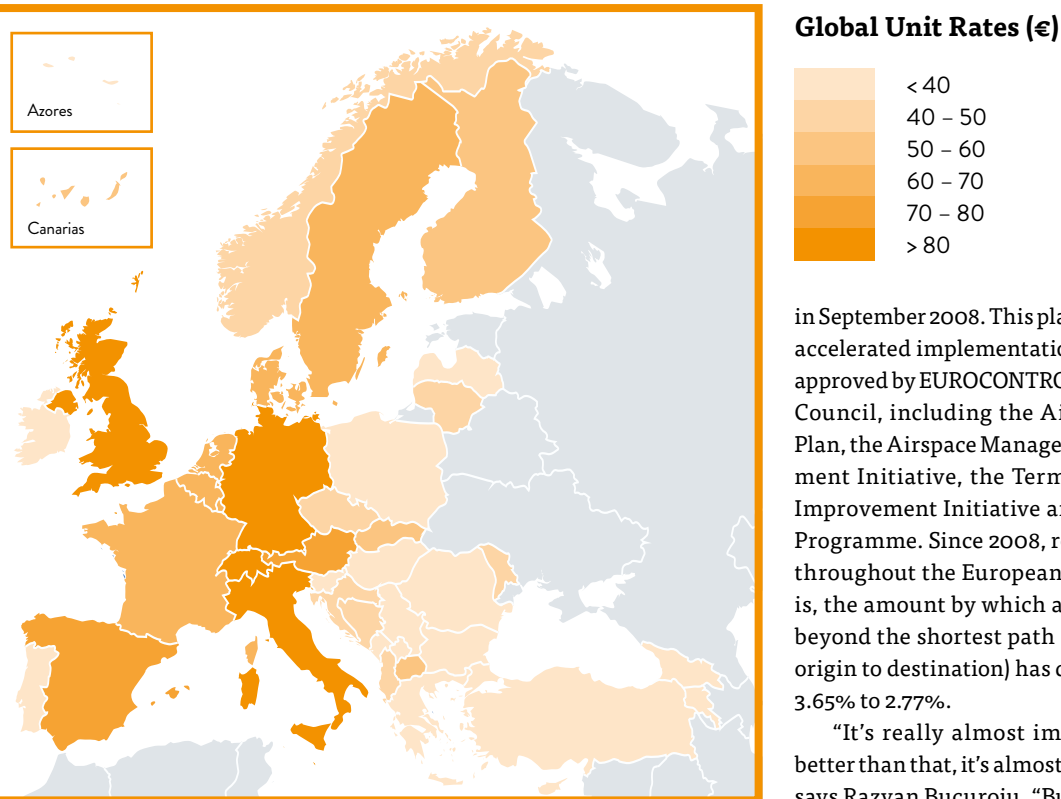


Figure one: Global Unit Rates applicable from 01/01/2016

in September 2008. This plan builds on the accelerated implementation of measures approved by EUROCONTROL's Provisional Council, including the Airspace Action Plan, the Airspace Management Improvement Initiative, the Terminal Airspace Improvement Initiative and the Airport Programme. Since 2008, route extension throughout the European network (that is, the amount by which an aircraft flies beyond the shortest path available from origin to destination) has decreased from 3.65% to 2.77%.

"It's really almost impossible to do better than that, it's almost a direct route," says Razvan Bucuroiu. "But there is a big difference between the route proposed

in the flight plan and the route the aircraft actually flies. A filed flight plan might show a route extension of 4.74%, to avoid an expensive airspace, but when we look at the aircraft's actual trajectory we see it is much less than

that."

Air navigation charges are based on the filed flight plan rather than the route that's actually flown. So when a pilot plans a long diversion to avoid expensive airspace, this has financial benefits for the aircraft operator. Of course the operator is not really interested in flying that longer route and burning extra kerosene, so on the frequency the usual requests for short cuts are put to the controller.

"For example, an airline planning to fly down the eastern side of the coast from northern to southern Italy will typically plan a route across the Adriatic Sea into Croatian airspace because the unit rate in Croatia is almost half the unit rate in Italy. Do you think that this aircraft ever enters the Croatian airspace? No. The controllers give the pilot a direct route and he or she flies through Italian airspace from origin to destination. Italy gets just small portion of the money corresponding to the flight plan. Croatia receives the money for this flight even though it will never enter Croatian airspace." However, both countries are planning for false volumes of flights as they expect flights to be carried out in accordance with the flight plans.

EUROCONTROL constantly monitors the differences between flight plans and actual trajectories and part of its flight-efficiency initiative is to improve the entire operation with optimised flight planning, proposing more fuel-efficient routes, analysing airspace design and looking at the way the Network Manager (NM) is evolving its operations to better understand the business priorities of its clients. It is providing new communications tools to allow its clients to exploit dynamic opportunities for fuel savings in the European network.

When an airline files a flight plan NM examines it, looks at the availability of airspace and automatically generates a proposal indicating where improvements could be made. NM knows that many airlines factor in the level of air navigation charges in neighbouring ANSPs, so, where it can, it also factors this in. Its proposals encompass route-charging issues as well as known areas of network congestion which need to be avoided, so the proposals are robust and workable.

And yet only between 10% and 20% are accepted.

"The real reason is that sometimes airspace users do not have sufficient resources to evaluate these proposals," says Bucuroiu. "But we have noticed there is a higher acceptance rate from charter airlines; because they operate to critical margins they

will intervene manually to save five minutes of flying time which could remove the need for having an extra crew.”

Short-haul scheduled carriers often do not have the personnel available to consider the improved flight plan suggestions. Their flight planning process is automated and tied into their business planning processes. They generate their flight plans via a computer flight plan service provider and look at alternatives only when there is problem. Some focus their flight planning efforts on their long haul services, an area outside the NM’s responsibility.

THERE ARE A NUMBER of other reasons why airlines are still flying routes which do not best suit their business case or their environmental management targets.

It is difficult for NM to make assumptions about the impact of air navigation charges on individual airline route planning operations because each airline is different, with different fuel purchasing policies, which can be key drivers in route selection priorities. Some airlines will be able to exploit fluctuations in oil prices and buy their fuel on the market at current low prices but others will have hedged their fuel costs some time ago and are locked into long-term price levels. EUROCONTROL wants to improve the way airspace users can see dynamic opportunities in the network for fuel savings so flight planning can adapt flexibly to their business and operational priorities.

“We need to find more ways to have more responsiveness from airspace users,” says Razvan Bucuroiu. “We need to have more forward-looking developments for computer flight plan systems to take account of the dynamic opportunities that the network and the airspace structure offer today. Some flight path service providers have evolved and kept pace with NM developments, but we need to bring them all to the same level, so they can exploit to the maximum the potential of the network. From our point of view, we are working to ensure there are increasingly effective business to business (B2B) connections that allow us to transmit all the airspace data that we have at any time.”

In some areas the route efficiency improvement work is ahead of schedule – such as in the close cooperation between ANSPs and EUROCONTROL in providing new opportunities for direct routes across borders, and in the early notification of restrictions. The next set of performance targets aim to further reduce route extension to 2.6% by 2019, a figure which Razvan Bucuroiu believes will be achieved by the end of 2017.

However, much remains to be done. At a technical level, aircraft operators will need to improve their internal flight planning systems so they can take advantage of new fuel-efficient routing possibilities when they are made available by the Network Manager. At a political level, a solution will need to be found to ensure differences in air navigation services charges will not work to undermine fuel-burn and environmental improvements. It is also important to note that airspace users are not part of the EU performance scheme, while they have a significant decision-making power whether the targets are achieved or not. If progress can be made on these issues the chances are good that the envisaged reductions in carbonisation and the current improvements in flight efficiency can be continued into the future. ■

European Route Network Improvement Plan (ERNIP) built on close cooperation

There has been increasing cooperation between the Network Manager and all functional airspace blocks (FABs) in the preparation of their Performance Plans, of the Network Strategy Plan, the Network Operations Plan and the European Route Network Improvement Plan (ERNIP) Part 2 – ARN Version 2016 – 2019/20. The latter will be a major contributor to the achievement of the performance targets of the second Reference Period of the Single European Sky Performance Scheme (RP2). It will ensure the implementation, in cooperation with ANSPs and FABs, of the Airspace Vision agreed by the Network Management Board.

This includes:

- a comprehensive cross-border implementation of Free Route Airspace, at least at and above FL310, in the European airspace;
- an optimised route structure below FL310 ensuring efficient connectivity in/out terminal airspace;
- a simplification of the Route Availability Document RAD;
- a harmonisation of airspace publications;
- more efficient Flexible Use of Airspace procedures and the associated system support to enable a better utilisation of the civil/military airspace structures;
- closer cooperation between the Network manager, airspace users and computer flight-plan service providers aimed at ensuring a better utilisation of the available airspace structures.



Why variations in navigation charges can influence traffic patterns

Fluctuations in the price of fuel and new flight planning tools which optimise the least expensive routes for aircraft operators have created new challenges for European air navigation service providers.

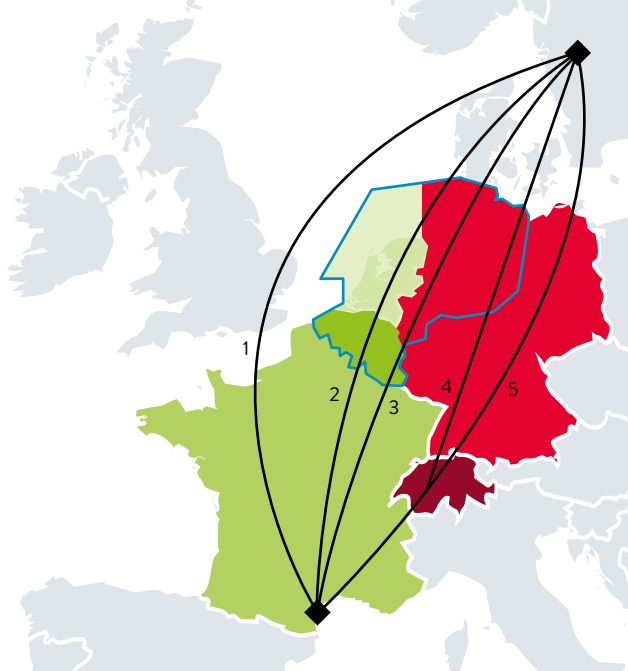


Figure one: Filed routes from south-west Europe to Scandinavia

% distribution of traffic on available routes		2012	2013	2014	2015 ¹	Total 2012-2015
1	UK-France	4%	4%	4%	3%	-1%
2	Germany-Netherlands-Belgium-France	61%	64%	65%	70%	+9%
3	Germany-Belgium-France	14%	14%	13%	11%	-3%
4	Germany (MUAC)-Switzerland-France	17%	14%	12%	12%	-5%
5	Germany-Switzerland-France	3%	4%	3%	2%	-1%
Other	Germany-Hannover-Belgium-France	1%	1%	2%	2%	+1%

Figure two: Distribution of traffic on available routes

Route charges	2012	2013	2014	2015
Belgium	€ 74	€ 68	€ 72	€ 71
Netherlands	€ 66	€ 66	€ 67	€ 67
Germany	€ 74	€ 77	€ 77	€ 90
France	€ 65	€ 65	€ 66	€ 70
Switzerland	€ 99	€ 97	€ 100	€ 111
UK	€ 85	€ 85	€ 87	€ 100
Jet fuel (gallons) average price	€ 2.38	€ 2.20	€ 2.03	€ 1.47

Figure three: Route charges and jet fuel prices

The law of unintended consequences has struck again. In 2013, air traffic flow managers at EUROCONTROL's Maastricht Upper Airspace Centre (MUAC) started to notice that airline flight planners were re-routing their aircraft away from more expensive airspace areas. And while it reduced the cost of flying for airlines, coping with the new traffic patterns gave air navigation service providers (ANSPs) in the region a number of challenges.

"In the old days, airlines would file repetitive flight plans, flying the same route they planned on January 1st for the whole

year," says Flemming Nystrup, Performance Manager at MUAC. "But new advanced flight planning software became available which allowed them to factor in many more elements – crew costs, the costs of passengers missing connections, the strength and direction of winds, fuel prices, air navigation charges and so on."

These powerful new optimisation tools have given airlines a very clear picture of the cheapest way to fly from A to B for every flight, every day of the year. "If an airline chooses to fly a longer route around an expensive airspace, it's relatively cheap these days, in terms of additional fuel burn, to do this," says Nystrup. "The flight planning system automatically calculates all the variable factors. We have studied this process with the University of Westminster and have been able to confirm that aircraft operators will normally choose the cheapest route option, as we would expect."

MUAC, like many other European ANSPs, is working with its colleagues and customers to find new ways to best accommodate these changing traffic patterns. In 2013 Belgium decreased its route charges while Germany raised charges. As a result, airlines flying from Scandinavia through MUAC-controlled airspace down to France, Spain, the Canarys and North Africa began to choose longer routes (see Figure one) to avoid expensive German airspace.

IN 2015 THE NUMBER of aircraft flying route number two, the route which avoids large tracts of German airspace on northeast-to-southwest traffic flows, gained 5% of traffic over the previous year as route charges over Germany rose from €77 to €90 in 2015, at a time when fuel costs have been relatively low. The forecast for this traffic flow over the same period was between 0% and 1.5% and MUAC, like neighbouring ANSPs, has been working to find new ways to accommodate the new traffic flows with minimal impact on delay performance. The forecast for this traffic flow over the same period was between 0% and 1.5% and MUAC, like neighbouring ANSPs, has been working to find new ways to accommodate the new traffic flows with minimal impact on delay performance. ▶

"If an airline chooses to fly a longer route around an expensive airspace, it's relatively cheap these days, in terms of additional fuel burn, to do this."



Flemming Nystrup,
Performance Manager at MUAC

¹Forecasted

Each ANSP faces its own particular challenge in this regard – at MUAC the challenge has been to ensure adequate capacity through matching the staff roster with new traffic demands. Although forecasts for overall increases in the number of flights may seem accurate, local variations have impacted different ANSPs in different ways.

“Some ANSPs retain a relatively stable number of controllers all year round, which means they often have spare capacity, so when they see traffic rising 4% or 5% they can often cope with that,” says Nyrup. “But we deploy a completely demand-based roster. Also, in the low season months, we are really sharp on our staffing. If we have a forecast of 1% traffic increase over last year we plan the rosters for that but in some sectors we have seen sustained traffic increases of 6%.”

A delicate balancing act is required to keep air navigation service provision costs to a minimum while still retaining enough staffing capacity to cope with the forecast demand. But with airlines being able to respond very quickly to rises and falls in air navigation charging, ANSPs are now having to look at new ways to respond with the required degree of flexibility. This has both financial and operational cost implications for ANSPs. “If your projected income is too much then you have to reduce your rate and give it back to the users. You can only charge the cost of the service, plus or minus a few per cent,” says Nyrup.

But there are other unintended consequences of airlines adopting new flight planning tools capable of handling a wide number of variables. EUROCONTROL

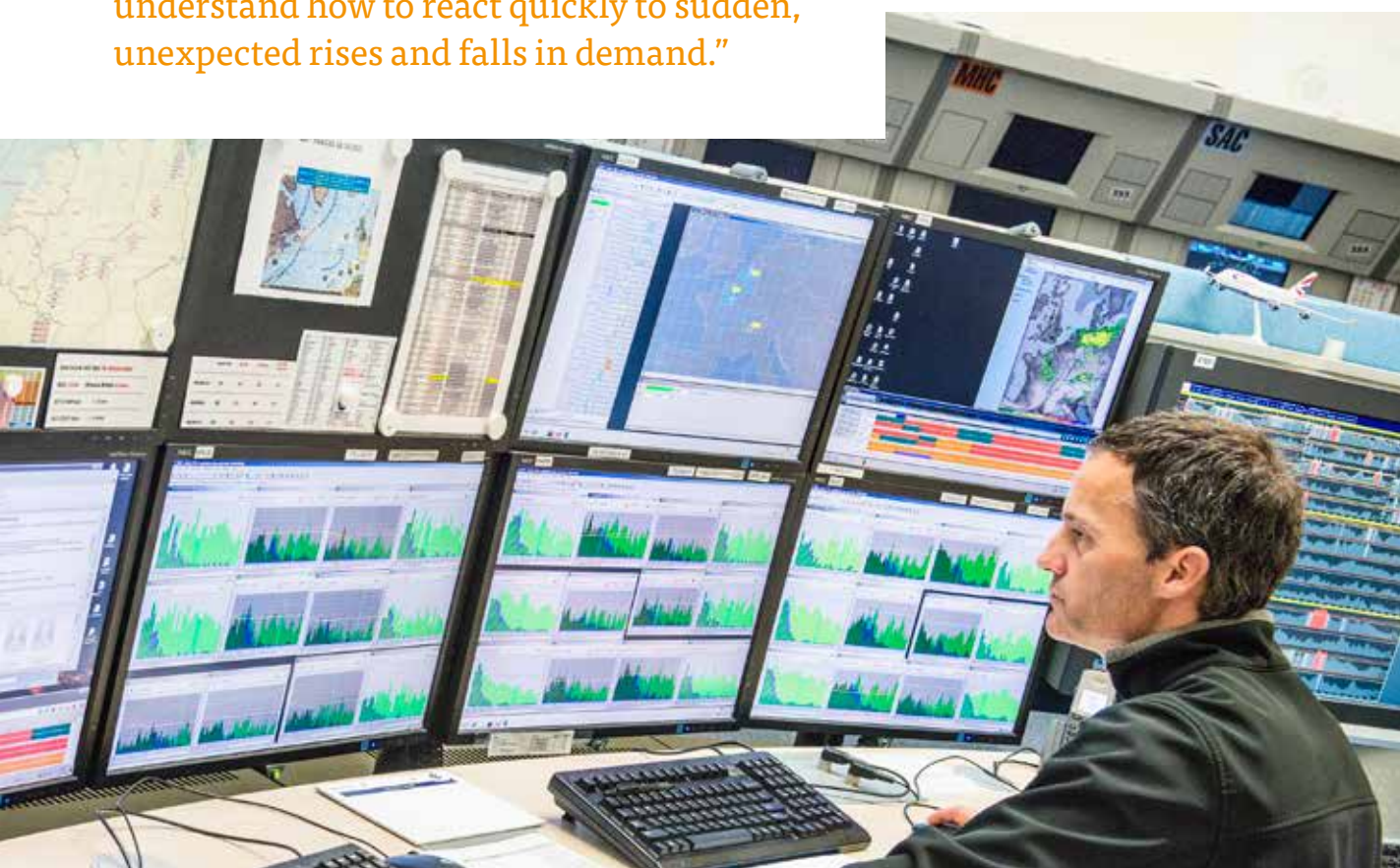
has been promoting a series of flight efficiency initiatives (see *Shorter routes possible with better flight planning*, in this issue) to give airlines direct and free routes which many airlines choose to ignore because flying longer, cheaper routes are more financially attractive than direct ones.

There are a number of responses to flight-planning optimisation efforts but all of them are politically, economically and commercially sensitive. Harmonised unit rates across a single functional airspace block (FAB) – so there is no difference in the rates charged by individual ANSPs, keeping charges at the same level for two years and building in more capacity by increasing the number of controllers on stand-by are all potential solutions. There is no reason for charges to be based solely on a national monopolistic ANSP working within the territory of its home country; route charges could be based on providing services for a larger area, for example a FAB. The income could be distributed according to a distribution scheme agreed by the national ANSPs within the FAB. Feasibility studies for such a charging scheme are available from the Directorates Central Route Charges Office and Network Manager at EUROCONTROL. Another partial solution, says Flemming Nyrup, would be to get a better understanding of how small rises and falls in navigation charges impact different airline traffic flow behaviour; whether legacy carriers work to the same operational and economic principles as low-fare carriers, for example.

This means working even more closely with aircraft operators and ANSP partners to understand how to react quickly to sudden, unexpected rises and falls in demand.

For the moment there is no easy solution to the problem of sudden changes in traffic flows caused by changing differentiations in air navigation charges, balanced against the effects of other operational factors. The benefits of lower air navigation charges for airlines are clear, both for the airlines themselves and ANSPs in terms of meeting performance targets. But there are hidden cost increases further down the line which are not always obvious at the outset and these will need to be addressed. ■

“This means working even more closely with aircraft operators and ANSP partners to understand how to react quickly to sudden, unexpected rises and falls in demand.”



FUA → AFUA

Civil-military cooperation advances with new flexible, shared airspace concepts

The main challenges to improved civil-military airspace management cooperation are not technical but institutional. Real progress is now being made to improve this vital area of European ATM performance.

It may seem simple, but moving from the basic flexible use of airspace (FUA) concept to the advanced FUA (AFUA) is an institutionally challenging process that demonstrates just how far Europe has come in the last few years – States, European Union bodies, EUROCONTROL, air navigation service providers (ANSPs), civil and military aircraft operators – in accepting the need for further and deeper ATM integration. The process goes to the very heart of confronting issues of national sovereignty and acknowledges that without wider and deeper civil-military cooperation planned enhancements, such as developing free route procedures, will not produce the expected ATM network performance improvements inherent in the Single European Sky vision, including environmental performance.

This is a vital time for the process of moving towards AFUA. The FUA concept, developed by EUROCONTROL in 1990s, is based on a simple principle – airspace should no longer be designated as military or civil but should be considered as a single continuum and used flexibly on a day-to-day basis. This means sharing information on the status of military usage of the airspace at the long-term/strategic, near-term/pre-tactical and real-time tactical levels, so, for example, civil airspace users can have a clear view of when temporary military allocated airspace will most probably become available for civil use.

“For each step you had to comply with a number of criteria and this has been achieved; implementation by States was successfully organised,” says Patrick Delmouzé, Head of the Civil-Military ATM Coordination Unit at EUROCONTROL. “But we noticed that some States, understandably, gave a national twist to it, so while FUA was implemented nationally there were still differences between how States applied it.”

These differences in national approaches have meant military airspace planning information has not been uniformly shared throughout the continent. SESAR researchers have been identifying shortcomings in the FUA concept and where improvements can be made.

“The Performance Review Report has identified, for example, one third of States did not share the relevant information,” says Patrick Delmouzé. “One of the main issues has been the ▶



“The Performance Review Report has identified, for example, one third of States did not share the relevant information.”



Patrick Delmouzé, Head of the Civil-Military ATM Coordination Unit at EUROCONTROL

interrupted flow between the three levels of airspace management [strategic, pre-tactical, tactical] and the availability of the right information to the right people at the right time.”

So in the early years of the new century EUROCONTROL's civil-military experts came up with the AFUA concept, which takes civil-military airspace sharing to a new level, moving from coordination to active cooperation. It encourages area modularity in airspace design, so smaller airspace volumes can be activated and de-activated in a modular, systematic way. It also takes account of the need for direct routing and free route airspace operations, allows for enriched data sharing between civil and military and, as a result, deeper and wider cooperative decision-making involving all actors. For the first time, it intends to incorporate performance measurement of civil-military airspace management (See also: *The objectives and benefits of AFUA*).

Because of the sensitivities involved in coordinating national military airspace planning priorities within a pan-European ATM framework there has

The objectives and benefits of AFUA

- AFUA will create the conditions for optimising the use of available airspace both locally and at network level, across borders, delivering increased flight efficiency, resulting in more performing flights.
- Permanent updates of airspace data will be available to all players with a single source of reference (linked to CS4 AFUA services).
- AFUA will allow systematic application of cooperative mechanisms among all civil and military partners, at local, sub-regional and network level through interactive ASM/ATFCM/ATS management at all three levels to optimise airspace resources and demand, to enable better information-sharing and more efficient collaborative decision-making in case of cross-border and/or regional operations.
- AFUA will minimise adverse effects on network operations caused by national borders and/or sub-regional (FAB) interfaces, and by uncoordinated local decisions on airspace status, through the application of continuous impact assessment of airspace planning and status.
- AFUA will allow a seamless and synchronised transition from one operational environment to another. It will provide the conditions for enhancement of demand/capacity balancing through cooperative, continuous, seamless and reiterative airspace planning and operational deployment, including proactive management of all airspace structures, activation and shifting air traffic flows as appropriate.
- It will also contribute to the achievement of the performance targets in safety, capacity, environment and flight efficiency/ military mission effectiveness, set up at European, sub-regional or national levels.



taken an almost unprecedented degree of collaboration between all the different stakeholders, from States, the European Commission, the Deployment Manager, the Network Manager, SESAR, the European Defence Agency to agree a strategy for AFUA deployment. The task of introducing the core concept throughout the continent has been given to the Deployment Manager – but this is only one of several initiatives that are underway to tie national deployment activities into a single, pan-European civil-military airspace management resource, useable by all appropriate stakeholders.

One of the most difficult challenges currently is to coordinate all these activities.

“IT’S A PROCESS WHICH starts at a national level, with civil-military coordination,” says Patrick Delmouée. “But there needs to be a European view, too, and that means the Network Manager (NM) becomes involved in supporting planning and optimisation. But that won’t work if the local airspace management tools used by States can’t be coordinated with NM activities.”

EUROCONTROL’s role, according to Patrick Delmouée, is to help speed up the process of AFUA implementation. It offers free-of-charge (supported by the European Commission through the trans-European transport network [TEN-T]) to Member States its LARA (Local and sub-Regional Airspace Management Support System) tool for civil-military airspace management coordination, fully integrated within the NM airspace planning process; by 2018 up to 25 European States will have implemented LARA.

LARA is constantly evolving to take account of national requirements that then become available to all users and the latest interface requirements. It incorporates concept elements such as AFUA and free route airspace and in some instances on demand by the States the costs of implementing the free LARA software package – training, hardware, implementation – have also been met by EU bodies.

For States operating their own civil-military airspace management tools, EUROCONTROL offers advice and support in upgrading and connecting these systems to the pan-European airspace management network. “We are also looking beyond the Deployment Manager’s defined tasks, addressing, for example, the issue of new information flows by improving the Network Manager’s system and the processes and procedures used to disseminate data,” says Patrick Delmouée. “We have made available to airspace planners access to national updated airspace use plans (UUPs), first as a single view, then with updates and now we are moving towards visibility of a ‘rolling’ UUP. But we want to go further; by 2018 we could have a continuous information flow, a concept which is part of Centralised Service 4 (CS4) Advanced Flexible Use of Airspace Service.

CS4 is due to be operational in 2018 and will deliver the latest information on civil and military airspace planning by all connected States. Strategic, pre-tactical and tactical information will be accessible for all airspace managers at local, sub-regional (functional airspace block [FAB]) and Network Manager level according to their needs. It will allow for the automation and harmonisation of planning procedures, continuous common situational awareness, a cooperative decision-making capability, system support for planning of military cross-border airspace operations.

“We need to build confidence and transparency,” says Patrick Delmouée. “Both military and civil controllers and airspace managers need access to the same information so when they collaborate there’s no hidden advantage to one side or the other.”

The goal will be, at the end of the process, to move from an end-to-end national automated airspace management system to a multi-national system where accurate, timely information on the status of the airspace can be shared by all qualified users, so trajectories can be planned in a far more efficient way than currently, minimising fuel burn and delays. It is only when all participants can access the same data and make collaborative decisions that the real benefits – shorter routes for civil airspace users, for example – will be realised, says Patrick Delmouée. “You can try to calculate the benefits of each component and there will be some intermediate benefits but the biggest gain will be reached when everybody is working at the same level.”

THERE ARE STILL SOME technical issues that will need to be resolved, especially in terms of identifying the airspace status information interfaces between national, FAB and NM operations. The ideal, from EUROCONTROL’s perspective, would be to use the system wide information management (SWIM) with standardised business to business (B2B) services, which can be accessed by all the relevant stakeholders. The B2B services are already being used for civil-military coordination activities in some part of the continent; Estonia, Hungary and Switzerland are LARA users, using the NM B2B Airspace Availability Service to exchange pre-tactical airspace planning information with the NM.

States have understandably different arrangements and views on information sharing; some have built airspace planning tools which do not take account of connecting to the NM system or their neighbours’ planning tools because, for example, they do not have an agreement to fly military aircraft in each other’s airspace. Others have plans to integrate ASM tools; Belgium and the Netherlands have the technical possibility to link their national ASM system where the Belgian Defence could reserve airspace volumes in the Netherlands for military operations, and vice versa. FAB arrangements to share ASM information between its members are still under construction.

One of the biggest challenges has been to engage the enthusiastic support of the military in the AFUA programme. The benefits to civil airspace users heavily outweigh those of military operators. Military traffic which operates like airliners – such as transport aircraft – will benefit from shorter routes and there could be some future benefits to fast-jet pilots accessing cross-border military training areas. But, as Patrick Delmouée says, the world is changing and the option of doing nothing is no option at all.

“Both sides have to evolve and we now have the military fully engaged in the process; they know they have to optimise the system to work together with civilian counterparts to ensure they can manage operational traffic in this new environment.” ■



FEATURE

Helping to keep Baltic high seas operations safe

The Baltic has always been one of Europe's great thoroughfares, creating some unique challenges for the traders, travellers and military personnel who regularly use it.

EUROCONTROL and its partners are working to ensure that all airspace users (commercial aviation, general aviation, State aircraft and others) operate safely in the busy skies above the Baltic Sea. During late 2014 and early 2015 airline pilots from several States reported close encounters with Russian military aircraft in the area. In response, Frank Brenner, Director General of EUROCONTROL, saw an urgent need to organise a technical workshop with Member States attended by the US, the North Atlantic Treaty Organization (NATO) and Russian government representatives in March 2015. The International Civil Aviation Organization (ICAO) followed this up in April that year with the formation of a Baltic Sea Project Team (BSPT), set up to look at the issue in more detail.

The BSPT was a multi-national, multi-stakeholder forum that included concerned governments, the International Air Transport Association (IATA), NATO, the European Aviation Safety Agency (EASA), ICAO and EUROCONTROL. It analysed the situation from technical and operational perspectives and reached agreement on a number of issues.

"Russian military aircraft, like any other military aircraft flying over the Baltic Sea, in High Seas airspace, may operate under 'due regard' procedures, which means they will use their equipment – sometimes 'see and avoid' procedures – to ensure that their operations are not endangering the safe operations of other aircraft" says Andy Woollin, Flight Planning and B2B Web Services Domain Manager in the Agency's Network Management (NM) Directorate. "A military pilot

will see and detect an airliner, but under due regard procedures could fly much closer to the aircraft than the required minimum instrument flight rules (IFR) separation for civil aviation. The civil pilot might be unaware that a military aircraft is near and cannot see such military aircraft on its air traffic display – the cockpit display of traffic information and traffic collision avoidance system (CDTI/TCAS). So when the military aircraft comes unexpectedly into the view of the civil pilot, it might appear surprisingly close, even though the military aircraft is complying with requirements for due regard to the navigation of the civil aircraft.

A State aircraft operating over High Seas under due regard is not required to file a flight plan, establish radio communications or enable its identification through means of cooperative surveillance.

When performing specific training or exercise requirements, very often the transponders of the military aircraft are set to not reply to interrogations from cooperative surveillance systems – some military aircraft are not equipped with transponders compatible with the civil air traffic services (ATS) surveillance systems. These aircraft would not be visible to civil pilots or to the air navigation service provider (ANSP) providing information to civil pilots and would appear as a surprise to the civil pilot once they came into view, flying closer than would be normal in the usual civil air-traffic environment.

It is exactly this situation that triggered the intensive media coverage in 2014 and early 2015 when it was incorrectly assumed that some kind of military misconduct had taken place and pilots had

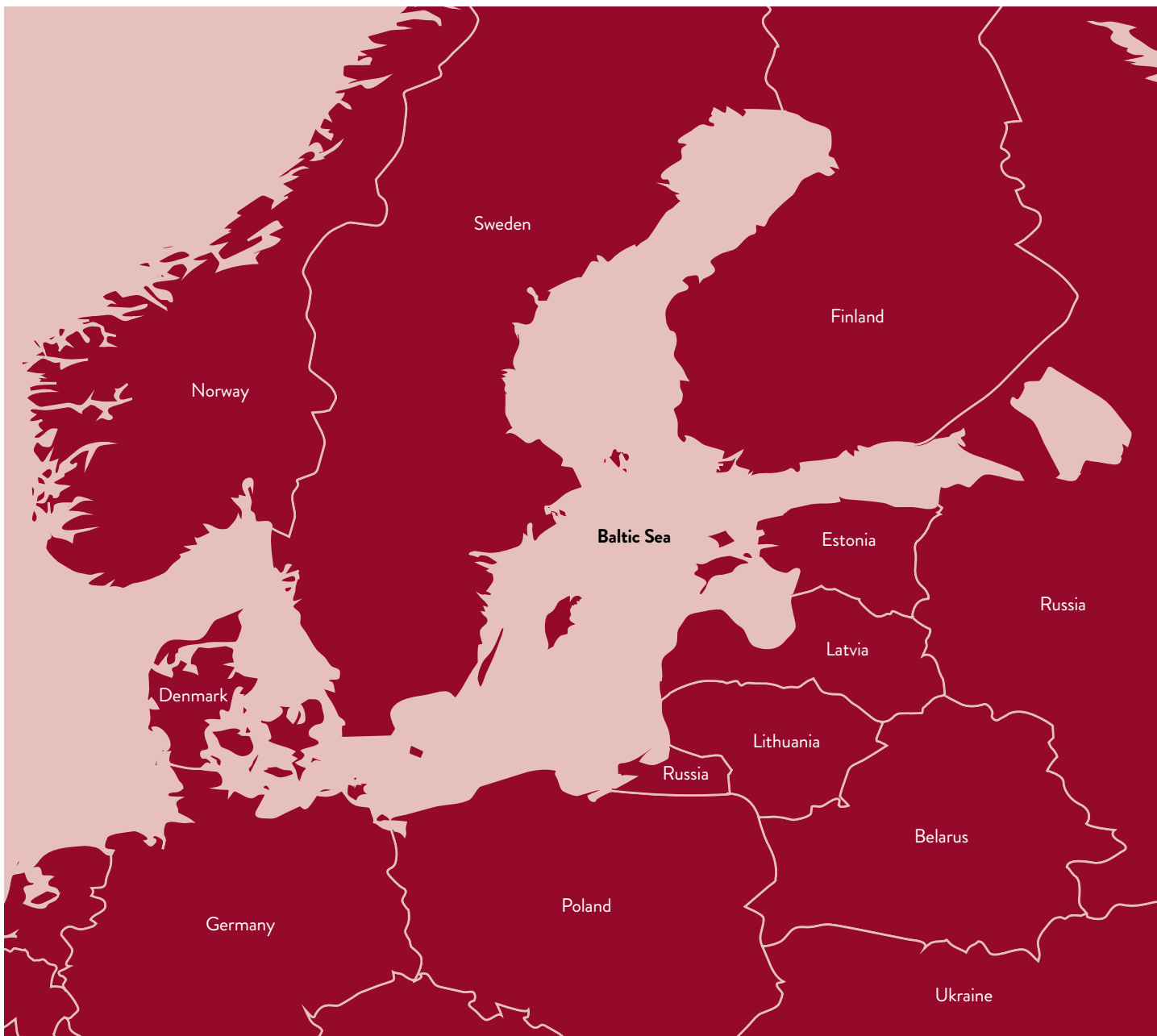
not followed the rules, say EUROCONTROL officials. Military aircraft operating under due regard are required to, and will, maintain safe distance from civil aircraft flying in their proximity, but this safe distance might be as close as 500 feet compared to an IFR minimum separation of five nautical miles horizontally and 1,000 feet vertically.

While no rule was violated by either airspace user or ANSP, safety concerns were raised because some military aircraft are not visible by modern means of cooperative surveillance and the intent of these aircraft remains unknown because there are no flight plans available. These concerns need to be addressed and mitigated without undue interference to the freedom of navigation over the high seas as agreed worldwide and detailed in the respective United Nations (UN) Convention.

THE BSPT CONCLUDED – confirming the findings of the March 2015 EUROCONTROL workshop – that there are three major ways to improve safety: the use of primary radar data by civil ANSPs; the provision of flight plans for military flights and the establishment of radio contact with civil ANSPs by military aircraft. One of EUROCONTROL's inputs into the BSPT was to seek how and whether military flight plans, including the ones from the Russian Federation, could be integrated into the Network Manager's (NM) planning and operation centres for further distribution to the relevant civil air traffic service units.

"We met with our Russian counterparts and agreed that flight plans for military cargo flights to and from St Petersburg would be made available to us," says Andy Woollin. "But for other operational air traffic (state aircraft), we would not be able to access flight plans."

Another EUROCONTROL proposal was to use the Civil-Military ATM Co-ordination Tool (CIMACT) to feed military primary radar data to civil ANSPs to enhance their situational awareness by displaying the "invisible" military traffic. But as rules and procedures differ greatly



between those for aircraft operations over the high seas and national territories the BSPT asked ICAO to publish an ops-bulletin reiterating the differences.

There were other practical outcomes of the BSPT work. Russia, Finland and Estonia agreed to define seven new waypoints for State and military aircraft operations over the high seas that could be used for all flight plans between St Petersburg flight information region (FIR) and Kaliningrad FIR, instead of the current string of latitude and longitude coordinates. The BSPT concluded that the use of direct routings between these waypoints would considerably help to facilitate the flight planning and aircraft operations over the high seas for these flight profiles.

And NM's Flight Planning System (IFPS) was also adjusted to ensure that it

would not reject Russian military flight plans even if they contained format errors; since the start of summer 2015 there have been no records of flight plans for State aircraft operated in Baltic Sea being rejected by the IFPS.

"One of the actions of the last BSPT meeting was for ANSPs to report when they knew an aircraft was there but they hadn't received flight plans," says Andy Woollin. "EUROCONTROL took on the role to gather these reports and discuss them with Russian colleagues. I would expect that due to the heightened awareness, we're not getting the number of air-miss reports as we had before because crews now realise those aircraft are allowed to operate close to civil aircraft. I've not heard of any pilot reports since the awareness campaign began." ■

Figure one: The Baltic Sea and its surrounding countries



Andy Woollin is Flight Planning and B2B Web Services Domain Manager in EUROCONTROL's Network Manager Directorate



INSIGHT

Action and partnership on aviation emissions

Dr Fang Liu is the Secretary General of the International Civil Aviation Organization (ICAO).



Air transport operators have been intensely and successfully working to reduce civil aviation carbon emissions since aircraft first took flight, with fuel cost imperatives being the largest driver of many efficiency performance improvements.

Today, greater awareness of the need for urgent climate action and increasing recognition of the critical role which aviation connectivity plays in sustainable socio-economic development have provided the global air transport community with further motivation to adopt forward-looking emissions reduction targets, consistent with the needs of both environmentally responsible and sustainable air transport and the near- and long-term needs of society.

These considerations have been especially front of mind post-2015, when the adoption of the Agenda 2030 Sustainable Development Goals (SDGs) and the Paris Agreement made at COP/21, the Paris Climate Conference, set the focus of aviation's next important climate change challenge, a global-market based Measure (MBM) for international flight emissions, squarely on the International Civil Aviation Organization (ICAO) and its Member States.

But what these dual achievements through the United Nations also served to stress was that truly sustainable development is dependent on three pillars, all balanced: economic development, social development and environment protection. Given aviation's fundamental role in fostering global peace and prosperity, our sector must therefore pursue balanced strategies supporting today's much-needed social, economic and environmental outcomes.

It was my honour to highlight this important role of international civil aviation at the UN Sustainable Development Summit last September, where Agenda 2030 was adopted. Of its 17 Sustainable Development Goals (SDGs), ICAO's Strategic Objectives contributes to 13, and our environmental protection work supports 10. This includes SDG 7, Access to renewable energy and SDG 13, Take urgent action to combat climate change and its impacts.

What that experience helped to consolidate for me was that aviation's role in addressing the world's challenges has never been more important, and that our global community

must work more closely together than ever before to ensure that reliable access to safe, secure and environmentally-responsible air transport is made as universally accessible as possible in the years ahead.

Skyway's readers already familiar with ICAO's ongoing No Country Left Behind initiative will be fully aware that ICAO views the effective implementation of our global standards and policies as instrumental to this process and its objectives.

Access to safe and secure air transport is not a privilege but a responsibility, and one which States must earn by organising and resourcing effective civil aviation oversight. But many States do not have those resources and capabilities readily available, and under No Country Left Behind, ICAO seeks to foster partnership and investment to address these needs for assistance and capacity-building.

We are seeing great interest and support for our aviation development activities from our Member States, both in terms of voluntary contributions and requests for assistance, and notably the level of enthusiasm and participation demonstrated at our first ever ICAO World Aviation Forum (IWAF) last year. The second IWAF will take place this year on 26 September, the day before the ICAO Assembly, and we expect that this momentum towards more intensive partnerships for sustainable aviation development will continue to build, well into the future.

All of these activities have been given greater impetus in light of the growth which our sector is now undergoing, with flight and passenger volumes projected to double by 2030. Aviation's current global economic impact (direct and indirect) is estimated at \$ 2.7 trillion or roughly 3.5% of world GDP, and this too will grow as aviation grows, as will the current 62 million jobs it sustains globally.

The economic factors are critical to ICAO's planning, but once again they must be balanced with strong social commitments and concrete environmental action to support balanced and truly sustainable growth and development.

A comprehensive approach to aviation and the environment

ACCORDING TO THE INTERGOVERNMENTAL Panel on Climate Change (IPCC), aviation accounts for approximately 2% of global anthropogenic (human-made) CO₂ emissions and international aviation is responsible for approximately 1.3%. The most recent estimates by ICAO anticipate aviation fuel consumption growing 2.8 to 3.9 times by 2040, compared to 2010 levels.

ICAO and its States have been pursuing a basket of measures to address aviation's noise and fuel emissions, including technological innovation, more efficient operational procedures, sustainable alternative fuels and market-based measures. These actions support the aspirational targets agreed by ICAO's Member States at our 38th Assembly in 2013, which identified fuel efficiency improvements at a rate of 2% per year for international aviation through 2050, as well as the goal of carbon neutral growth for global air transport from 2020.

Once again, cooperation, partnerships and innovation are key to aviation's success in limiting its environmental impacts, and to how our sector can multiply its actions on emissions reductions.

It is important to recognise that these goals and objectives are technically feasible. Fuel efficiency for aviation continues to improve and today's commercial aircraft are 80% less polluting

The economic factors are critical to ICAO's planning, but once again they must be balanced with strong social commitments and concrete environmental action to support balanced and truly sustainable growth and development.

and 75% quieter than the first passenger jets. This is largely the result of technological innovations, but also the more efficient air navigation management and refined operational procedures which EUROCONTROL is helping to deliver, the increasing deployment of sustainable alternative fuels, and ICAO's work supporting improved global awareness and capacity-building for aviation emissions reduction, notably through the Action Plans we have assisted our Member States in developing.

The recommendation of the first Global CO₂ Certification Standard for aircraft by ICAO's Committee on Aviation Environmental Protection also represents some new and significant progress. And the continued implementation of our Global Air Navigation Plan over the next decade will further enhance the efficiency of air traffic management systems and reduce emissions.

Expectations for the global aviation MBM at ICAO's 39th Assembly

TAKEN TOGETHER, THIS PROGRESS is already helping international aviation to exceed the 2% per year efficiency improvement goal which has been established. Projections still point to a gap in our overall carbon-neutral growth target, however, and to address that ICAO has been working hard to achieve consensus on a global-market based measure, or global MBM, for international flight emissions.

ICAO's 36-State Governing Council established a dedicated Environment Advisory Group (EAG) in 2014 to begin ironing out the basic MBM design framework, and we have consulted widely with our 191 Member States, industry groups and civil society in the intervening months.

Most recently we held a high-level meeting on the subject at our Montréal Headquarters where all 191 ICAO Member States were invited to attend. And thanks to the series of global outreach events we organised under the Global Aviation Dialogues (GLADs) banner, these participants arrived very well-informed.

Several main areas of agreement were achieved.

In the first place States have recognised the need for the scheme to take into account each participant's ►

special circumstances and respective capabilities while minimising possible distortions to the market, and they intend for it to be administratively simple and cost effective, route-based (to ensure a level playing field) and informed by transparent and objective aviation metrics.

States have also highlighted the need to ensure the quality and effectiveness of the system, and ICAO is developing robust monitoring, reporting and verification (MRV) procedures and criteria for the definition of emissions units.

It was also agreed that every State should have an opportunity to voluntarily participate in the scheme and we called for the provision of assistance and capacity building, especially in developing States, to better ensure that No Country is Left Behind.

Partnerships key to environmental success

ICAO HAS ALREADY GAINED significant experience in establishing partnerships to strengthen the national capabilities of our Member States. We are currently involved in a capacity-building project financed by the European Union and are collaborating with the United Nations Development Programme (UNDP) on a targeted CO₂ mitigation project financed by the Global Environment Facility (GEF).

The ICAO-European Union joint assistance project, Capacity Building for CO₂ Mitigation from International Aviation, is a €6.5-million initiative to assist 14 States from Africa and the Caribbean in the development of their action plans on international aviation CO₂ emissions reduction activities. It also aids them in setting-up MRV systems for the establishment of CO₂ emissions inventories from international aviation. The project is moving towards the implementation of mitigation measures in pilot States, such as the installation of solar systems in airports, improvements to air traffic management (ATM) systems and procedures and feasibility studies on alternative fuels for aviation.

ICAO's partnership project with the United Nations Development Programme (UNDP) and the Global Environment Fund (GEF), Transforming the global aviation sector: Emission reduction from international aviation, is a \$1.9-million joint assistance project which includes the implementation of pilot renewable energy projects Jamaica.

Both of these projects will be helpful toward the development of further pilot projects and support materials for other States, thus multiplying the associated environmental benefits.

A strong environmental record and a sustainable future ahead

ICAO AND THE GLOBAL aviation community have a proven track record of overcoming significant political and technical challenges in order to secure the common good of the peoples we serve. We have consistently drawn on our strengths, cooperation and consensus, for over 70 years, to create a safe and efficient network that connects every country on earth, and we have done so on the basis of an exemplary environmental track record when compared to other major industrial sectors.

International aviation emissions are not included in the Paris Agreement agreed at the COP/21 meeting last December, so the peoples of the world are expecting ICAO to deliver environmental action. These expectations are driven by passionate hopes and firm expectations, and we must work together to ensure our shared success and common future. ■



Prior to her appointment as Secretary General, *Dr Liu* served for eight years as the Director of ICAO's Bureau of Administration and Services (ADB).

During her tenure, she contributed extensively to ICAO's Senior Management Group and also participated in the High-Level Committee on Management within the United Nations common system. Prior

to joining ICAO, Dr Liu served at the General Administration of Civil Aviation of China (CAAC), where over the course of twenty years she successively held the posts of Legal Counsel, Deputy Director, Director and Deputy Director General, Department of International Affairs and Cooperation. Dr Liu earned a PhD in international law at Wuhan University, China, and a Master's degree in air and space law at Leiden University, the Netherlands

“Reducing emissions, building resilience”

Jos Delbeke is Director General of the European Commission's Directorate-General for Climate Action (DG CLIMA).



Has the aviation element of the European Union Emissions Trading System (EU ETS) been a success and what will happen if the global-market based measure is approved by the International Civil Aviation Organization (ICAO) at the 2016 Assembly?

The European Union has been successfully tackling aviation emissions through the EU ETS as part of its broader climate policy and objectives since 2012. Through its work with EU ETS, the European Union has taken the lead in acting on this fast-growing source of emissions and has shown how market-based mechanisms can be used to address the significant climate impacts of aviation.

But aviation emissions are not confined to EU: global emissions from international aviation should also be tackled. They have doubled since 1990, and are predicted to be seven times higher than the current level by 2050.

The good news is that this trajectory is not inevitable, but we need to go beyond business as usual and I am convinced that there is momentum to make this happen. The EU has been actively engaged in negotiations under ICAO that should result in a global market-based

measure. We are committed to reaching a global agreement later this year with a view to stabilising international aviation emissions from 2020. The momentum is there, and this is a credibility test for ICAO after the Paris Agreement where world leaders agreed to limit global warming to well below 2°C and pursue efforts to limit the increase to 1.5°C. This can only be achieved through action by all, but also by all sectors, including international aviation.

One thing is clear: the adoption of the Paris Agreement last December makes it more important and more urgent than ever that international aviation contributes its fair share to achieving global targets. The priority for now is for ICAO to secure a good and credible outcome for international aviation this autumn. We will then have to report back on the outcome to the European Parliament and Council, which should feed in preparations for a possible review of the EU ETS for aviation. ►

“One thing is clear: the adoption of the Paris Agreement last December makes it more important and more urgent than ever that international aviation contributes its fair share to achieving global targets.”

What are the prospects for sustainable alternative biofuels, both in general and for aviation?

EU COUNTRIES HAVE SET a target to derive at least 10% of their transport fuel from renewable sources by 2020; biofuels and bio liquids will be instrumental in helping to meet this. Amendments to the Indirect Land-use Change (ILUC) directive of 2015 demonstrate that the EU wants to transition from biofuels made from food crops to advanced biofuels.

While the uptake of sustainable, alternative fuels in aviation is still in its infancy, they have considerable potential for reducing greenhouse gas emissions in the coming decades. But we must do it right. The contribution that alternative fuels make to emission reductions will depend on their carbon footprint.

To help spur the commercial development of biofuels for aviation, the European Commission and its partners have launched the European Advanced Biofuels Flightpath initiative. This aims to get sustainably produced biofuels to the market more quickly, through the construction of advanced biofuel plants, and to get the aviation industry to use two

million tonnes of biofuel by 2020. Support includes facilitating the signing of purchase agreements between the aviation sector and biofuel producers.

Aircraft operators also have an incentive to use biofuels under the EU Emissions Trading System as sustainable biofuels used in flights covered by the EU ETS are rated as zero emissions. This applies to biofuels meeting sustainability requirements under our renewable energy legislation.

As part of our work on the EU Energy Union and policies to deliver targets of the 2030 climate and energy framework, the Commission is developing a Communication on Decarbonising the Transport Sector which will consider the role of low-emission alternative fuels, including advanced biofuels, to help meet EU climate and energy targets.

The EU also supports the work undertaken by relevant expert groups at ICAO and encourages countries to develop incentive mechanisms to increase the availability of sustainable fuels to ensure sufficient volumes are available in the medium to longer term.

The European Commission and EUROCONTROL have been working together on the aviation element of the EU ETS for more than 10 years. What are the benefits of this cooperation and how would you like to see this collaboration develop?

THE COLLABORATION BETWEEN EUROCONTROL and the European Commission has developed into an excellent partnership that has led to the successful inclusion and smooth running of the aviation element of the EU ETS.

EUROCONTROL's expertise complements and supports our work to meet our climate objective. It plays an important role in helping us check compliance of aircraft operators with ETS obligations, and

also helps reduce administrative burdens for small operators.

EUROCONTROL's crucial technical work on the global-market based measure is also extremely valuable as it helps analyse the impacts of various design options. EUROCONTROL's work is important and highly appreciated, and we look forward to our successful collaboration continuing and growing even stronger in the years ahead.

Although climate change is seen as one of mankind's greatest challenges, on a day-to-day basis, noise has a bigger impact on airport infrastructure development. Do you see climate change supplanting noise as our industry's biggest environmental risk?

IN THE EUROPEAN UNION we take a comprehensive approach to effectively address the various environmental and climate challenges that come with aviation activity. This includes the impact of aviation on climate, noise and local air quality. Regarding noise and local air quality, we have standards that must be met. This includes an EU regulation that embodies ICAO's "balanced approach", comprising aeroplane noise standards, the management of land around airports, operational procedures to reduce noise impacts and operating restrictions. The latter are a particularly delicate matter, which is why EU rules establish

a clear and transparent procedure to introduce them in an evidence-based fashion.

At the same time we also know that climate change is one of the biggest threats facing our planet today and driving down emissions is crucial. It is clear that aviation must contribute its fair share to reaching our long-term objectives under the Paris Agreement if we are to avoid dangerous climate change. Effective risk management by industry must take into account this multi-dimensional regulatory framework and help encourage and support innovation that reduces the negative impacts of aviation.

What is DG CLIMA doing to prepare the EU and its citizens to adapt to a changing climate?

THE IMPACT OF CLIMATE change is already being recognised by industry as an operational and financial risk, including in the aviation sector. Action to adapt to this impact has already been initiated in Europe, and the Commission supports the work of ICAO's Committee on Aviation Environmental Protection to better understand the risks, how they can be addressed and share information accordingly.

Clearly, the best way to minimise the impact of climate change is to reduce emissions in the first place. Nevertheless, even if the world succeeds in limiting and then reducing emissions, our planet will need time to recover from the greenhouse gases already in the atmosphere. The effects will last for many decades.

Recognising the need to prepare for and adapt to climate change, the EU launched a Europe-wide adaptation strategy in 2013. This aims to make Europe more climate-resilient by providing improved coordination and enhancing the preparedness and capacity of all levels of government to respond to the impact of a changing climate. The European Climate Adaptation Platform provides access to information on expected changes to the climate in Europe. EUROCONTROL supports our work by making resources on climate resilience available to the aviation industry. At the European Commission we also provide useful tips and suggestions on climate action that can be taken in all areas of citizens' lives, which will not only help reduce emissions but also build our resilience. ■

http://ec.europa.eu/clima/citizens/tips/index_en.htm



Mr Jos Delbeke (1954, Belgium) has been the Director General of the European Commission's Directorate-General for Climate Action since its creation in 2010. He joined the European Commission in 1986. Mr Delbeke was very involved in the negotiations on the European Union's 2009 policy package on climate change and energy in the European Council and Parliament. He has been a key player in developing EU legislation on cars and fuels, the Emissions Trading System (ETS), air quality, emissions from big industrial installations and chemicals (REACH).

Mr Delbeke has been responsible for developing the EU's international climate change strategy and was for many years the European Commission's chief negotiator at the United Nations climate conferences.

Mr Delbeke holds a PhD in economics (1986, Louvain, Belgium) and worked in 1985 at the International Monetary Fund (Washington DC, USA). He has been a lecturer at the University of Louvain on European and international environmental policy since 2013. As an economist, he has always underlined the role of market-based instruments and cost-benefit analysis in the field of the environment. In 2015, Mr Delbeke co-authored a book entitled "EU Climate Policy Explained", which aims to explain the EU's climate policies in an accessible way.



Greening aviation

Frank Brenner, Director General of EUROCONTROL.





Air traffic management (ATM) has an important role to play in greening aviation. When compared to aircraft and engine design, it is not the most significant role – after all, in Europe aircraft already fly routes only 3% longer than the optimum – but all of us in ATM still have a responsibility to do all we can.

One area is to reduce even further those route extensions. For example, the introduction of Free Route Airspace across Europe means that the pilot is not forced onto predefined routes but can instead select the best and hopefully more direct route. Free Route Airspace is not the simplest approach for controllers, but it is more efficient for the aircraft.

ATM also works closely with our military colleagues on minimising the effect of military exercises. It is important for us to enable the military to fulfil its mission by making available the needed airspace. However, once the exercise is over, then the airspace should be made available for civilian flights as soon as possible. Moreover, flight planners and pilots should be told about this change in availability in time for them to be able to make use of the airspace. That is one of the objectives of the new Advanced Flexible Use of Airspace (AFUA) service currently being developed.

Sometimes airlines choose to fly longer routes for other reasons, for example to avoid bad weather or congestion. However, it may also be because it costs a lot more to fly over some countries than others – even neighbours. It costs the airspace users between 22% more and 117% more to fly over Italy than over its Balkan neighbours. The cost to be paid by the airspace users for the air traffic services overflying Germany is more than twice as high as the unit rate for neighbouring Poland.

So if we are truly to be innovative in greening aviation then why don't we go away from the very different national unit rates in Europe and eliminate the perverse incentive for airlines to fly longer and burn more fuel than necessary in order to avoid high priced airspace? Of course flying longer means more fuel burn, but financially in many cases it still pays out for the airspace users. There are several options to overcome these concerns combined with real political challenges to achieving such an objective. We need to find ways of overcoming these difficulties and making sure that we can reduce the negative environmental impact the current situation creates.

Just as important is the need to address the environmental effects of aviation near airports. In fact, this is vital and not just because it is the right thing to do from a social and ethical perspective. Airports are set to be the bottlenecks that will restrain growth in European aviation in the next 20 years. It is already incredibly difficult if not impossible to build new runways in Europe and even

“Airports are set to be the bottlenecks that will restrain growth in European aviation in the next 20 years. It is already incredibly difficult if not impossible to build new runways in Europe.”

existing airports are constantly being challenged on, for example, their operating hours.

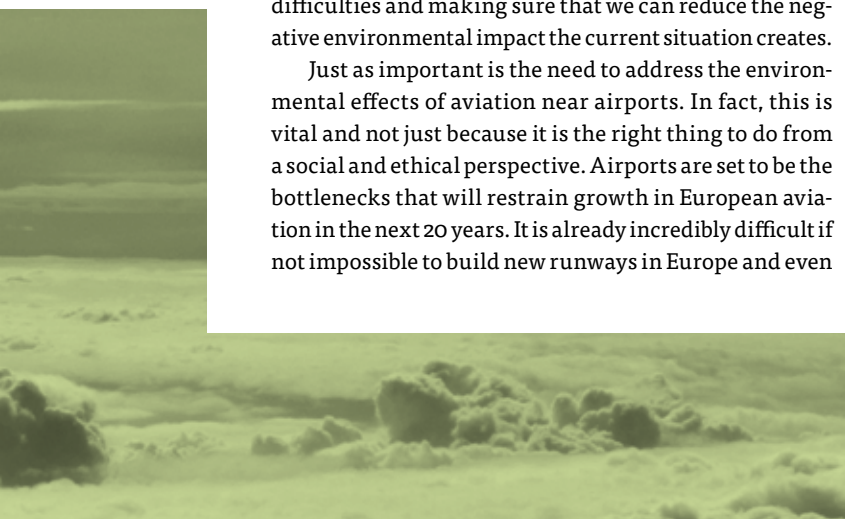
The EUROCONTROL Challenges of Growth reports forecast that by 2035 there will be 20 European airports operating at 80% or more of capacity for six consecutive hours; that figure allows for the fact that 1.9 million flights might not happen, simply because we do not expect to have the capacity on the ground to accommodate anticipated demand.

It is clear that addressing environmental issues at airports is crucial for the aviation business. Airports, airlines and air navigation service providers (ANSPs) need to work with local communities to understand and address their concerns. For any introduction of new technology or new procedures we need to consider the environmental impact – particularly noise – and to perform detailed modelling of the impact.

Modelling is one area where EUROCONTROL has particular expertise, both in terms of traffic forecasting and environmental impact. In fact, we have recently agreed to assist the International Transport Forum's work on modelling the decarbonisation of transport. This builds on the work we have done with colleagues in the European Commission (EC), the European Aviation Safety Agency (EASA) and the European Environment Agency (EEA) to produce the first European Aviation Environmental Report. The forecasts in that report have already been expanded to cover not just European Union (EU) States but the whole of Europe.

We like to think that we work towards reducing the environmental impact of aviation for ethical reasons – it is the right thing to do. However, it is becoming increasingly clear that there are real financial incentives involved. That might be through saving fuel or overcoming local concerns about airport operations. Of course, we also see the impact of governmental measures such as regulation or environmental taxes. This is a topic that will be explicitly addressed later this year by the International Civil Aviation Organization (ICAO).

Whatever the motive, we need to change our way of thinking to make sure that we consider the environmental impact of what we do in the same way as we think about the safety impact – particularly in times of change. There is still a great deal to do, particularly in improving the vertical element of the aircraft trajectory, in order to minimise the impact of both emissions and noise. ■





VIEWPOINT

How airports are dealing with climate change

Inês Rebelo is Communications Coordinator at ACI EUROPE and is a regular contributor to Airport Business magazine.

Climate change is back in the spotlight having been overshadowed by the recent global economic and financial crisis. In the political sphere a major event was the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) (COP21/CMP11), held at Paris-Le Bourget Airport during November and December 2015. It was a historic international climate conference because, for the first time, 195 nations adopted a universal climate agreement that limits temperature increase to below 2°C. In addition, global environmental discussions have been dominated by the International Civil Aviation Organization's (ICAO) goal to forge a deal on capping net airline emissions. ICAO is due to take a decision on a global-market based measure to curb net airline CO₂ emissions from international flights above 2020 levels in autumn through an offsetting mechanism.

Decision-makers and companies worldwide are implementing actions to build a more sustainable future for people and businesses. The airport industry is no exception. With so much vital infrastructure on the ground, airports have earnestly invested in sustainability over the past years, be it in energy consumption or eco-friendly mobility. The industry has pursued a two-pronged approach, reinforcing its resilience to the impact of climate change on airport infrastructure and operations and working to reduce its impact on the environment by lowering carbon emissions.



From left to right: Angela Gittens, Director General ACI WORLD, Daniele Violetti, Chief of Staff UNFCCC secretariat & Olivier Jankovec, Director General ACI EUROPE announcing the ACI and UNFCCC partnership at COP21 in Paris.

Managing environmental risks

THE AIR TRANSPORT INDUSTRY regularly faces disruptive weather and this is likely to become more frequent and extreme as a result of the growing impact of climate change. Airports are attempting to mitigate risks by assessing their level of vulnerability to the potential effects of climate change. They were particularly motivated to do so following the publication of EUROCONTROL's *Challenges of Growth: Climate Change Risk & Resilience* in 2013 – a report detailing the potential impacts of a changing climate on the European aviation sector. ACI EUROPE cooperated with EUROCONTROL, Aena, AVI-NOR, the Directorate General of Civil Aviation's technical support service DGAC/

STAC, Heathrow Airport, NATS, Manchester Metropolitan University and IATA to produce a collaborative factsheet *Adapting Aviation to a Changing Climate* in November 2014. This factsheet explains some of the climate change risks for aviation and their potential impact on the provision of aviation services for aircraft operations, airport operators, air navigation service providers (ANSPs), passengers and staff. It also provides a checklist of questions and case studies to help organisations initiate their climate risk assessments.

In parallel, ACI EUROPE and EUROCONTROL also launched the Collaborative Environmental Management (CEM) specification in November

2014, following EUROCONTROL's CEM specification publication in September 2014. ACI EUROPE endorsed it as one of its recommended practices for the management of noise, local air quality and greenhouse gas emissions, making it an industry standard. In October 2015, a peer workshop on CEM was held in Vienna, jointly organised by ACI EUROPE and EUROCONTROL, to exchange best practices on CEM between the airports that have already implemented CEM, and potential new partners.

Addressing carbon emissions

THE OTHER PART OF this two-pronged approach is about airports reducing the CO₂ emissions under their direct control



From left to right: Olivier Jankovec, Director General ACI EUROPE, and Frank Brenner, Director General, EUROCONTROL, signing a mutual recognition of ACI EUROPE and EUROCONTROL's commitment to aviation's sustainable development.

and engaging others on the airport site to do so. The independent programme *Airport Carbon Accreditation* is helping airports to achieve better carbon management.

It was launched by ACI EUROPE in 2009 and endorsed by EUROCONTROL from the outset. *Airport Carbon Accreditation* is empowering airports to reduce their CO₂ emissions by independently assessing and recognising their endeavours to manage and address their carbon emissions through four levels of certification, covering all stages of carbon management: Mapping, Reduction, Optimisation and Neutrality. The programme is independently administered by WSP Parsons Brinckerhoff, an international environmental consultancy appointed by ACI EUROPE to enforce the accreditation criteria for airports on an annual basis. Airports applying for accreditation must have their carbon footprints independently verified in accordance with ISO14064 (Greenhouse Gas Accounting). Evidence of this must be provided to the programme administrator, with all claims regarding carbon management processes which must also be independently verified.

One pertinent example of effective carbon reduction is another joint

initiative between ACI EUROPE and EUROCONTROL: *Airport Collaborative Decision Making (A-CDM)*. In 2008, the two organisations launched a joint A-CDM action plan, agreeing to roll out A-CDM at European airports as part of a wider co-operation partnership, and 20 airports in Europe have already fully implemented A-CDM. These airports are sharing real-time information with airlines, ground handlers and ANSPs and are following a set of operational procedures that allow them to improve their performance and reduce their environmental impact. The reductions achieved through A-CDM can then be counted under the Optimisation Level (Level 3) and the Neutrality level of the *Airport Carbon Accreditation* programme.

Origins of Airport Carbon Accreditation: from regional to global

THE AIRPORT CARBON ACCREDITATION programme started in 2007, at the ACI World Annual Congress, where the global airport industry committed to reducing its carbon emissions. Eight months later, at the ACI EUROPE Annual Assembly, Congress and Exhibition, the European

airport industry also committed to reducing its carbon emissions, with the ultimate goal of becoming carbon neutral. ACI EUROPE promised to build a carbon management tool that would allow airports to measure their progress in delivering on their commitment.

In June 2009, after an intensive development phase, ACI EUROPE launched *Airport Carbon Accreditation*. Within two years, the programme certified 25 airports and there was demand for it in Asia-Pacific. In September 2009, Frankfurt Airport became the first accredited airport achieving Level 2 Reduction, and in November 2009 Stockholm-Arlanda Airport became the first airport to achieve the highest level of accreditation, Level 3+ Neutrality.

In November 2011, accreditation was given to Abu Dhabi International Airport, the first airport to become certified in Asia-Pacific. This year, the programme is celebrating its fifth anniversary since its extension to Asia-Pacific, with 29 accredited Asia-Pacific airports, which account for more than 24% of air passenger traffic in the region. Patti Chau, regional director of ACI Asia-Pacific, remains ambitious about the potential for the programme to spread to more airports: "I encourage more members to join the 156 airports worldwide to become Airport Carbon Accredited and demonstrate our airports' dedication to sustainable growth," she says.

Another important chapter in the story of airport sustainability was the extension of *Airport Carbon Accreditation* to Africa in June 2013. Enfidha-Hammamet International Airport in Tunisia became the first certified African airport. Today, another two African airports are addressing their carbon footprints: Félix Houphouët-Boigny Abidjan International Airport and Libreville Leon Mba International Airport.

And in September 2014 another milestone in the programme was reached in North America with the accreditation of Seattle-Tacoma International Airport at Level 2 Reduction. Since then, in less than two years, 13 airports in North America have been certified. The programme has become the global carbon management standard for airports.



In pursuit of carbon neutrality...with the UNFCCC

TO DATE 156 AIRPORTS have been certified at one of the four available levels: 107 airports are accredited in Europe; 29 in Asia-Pacific; 13 in North America; four in Latin America and three in Africa. Twenty-two airports in Europe are carbon neutral and the goal is to increase the number of carbon neutral airports in Europe to 50 by 2030, as announced by ACI EUROPE at COP21 in December 2015. Furthermore, the United Nations Framework Convention on Climate Change, ACI EUROPE and ACI World signed a Memorandum of Understanding (MoU) to jointly cooperate in

promoting *Airport Carbon Accreditation* as well as associated climate actions by airports and the UNFCCC "Climate Neutral Now" campaign. The agreement aims to increase the number of airports progressing to Level 3 (Optimisation) and Level 3+ (Neutrality) of the programme.

When the MoU was signed, John Kilani, Director, Sustainable Development Mechanisms programme at the UNFCCC Secretariat commented: "It is immensely encouraging to see an industry as visible and strategically relevant as the airport industry being so proactive on climate action. What ACI has achieved through *Airport Carbon Accreditation* over the past six years is inspiring – to mobilise [the then] 137 airports in the journey towards carbon neutrality is an example that many other industries could learn from."

The environmental efforts of the airport industry are being translated into tangible results. In the past year, the 156 accredited airports have reduced CO₂ emissions under their direct control by 197,070 tonnes. These efforts have been praised by European Union Transport Commissioner,

Airports certified by Airport Carbon Accreditation across the world.

Violeta Bulc, who says: "With substantial CO₂ reductions achieved already, *Airport Carbon Accreditation* is a fine example of industry-led action that is helping move aviation onto a more sustainable footing."

"Partnering with the UNFCCC is really a big moment for *Airport Carbon Accreditation* – it demonstrates the value of the programme to airports but more importantly, it showcases the airport industry as a proactive pioneer when it comes to carbon management," says Marina Bylinsky, Manager for Environmental Strategy and Intermodality at ACI EUROPE. ■

Latest information: <http://airportCO2.org> and @AirportCO2 on Twitter

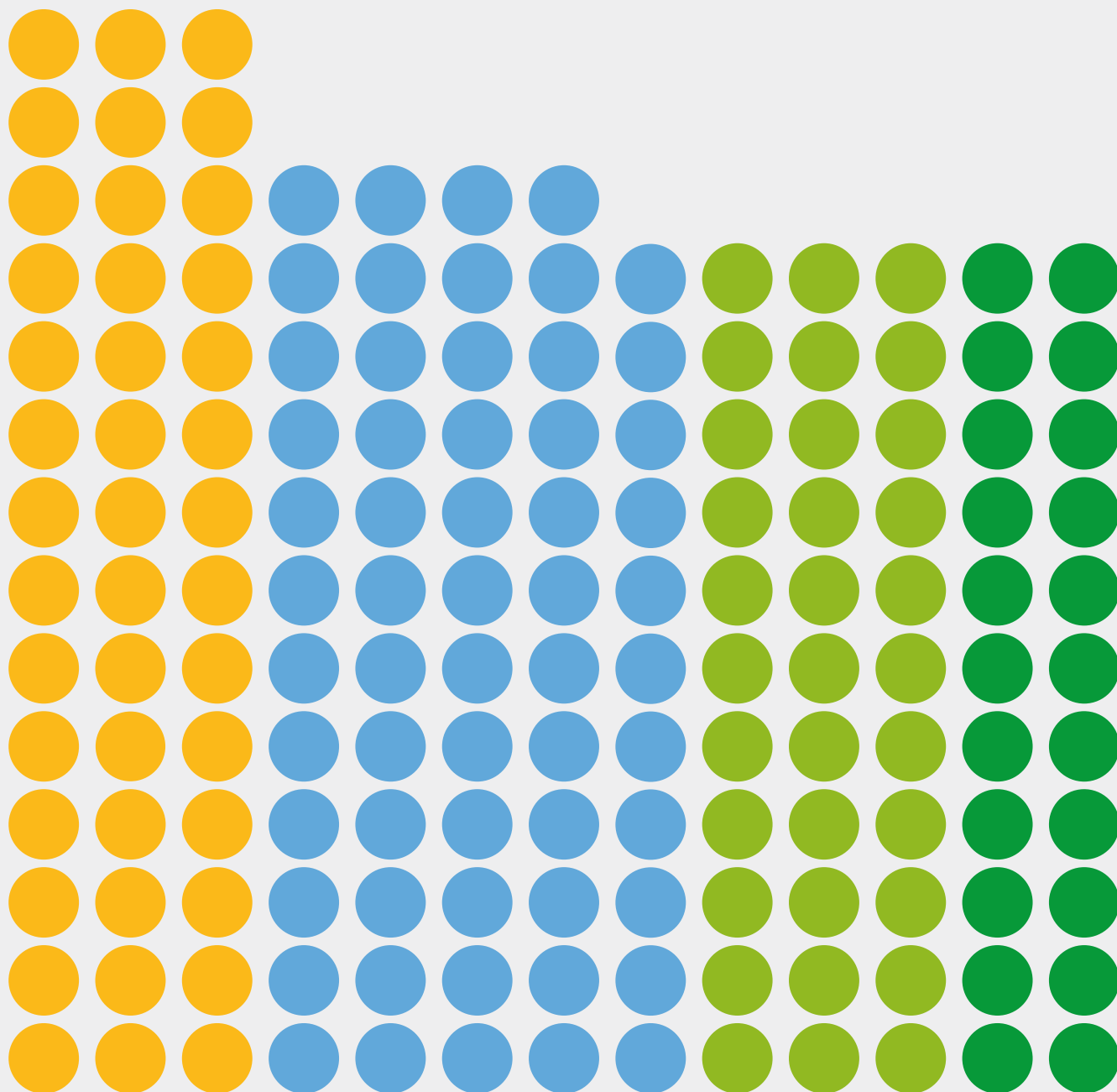
"Partnering with the UNFCCC demonstrates the value of the programme to airports but more importantly, it showcases the airport industry as a proactive pioneer when it comes to carbon management."

Marina Bylinsky, Manager for Environmental Strategy and Intermodality at ACI EUROPE



Inês Rebelo is Communications Coordinator at ACI EUROPE and is a regular contributor to *Airport Business* magazine

4 levels of certification. 1 global programme.
156 accredited airports and counting.



Lower charges or environment improvements – are the two compatible?

Many airlines prefer to pay lower air navigation charges than fly shorter, environmentally sensitive routes. A way must be found to balance environmental issues with cost performance concerns, says *Ralph Riedle*, Chairman of EUROCONTROL's Performance Review Commission

In the key performance targets for European air traffic management (ATM), a focus on meeting one target, such as cost efficiency, can mean compromising progress on another, such as reducing the environmental footprint of aviation. How can an optimum balance be achieved?

The point is not a new one, this is a discussion that has been going on for years. The European Commission (EC) has put forward a flight-efficiency target to ATM, but airlines will always look to fly the most cost-optimised route. This presents a conflict in itself. For many years now airlines have not taken the shortest available route offered to them because their flight-planning tools have told them there is a more cost-efficient route available.

Are they under any regulatory pressure to fly shorter, rather than cheaper, routes?

FIRST OF ALL, AIRLINES are not part of the performance scheme. The environmental target is a key performance indicator set for the Network Manager (NM) by the Commission. But is it there just to fulfil a requirement that doesn't make any sense? If that were the case, it would be understandable if everybody tried to cheat it. And if it does make sense, if it is there to achieve something that is favourable to the environment through the reduction of carbon dioxide and nitrous oxide emissions, then cheating is not acceptable, although it can be explained.

The reason why airlines want to fly a longer route is the relative cost of flying through different national airspace areas. Airline flight-planning tools give carriers an accurate figure for the lowest cost to reach their destination, something which the Network Manager and previously the Central Flow Management Unit have been aware of for years.

We have to understand the point of view of airlines who say it is cheaper to fly longer routes, because air navigation service charges along these routes are lower. But there has to be a review of the impact of this on the environment. It has to be looked at from both sides, from the viewpoint of the regulator and the airlines. Air navigation service providers (ANSPs) set their fees in such a way that airlines need a tool to find the most cost-efficient route from a number of options.

So why can't ANSPs working within a functional airspace block (FAB) agree a single standard set of charges? Why can they not agree to cross-subsidise each other and avoid having these competitive prices?

THIS IS A GOOD idea. But here we are talking about the role of sovereign States and States who currently still do not agree with getting into a relationship with a neighbour which will allow one to subsidise the other. You could perhaps look at an overall single fee structure for a FAB, with differentiated charges to individual ANSPs.

But there is a reason why a large ANSP situated in the most complex airspace in Europe, needing a lot of infrastructure to provide the capacity required to guarantee

the punctuality per movement, has to invest considerably more than a smaller ANSP sitting on the edge of the European Union. A smaller ANSP here, managing a far less complex airspace, requiring less complex tools, will not need the same level of investment; on the other hand, the more traffic is handled, the higher the income.

So what's the best forum for these issues to be resolved? Where can airlines, regulators and other stakeholders get together to sort out this problem?

IT NEEDS TO BE resolved by the Network Manager and airlines. They both have the professional background to discuss these issues in detail and if you are not discussing these matters operationally, if the discussions are merely theoretical, then nothing will change. This has to be proposed and recommended to the Commission, or changed into a format where it can be recommended to the Commission for change in the RP3 (reporting period three) time frame.

Have you detected any willingness for this to happen?

YES. BECAUSE I KNOW that this is a discussion that's been going on for years; I know that the Network Manager and the airlines do have a basic understanding of each other's viewpoint but of course they cannot change the rules. But they could continue to work on a solution that would be acceptable to all, which includes looking at the environmental impact. It's not just a business target, there has to be relief for the environment as well.

Do you think we now need to prioritise the environment over the business case for the airlines?

YES WE DO. OTHERWISE there is no point in having an environmental target. As long as there is a target and an index which outlines what ATM has to do to lessen the environmental impact of aviation. Another way forward might be to create trade-offs between the costs to airlines and the environmental target for ATM.

One of the issues for airlines is transparency: they will not want their operational costs to be detailed to competitors and they will also need to retain some flexibility on costs.

OF COURSE THERE MUST always be the opportunity for airlines to choose cost-optimised routes, especially when fuel prices change again and the competitiveness of certain routes will suddenly disappear. We must retain flexibility – but understand that if fuel prices suddenly double and traffic moves to new routes this will have an impact on the capacity requirements for ANSPs.

The relationship between air navigation service charges and traffic flows is a huge issue for ANSPs, especially those where controller rosters are matched closely to forecast demand.

BOTH SIDES HAVE TO be considered. Airspace capacity can suddenly vanish because airlines are choosing different routes and ANSPs can suddenly find they have to impose restrictions because they do not have enough capacity to cope with the increased amount of traffic. This is a secondary impact which has an important role to play in capacity planning and has to be considered in any discussion.

So what needs to happen next for these discussions to take place?

I BELIEVE WE NEED to arrive at an agreement that considers all these various points and brings them together within a consolidated proposal. I think all partners have a role to play here together but the role of airlines will be particularly important. They do have to consider all the secondary effects of their route planning actions. It has to be a solution that is acceptable to all; if the airlines feel they are being discriminated, they will start to find other ways to save money. But they need to accept that environmental targets will have to be met and cannot be circumnavigated. I think the only way to come to a solution is to create full transparency here.

What are the chances of achieving an agreement in the next two or three years?

IF THERE IS A will, there's a way. If one side is not willing to negotiate we could be going round in circles for years. We need people who understand the problem, who understand we have to find a solution and then a solution will be found. This solution might as well be one which proposes to change the key performance indicator.

It's not in the interest of airlines to ignore environmental targets, they are under pressure to improve their environmental performance, too.

THERE'S NO QUESTION ABOUT that. We all know the boards of airlines are made up of responsible people and that they do not just look to maximise revenue but to meet other targets as well, including environmental targets. They live in the same world as we do and of course they know about their responsibility to behave trustworthily when it comes to environment and sustainability. ■



Ralph Riedle is the Chairman of EUROCONTROL's Performance Review Commission and a member of the European Commission's Performance Review Body

European airspace modernisation – creating new momentum for change



Network efficiency and service continuity are at the heart of reforms that airlines want to see enacted over the coming years, says *Rafael Schvartzman*, International Air Transport Association's European Regional Vice-President.

If politicians were given a project that could create a million extra jobs and billions of Euros in economic benefit for European consumers, you would imagine they'd grab it with both hands. Research commissioned by the International Air Transport Association (IATA) shows implementation of the Single European Sky (SES) could achieve just that, yet the political will for change remains disappointingly weak. It's time for airlines

to bring together a wider coalition of business groups, unions, passengers and industry partners to push for genuine airspace modernisation and reform.

We are confident that implementation of the SES will generate an economic bonanza for Europe. Respected independent economists SEO Amsterdam were asked to look at the benefits that Europe would accrue if SES goals were met by 2035; the conclusions of the report were startling. As a result of increased productivity worth over €700 per employee and an extra one million jobs, the European economy would gain €245 billion in gross domestic product (GDP) annually by 2035. European citizens would gain €32 billion in consumer benefits, mainly from lower costs, fewer delays and more choice.

A fully modernised and reformed airspace in 2035 would generate particular benefits to European tourism, trade and the knowledge economy. Examples include aid to the tourism industry, with additional demand supporting the provision of 1.3% additional hotel beds and up to 2.2% expansion of trade in services. Most striking of all is the boost to knowledge-intensive industries, which benefit most from easy face-to-face access; optimising the European aviation network would generate 5.5% more patent applications and 4.7% greater research spend; and 1.3% more employment in knowledge-intensive industries.

Slow progress on SES

IF WE ACCEPT THAT the economic case for SES is compelling, then the question has to be asked – why is progress so slow? There is no doubt that delivery of SES goals has stalled. Costs have been only marginally contained. The Functional Airspace Blocks (FABs) have led to little back-office

coordination, front-line efficiencies or service improvements. The SES-ATM Research (SESAR) project has swallowed billions of Euros for very modest gains. Unnecessary delays and route extensions have proliferated. Additionally, there has been increasing industrial unrest as air traffic controllers, in the context of poor change management, seek to prevent much-needed reforms. And all the time, passenger and flight numbers are increasing. What is to be done?

In 2013, IATA published *A Blueprint for a Single European Sky* with suggestions for a way forward for reform of European airspace that would, among other things, reduce the number of control centres while retaining current staffing levels of front-line air traffic control officers. The blueprint laid out objectives which if pursued, would bring States closer to delivery of the Single European Sky.

The technology and procedures to deliver the safety, capacity, efficiency and environmental goals of the SES exists today. What is lacking is the political will to push for reform. In addition to the economic benefits outlined in the SEO Amsterdam report, two further challenges in particular should be focusing political minds. The first is to reduce emissions through a more efficient route network and the second is to ensure better service continuity when air navigation services are disrupted by industrial action or technical and system failures.

Network efficiency

A more efficient network, reducing route extensions, presents a compelling environmental and economic case for change. Inefficiencies in the European airspace system are a cause of significant wasted CO₂ emissions. Despite some

If Single European Sky goals were met by 2035 (according to SEO Amsterdam):



Increased productivity of
€700 per employee plus
1 million extra jobs



Increase of **€245 billion** GDP
across the European economy

1.3% additional hotel beds

2.2% expansion of trade in services

5.5% more patent applications

4.7% greater research spend

1.3% more employment in
knowledge-intensive industries



improvements, Europe's air navigation service providers (ANSPs) missed the agreed flight-efficiency target for the 2012-2014 period by 45%, and the performance has deteriorated further since then.

The prize of emissions reductions has additional momentum when set in the context of the push for a global carbon offset scheme for aviation, which is expected to be agreed at the International Civil Aviation Organization (ICAO) in September. If the scheme is agreed it will be a major step towards the industry achieving its goal of carbon-neutral growth from 2020. But the industry wants to go much further and cut emissions 50% by 2050, compared to 2005. To achieve that, every wasted tonne of carbon must be eliminated. Politicians who pay lip-service to environmental priorities now have an opportunity to make a genuine difference by pushing for more efficient air traffic management.

The situation is critical, and comments in the 2015 Performance Review Report sum up the issue succinctly: "In view of the numerous factors and complexities involved, and with traffic levels growing again, flight efficiency improvements will become more and more challenging and will require the continued joint efforts of all stakeholders, coordinated by the Network Manager." In other words, genuine European airspace coordination must become a reality if route efficiencies are to be found.

Service continuity

ACCORDING TO THE EUROPEAN Network Manager, 2015 saw nearly one million minutes of delay caused by air navigation service disruptions. There were two prime drivers of delay: 300,000 minutes as a result of infrastructure and system failures closing airspace, and around

650,000 minutes attributable to air traffic controller (ATCO) strikes.

This situation is hard to justify – air traffic controllers are well-remunerated and have, rightly, considerable working condition safeguards to ensure they can operate at their best. ATCOs do a very demanding job and everyone who flies should be grateful for their proficiency and dedication. But the increase in strikes has been particularly notable this year and is out of proportion with the modest reforms being proposed to the air traffic system. The result is that unfortunately a minority of militants are damaging the reputation of the profession. And according to research by PWC for the 'Airlines 4 Europe' group, the cumulative cost of ANSP strikes for the period 2010-2015 amounts to €9.5 billion.

No-one wins when passengers and cargo are unable to reach their destinations in time because of industrial action. A sensible way forward has to be found. Airlines need to keep an open dialogue with ANSPs and ATCOs to find areas where all parties can see a mutual benefit in partnering for change. But in return, we need the ATCO community to acknowledge the damage that excessive disruption is causing.

In terms of system or infrastructure failures causing service disruptions, it needs to be understood that airlines fund about €1 billion per annum in capital investments across Europe for ATM modernisation. So it's infuriating to see in the Performance Review Board Capital Expenditure (CAPEX) Report for reporting period one (RP1) that 25% of the €3 billion paid by the airlines was used for something other than modernising European ATM infrastructure. Clearly, we cannot continue to support a situation where infrastructure plans are billed to the airlines, but spent on something else,

particularly when the infrastructure fails and the airlines pay again having flights cancelled, delayed and re-routed.

Airspace is a scarce resource and we expect regulators, service providers and ATCOs to put in place the measures required for best practice business continuity to keep European airspace open no matter the cause of the disruption.

These twin concerns – network efficiency and service continuity – are at the heart of the reforms that airlines want to see enacted over the coming years. It is clear from the research commissioned by IATA that tremendous economic benefits will flow to air passengers and the entire European economy. Moreover, the required modernisation and reform can be done without the need for any ATCOs to be made redundant, or unreasonable changes to working conditions made.

National airspace strategies

SO WHAT SHOULD BE the next steps?

We urgently need European governments to develop their own national airspace strategies (NAS), incorporating clear key performance indicators (KPIs) towards attaining Single European Sky objectives. These strategies would be based on smart regulation precepts, including consultation with airspace users; a multi-stakeholder governance structure; a roadmap with SMART milestones and supporting cost/benefit analyses. Each NAS should integrate with the wider European airspace network to maximise efficiency, deliver SES and SESAR goals and align with national environment and defence legislation requirements.

In addition, the airline community expects an airspace strategy to put service dependability and reliability at its very heart. In practice, this means ►



implementing principles of business continuity to ensure minimum service levels, build resilience into systems and people processes, design recovery capabilities into service delivery and key support areas, and guarantee contingency service with FAB partners.

Note that these elements are not connected with investment. Many States have an ANSP investment plan. This is not the same as an airspace strategy.

Coalition for change

EUROPE'S RECENT PERIOD OF relative peace and prosperity has been founded on greater connectivity across the continent, much of that delivered by airlines. That air connectivity is under threat, not only from the lack of airspace (and airport) capacity, but from a more serious malaise: a lack of understanding of what aviation needs to be successful. A whole raft of issues, from poorly-drafted consumer protection regulation, to a lack of firm economic regulation of airport monopolies, to the treatment of aviation as a tax cash-cow rather than an economic golden goose, threatens European aviation. But the most pressing failure of all has been the

SES. That failure is going to cost Europe billions of Euros in lost GDP, and around a million jobs, because of the lack of political will to make the SES a reality. It is a failure which Europe's citizens should no longer tolerate.

The answer is to build a coalition for change. Individual business sectors, trades unions and the travelling public can now see the benefits that will directly accrue to them from modernisation and reform. Hoteliers and tourist attractions, for example, will see more customers through their doors. Environmental groups can see the prospect of lower emissions. Hi-tech firms are noting how research and development and knowledge transfer will be boosted by a more efficient Europe-wide transport network. Trades unions can see how employment in high-value jobs will increase. The momentum for change will only become irresistible when the combined weight of all these concerned stakeholders is brought to bear. There can be no more failure to deliver. SES has to happen – the extent of Europe's future prosperity depends on it. ■

For more information please visit <http://iata.org/europe-airspace>



Rafael Schwartzman is the International Air Transport Association's European Regional Vice-President

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A night sky with a city skyline and light trails from airplanes. The text is overlaid on the left side of the image.

IT'S TIME FOR A NEW **APPROACH** TO ATM

With the ever-growing amount of traffic in the sky, air traffic management (ATM) is a critical priority that requires continuous progress. Working together with industry and government organizations, Boeing is committed to an ATM transformation that improves safety, efficiency and the environment for all. At the core of Boeing's ATM solutions are secure network-centric operations that will incorporate the capabilities of modern airplanes, as well as ensure global interoperability and real-time access to critical information. The time is now, and Boeing is ready to help.

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