

SKYWAY

SUMMER 2021



**“THE
ENVIRONMENT
IS INDUSTRY’S
BIGGEST
CHALLENGE”**

AKBAR AL BAKER,
GROUP CEO
QATAR AIRWAYS

ULLA LETTJEFF,
SENIOR VICE-PRESIDENT,
HELSINKI AIRPORT

**“THINKING OUTSIDE THE
BOX TO SPEED UP INDUSTRY
RECOVERY”**

AIRBUS AND BOEING
DESCRIBE GREEN
ROUTES TO THE FUTURE

Aviation Sustainability Briefing



SUBSCRIBE to receive the next issues about
the most promising sustainability initiatives in aviation





5 EDITORIAL

Eamonn Brennan, Director General, EUROCONTROL



INSIGHT

- 7 “The biggest challenge the industry faces is the environmental challenge”
His Excellency Akbar Al Baker, Group CEO Qatar Airways
- 12 Recovery depends on a harmonised approach
Ulla Lettijeff, Senior Vice-President Helsinki Airport, Finland
- 15 The Impact of COVID-19 on Ethiopian Airlines, recovery preparedness and challenges
Tewolde GebreMariam, Group Chief Executive Officer, Ethiopian Airlines
- 18 Partnering for a sustainable aerospace future
Brian Moran, Vice President Global Sustainability Policy & Partnerships, Boeing
- 22 Delivering a sustainable aviation recovery
Amparo Brea, Innovation, Sustainability and Customer Experience Director, Aena
- 24 Climate-neutral aviation: redefining business as usual
Glenn Llewellyn, VP Zero-Emissions Technology, Airbus
- 27 Improving network performance by integrating operational and technical working groups
Views of Ulf Thibblin, Chair of Network Directors of Technology (NDTECH), and Xavier Benavent, Chair of Network Directors of Operations (NDOP)



FOCUS

- 30 “We are now all collaborators working within a single Network”
Steven Moore, Head of ATM Network Operations, EUROCONTROL



INNOVATION

- 34 Europe is now in the fast lane to implementing UAS traffic management systems
Munish Khurana, Business Development Manager, EUROCONTROL



DATA

- 38 Data



NEWS

- 42 NEWS

DETAILS

Managing Editors

Lucia Pasquini, Catherine De Smedt

Editor

Philip Butterworth-Hayes

Advertising

Kay Rolland
101 rue de Sèvres
92100 Boulogne Billancourt – France
T: +33 609 133 510
E: kay.rolland@gmail.com

Design

inextremis.be

Printing

EUROCONTROL

Contacts

Lucia Pasquini

Managing Editor
E: lucia.pasquini@eurocontrol.int
T: +32 2 729 34 20

Philip Butterworth-Hayes

Editor
E: Philip.Butterworth-Hayes@pmi-media.com
T: +44 1273 724 238

PMI Media Ltd

61 Davigdor Road, Hove, BN3 1RA, UK
www.pmi-media.com

EUROCONTROL

96, rue de la Fusee, 1130 Brussels, Belgium
www.eurocontrol.int

© EUROCONTROL, June 2021. All rights reserved. The entire contents of this publication are protected by copyright. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means electronic, mechanical, photocopying, recording or otherwise, without the prior permission of EUROCONTROL. The reproduction of advertisements in this publication does not in any way imply endorsement of their content by PMI Media Ltd or EUROCONTROL. The views expressed in the articles are those of the authors and do not necessarily reflect the official position or policy of EUROCONTROL.



Advertisers Index

Indra advertorial 10-11 / Back cover Indra

To receive a free copy of Skyway, please subscribe at
www.eurocontrol.int/subscribe

#BUILDBACKBETTER ISN'T JUST A HASHTAG – IT'S A GOAL, IT'S A WAY OF THINKING



The latest EUROCONTROL traffic scenarios indicate that in the most likely case, the number of flights in Europe will recover to 2019 levels in 2024. This assumes that vaccination rollouts will continue to move ahead and facilitate more long-haul travel, starting in 2022. Certainly, it is clear that there is a lot of pent-up demand and that airlines are ready to increase capacity rapidly once travel restrictions ease.

CHANGE AHEAD

But that doesn't mean that European aviation in 2024 will be the same as in 2019. We can already see that there will be many changes and we need to be preparing for them. In fact, we need to be driving change. 2019 saw air traffic management (ATM) in several parts of Europe straining to meet the demand of over 11 million flights. We had massive delays (en-route delays were over three times the target level) and the measures taken to minimise delays sometimes resulted in more inefficient flights, at a cost both to the airlines and to the environment. So we don't want to be in the same position as 2019 once traffic recovers to that level and for that reason it is essential that we secure a good outcome from the ongoing EU Single European Sky reform negotiations in the coming months.

Changes are anyway happening in every part of the sector. Manufacturers are focusing on the latest, most fuel-efficient models as a result of demand from the airlines, several of which are also changing the mix within aircraft with more premium economy seating. Recently Lufthansa said that

the financial contribution per square metre of premium economy was 39% higher than that of business class. This rebalancing of the cabin is also driven by concerns over how much business travel there will be post-recovery, now that video conferencing has moved from an occasional experience in a specially equipped room, to an everyday experience from your desk – or wherever you happen to be.

COVID-19 CHANGES

COVID-19 has also prompted a series of changes to the travelling experience, some of which may well be here to stay post-pandemic. Airlines have become much more responsive and agile – adjusting routes as a result of evolving demand. The idea of setting schedules for an entire season may cease to be the norm. At airports, COVID-19 has resulted in more spacing and, potentially, less capacity. We are also seeing an acceleration of the trend towards contactless progression through the airport with fewer passengers checking-in and more technology such as facial recognition being used to ease the traveller's journey and to minimise bottlenecks.

One area where major delays are feared (and, in some cases, are already being seen) is immigration/verification of health status. There is a real need to digitalise this and move much of the work away from the airport itself. Once travel restrictions take account of the health status of the passenger (including vaccination) and there is widespread acceptance of (and use of) digital certificates such as the EU Digital COVID Certificate

or the IATA Travel Pass, then the burden on officials at the airport (and the passenger) should ease. However, for now we are already hearing of multi-hour delays; some airports are restricting the number of flights they can take based on their immigration capacity (in at least one case looking at this on a terminal by terminal basis).

TECHNOLOGICAL CHANGES

Other changes are part of the constant process of evolving technology. ATM has to respond to and embrace changes whether they come from inside (such as the growing capabilities and use of Remote Towers) or from outside traditional ATM. Here we see major changes coming in terms of new aircraft types. A lot of the news is about drones but there are many other innovations, ranging from urban air taxis to very high altitude aircraft and even airships for short/medium range passenger travel.

Technology can also enable new ways of doing things within ATM. The rapid explosion in the availability of data means that we can plan traffic flows across Europe much better than ever before – which means more capacity and fewer delays. Artificial Intelligence is already starting to deliver practical benefits in aviation and this is set to accelerate. EUROCONTROL has just hosted a series of fascinating webinars on the topic – do check them out at www.eurocontrol.int/fly-ai.

SUSTAINABILITY CHANGES

One area where change is being driven across the industry is sustainability. Again, this ranges across all the different parts of aviation. Aircraft manufacturers are not only making more fuel-efficient aircraft, they are also starting work on developing new types, such as electric and hydrogen-powered. For current aircraft, aircraft and engine manufacturers are making the use of Sustainable Aviation Fuel (SAF) possible in ever greater proportions. We are lucky enough to have contributions from both Airbus and Boeing in this issue.

There's been a sharp rise in calls to shift from air to rail, especially for travel below 1,000 km. In June, we published our latest **Think Paper** which provided some balance to the debate. The paper concluded that rail cannot effectively substitute for air. Transportation decarbonisation is more complex than simply planning to shift to rail for travel below 1,000 km. Such a shift, we find, would achieve only limited emissions savings while generating a range of drawbacks including a high total cost; a long lead time, resulting in new rail lines potentially entering into operation after aviation decarbonisation has started to deliver huge gains from SAF use and innovative propulsion technologies; and entailing significant economic and environmental downsides without being able to match the connectivity air provides. However, the paper does find that multimodal solutions that combine air and rail are highly attractive in terms of optimising

sustainability and improving connectivity. Transport investment should be balanced between both industries, building on natural complementarities and working towards the transport industry's emissions reduction goals, making the optimal solution more “plane and train” rather than “plane vs train”.

Airports are now starting to make SAF more available and this will be vital if the industry is to achieve the targets expected to be agreed as part of the ReFuelEU initiative. We are even starting to see work on seeing how hydrogen storage at airports will happen in practice. Airports are also already doing a great deal to reduce their own emissions, with more than 90 airports set to achieve Net Zero emissions by 2030. Electric vehicles are being introduced for passenger transport, baggage handling, aircraft pushback and even de-icing. ACI Europe recently reaffirmed the commitment of the European Airport Industry to achieve Net Zero by 2050 at the latest.

At the end of May, EUROCONTROL joined with EASA in setting out five pillars for a Green Single European Sky ranging from objectives to oversight. These pillars also include using the SES charging scheme as a tool to provide incentives to encourage efficient flight trajectories. We estimate that 8.6%-11.2% of emissions could be generated from fuel-efficient air traffic management improvements (see our recent **Think Paper**). We're already working with partners to start achieving these improvements.

BUILD BACK BETTER

We have seen some of these improvements during the pandemic. Aircraft are flying more efficient flight profiles, using more direct routes at more efficient flight levels and increasing the proportion of flights using techniques such as Continuous Descent Operations. In part, this has been achieved because of the relatively low levels of traffic we have experienced. Also, we've been able to drop a lot of route restrictions.

The challenge is to maintain as much as possible of these gains even as traffic recovers. It won't be easy – the entire industry has been under incredible financial pressures over the last year and that makes it even harder to justify investing in the future. But that is exactly what we must be doing. We need to look ahead to 2025 and make sure that as traffic levels recover to 2019 levels, we don't also have the delays, the diversions and the inefficient flight profiles. We're already working on that and there's an excellent article on the operational recovery in this issue.

#BuildBackBetter isn't just a hashtag – it's a goal, it's a way of thinking. It's vital for all of us if we are to make aviation more efficient and more sustainable. ■

“THE BIGGEST CHALLENGE THE INDUSTRY FACES IS THE ENVIRONMENTAL CHALLENGE”



Airlines need governments to provide clear and timely directions to help aviation industries deal with the pandemic – but in the long term, reducing environmental emissions is the industry’s biggest challenge, says **Akbar Al Baker**, the Group Chief Executive Officer of Qatar Airways



What are your key challenges in managing a recovery from the COVID-19 pandemic?

We are the world's largest long-haul airline – and in dealing with the challenge of a global pandemic the major issue we face is that no government has put in place a proper protocol for managing the aviation impact. There is no proper direction. Decisions are made and then sometimes changed overnight, so the airline industry doesn't know exactly what to expect from day to day. Pandemics happen, epidemics happen, natural disasters happen and there are security and terrorism incidents and normally there is a clear direction to follow immediately after. But with this pandemic I don't think any airline CEO in the world knows exactly what to expect tomorrow. We have no ability to plan.

Perhaps it is surprising there hasn't been more collaboration around dealing with the fall-out to airlines as for many governments aviation is a strategic industry.

Yes it is. We need one entity – and I've always said that this has to be IATA – to lead the way for airlines to comply with different regulations that are being generated by different governments. It is important that ICAO and IATA work together so we can all follow the same direction and protocols agreed by the world regulators.

“I don't think any airline will emerge from this in a strong position. We all will be severely affected.”

What has been the impact of the pandemic on your operation?

Every airline in the world has been severely affected by the pandemic but we have not been as badly hurt as most of the others because we took the risk of continuing to operate; pockets of business have remained available while many airlines tried to conserve cash. People have been stranded all over the world by the pandemic. The whole industry was switched off within days and that meant there were hundreds

of millions of people in the air or in transit or stranded at tourist destinations. So we decided at Qatar Airways to take this opportunity to do two things: to get people back to home to their loved ones while showing them that Qatar Airways would be there with them in good times and bad. It is now clear that the decision to keep our airport and airline open was a wise one.

What changes will the pandemic bring to the aviation sector?

This pandemic has decimated the industry. Every airline has asked for state aid, for subsidies, for contributions from government and I don't think any airline will emerge from this in a strong position. We all will be severely affected; we all will be injured – only the strongest will survive. There will be a lot of bankruptcies, a lot of collapses.

The tourism industry has been decimated along with the airline sector because there is no tourism without aviation. There is no global trade without aviation and no international supply chain without aviation - this is a whole vicious circle and I think it will be a long time before we recover.

How important is it that despite the current problems we continue to pursue sustainability and decarbonisation strategies?

Even before the pandemic Qatar Airways was at the forefront of sustainability. We take our duty towards the environment very seriously. We have taken part in carbon offset programmes and are following the emissions requirements that we agreed at IATA. Qatar Airways has the most modern fleet of any airline and we have continuously placed aircraft orders to keep our fleet young, investing in the most fuel-efficient aeroplanes like the Airbus A350, the Boeing 787 and most recently the Airbus Neo and the Boeing 777X.

We are also allowing our passengers to offset their emissions by contributing to tree planting programmes in India and elsewhere while taking part in the carbon offset programme of IATA. We have done everything we can to make sure that our growth is not impacting the environment to the extent that other airlines are.



In Europe there is a huge movement against airlines that have old and inefficient aircraft. We were the first airline to fly with gas-to-liquid (GTL) fuel and all the fuel in our aircraft is GTL-derived. This emits lower sulphur dioxide, which is one of the very dangerous greenhouse gases.

It is very easy to blame aviation and accuse it of being the biggest polluter - but very few people have identified the marine industry, cruise and cargo ships that burn heavy diesel, as being major polluters.

But it is not only airlines that should take the brunt of criticism: this should also be directed at aircraft and engine manufacturers and fuel suppliers. They need to invest in new technology that will deliver systems that will help us meet the very stringent environmental targets that as an industry we have accepted to deliver by the 2050-2060 timeframe.

The biggest challenge the industry will face in the next few decades is the environmental challenge. Our industry is vital for the development of the entire world in every way so it is vital for us all to invest in new technologies even if it is at the expense of the bottom line. Because when aviation collapses entire businesses collapse; for the future of our children and grandchildren we must build a world free of pollution and climate change.

How have you managed practically to deal with all the restrictions?

There were painful decisions to be made. One of the most painful of these was to shed employees, to make people redundant. People who have helped us to grow this airline to what it is today. But we have given an undertaking to employees who have been made redundant that once the airline industry rebounds they will be the first we will approach.


I'm proud and glad to say that we have already started doing this—re-recruiting pilots and cabin crew that we let go last year.

Are you optimistic that you can get back to where you were?

Yes, but it will take three to four years to get back to where we were in 2019. What is good about Qatar Airways is that we will be able to do that faster than other airlines because we don't have to jumpstart. We continued to fly. We've already re-established ourselves and people will remember that.

How would you characterise your relationship with EUROCONTROL?

My relationship with EUROCONTROL is very good, especially with the boss of EUROCONTROL whom we all in the industry greatly respect. But of course EUROCONTROL needs to modernise, needs to provide a better navigation system and, most importantly, needs to sharpen its pencil when it comes to navigation charges which in Europe are some of the highest that airlines pay. It is very important that in this time of pandemic when all airlines are struggling that EUROCONTROL plays its part in reducing airline navigation charges. ■



“We were the first airline to fly with gas-to-liquid (GTL) fuel and all the fuel in our aircraft is GTL-derived.”



THE FUTURE OF ATM VOICE COMMUNICATIONS

Voice communications are essential to the safety and efficiency of our airspace. Calm, dependable directions make global air travel possible.

Before the COVID-19 outbreak, many Air Navigation Service Providers were dealing with air traffic continuous growth and, once we overcome the pandemic, those organisations will have to face the same challenge again.

Air traffic optimisation should start with the upgrade of aged equipment in order to improve coordination tasks and reduce workload, reduce the complexity of the control area and provide the controller with additional support, increase safety and security and get real-time geo-resilience.

The IP voice in ATM is one of the key revolutionary technologies to enable the transformation of the aviation industry. An integrated voice service with the ATM data networks is key to increase network capacity and flexibility without compromising safety. This is achieved thanks to the IP architecture concepts, which enable more cost-effective and efficient integrated voice solutions.

The use of Voice over Internet Protocol (VoIP) in Air Traffic Management standards (ICAO 9896 and EUROCAE Working Group 67) enables the interoperability among every platform of the communication ecosystem: Radios, Voice Communication System, Recorders and Supervision System.

The highest availability and resilience in the solution is achieved thanks to the Wide Area Network (WAN) distributed components of the IP voice switch.

The IP technology is becoming the sole transmission means, forcing former protocols to fall into disuse, and voice service in ATC is not an exception. This is due to the enormous advantages of Full IP voice systems over legacy communication systems, such as the following:

- Homogeneity by Integration in standard networks together with any other data.
- Redundancy, resilience and availability of these networks in comparison with the proprietary and dedicated connections used in the past.
- Easy and simple scalability of the systems.
- Contingency scenarios solved thanks to sharing resources and connectivity within the WAN.

The deployment of a Full IP voice system across the entire network will provide business continuity in case of node failures caused by technical, natural or ill-intentioned disasters. Additionally, the implementation of the interoperability standards will permit the introduction of new cross-border voice communication services.

GAREX 300 Full IP voice switch is the latest generation of the successful evolution of the GAREX suite of air traffic communication systems.

COMETA® Full IP solution offers not only the state-of-the-art advantages but also the safest design for large ATC centers. Its architecture comprises two pure-IP VCS blended seamlessly for the controller with completely diverse hardware platforms and software implementations.

Our pure-IP solutions have been in operation for more than 5 years in several ANSPs, they are not only the first Full IP platforms in the market but also the only ones proven in operation so far.

Compared to other communication platforms in the ATM industry, GAREX 300 and COMETA® bring many technical and operational advantages such as the following:

- Enabling end-to-end VoIP natively at the controller working position while others have to use converters to VoIP, resulting worse voice quality, bigger delays in communications and decreased availability of the service.
- Being routing capable in all components instead of relying the routing capability in centralised components which lowers the reliability of the system.
- Designed for enabling a highly resilient operation in Wide Area Networks (WAN) while others operate in legacy and Local Area Networks (LAN), affecting quality or latency.

“Indra’s voice switch solutions are the first and only ones in the market purely built on Internet Protocol standards.”

- With simple and flexible architecture due to the decoupling of software and hardware instead of running on proprietary equipment where software, firmware and hardware are blended, giving a more complex and expensive evolution
- Proven hyper-connectivity for cloud and virtual-center solutions while others are deployed on Isolated and centralised with proprietary platforms, precluding the virtualisation and cloud deployments.

Having led the VCS market for more than 50 years and implemented in more than 650 customers worldwide, our solutions are the latest evolution of a proven suite that is currently managing some of the most large and complex airspaces in the world.

For further info, contact our expert:

indra

Jose Alberto Delgado
Product Expert VoIP Suite
jadelgado@indra.es

GAREX 300 and COMETA® enhance voice communications services in a secure, safe and optimal way:

- Through direct VoIP communications between controllers of the same or different ATC centers.
- By sharing resources across boundaries.
- Preventing any configuration mismatch, adapting the workload of the control room to the air traffic flow.
- Providing mutual contingency between centers to deal with failures.

- With limitless scalable IP connections which simplifies deployments.
- Lowering operating costs with commercial off-the-shelf equipment while keeping the solution reliability.

Our solutions are continuously evolving by leveraging the latest technologies such as cloud and voice recognition based on artificial intelligence, while building a roadmap for the near future that encompasses the ability to manage unmanned traffic and the full integration with the ATM CWP and virtual remote towers.



JOIN THE CHANGE. BE PART OF THE FUTURE

RECOVERY DEPENDS ON A HARMONISED APPROACH

Finavia's response to the Covid-19 pandemic involves a collaborative, community effort says **Ulla Lettije**, Senior Vice-President, Helsinki Airport

International tourist arrivals in January 2021 were 87% lower than they were in January 2020, according to the United Nations World Tourism Organisation (UNWTO). This has followed the COVID-19 pandemic — the worst crisis in aviation history — resulting in over a year of significant reductions in passenger numbers, cancelled or empty flights, and sustained financial losses for airports and many of their stakeholders. The organisation has called for “stronger coordination on travel protocols between countries to ensure the safe restart of tourism and avoid another year of massive losses for the sector”.

But UNWTO also forecasts a recovery of the industry over the course of this year, with varying rates of recovery depending on a range of factors, including harmonised immunity passports such as the European Union's planned EU Digital COVID Certificate and vaccination programmes.

For the aviation industry to recover not only quickly, but sustainably, all its stakeholders, from airports to airlines, from passengers to governments, must work together. Finavia has focused a large number of its resources to safe travel and recovery at its airports.

HIGH-QUALITY CUSTOMER SERVICE FROM THE BEGINNING

Finavia's overall response to COVID-19 was strongly proactive, beginning as early as January 2020 with ramped-up processes including thorough cleaning and disinfection, social distancing, the distribution of hand sanitiser and a comprehensive health communications effort aimed at passengers and the airport staff. We were one of the first organisations in Finland to recommend masks and to implement a mandatory mask policy. We took the pandemic extremely seriously right from the start. And we have done these things not to form some sort of competitive edge, but because they are an absolute *must* — a baseline upon which to build everything else.

Our success would not have been possible without the collaboration between us and our various stakeholders — health authorities, airlines, ground handling companies, the police, customs, border guards and the City of Vantaa. It has been a community effort, and that community has done a tremendous job.

A focus on high-quality customer experience has also been a significant factor in Finavia's response to the pandemic. We have invested heavily in operations and services to create an environment in which passengers feel safe to travel and staff feel safe to work, and this has been reflected in positive results from ongoing customer surveys.

In January 2021, Helsinki Airport was selected as the best European airport in its size category for 2020. The Airport Service Quality (ASQ) Award was given by the Airports Council International (ACI). Helsinki Airport also received recognition for its hygiene measures during the pandemic in 2020. In fact, our overall customer feedback during the pandemic actually increased. Combined with the ACI awards we received in January for best airport and for hygiene, this result has boosted our energy and confidence that we have done and are continuing to do the right thing.

**FINAVIA**

“We have invested heavily in operations and services to create an environment in which passengers feel safe to travel and staff feel safe to work”

FASTER REINSTATEMENT OF EU AIR TRAVEL WITH THE EU DIGITAL COVID CERTIFICATE

The aviation industry ultimately depends on the flow of travellers around the globe. One of the key opportunities with the potential to restore a significant share of travellers to the skies, at least in the European Union (EU), is the EU Digital COVID Certificate. The European Commission (EC) proposed the certificate in March 2021 (then called a ‘passport’). It is aimed at restoring non-essential travel within the EU and will be able to be issued to EU citizens, non-EU nationals who legally reside in the EU and visitors who have the right to travel to other member states.

As it currently stands, the certificate would ensure non-restricted travel within the EU not only for those who have already been vaccinated but also for those who have tested negatively or are able to prove their recovery from the coronavirus. This approach is designed to prevent discrimination against people who are not yet due for vaccination.

The adoption of the EU Digital COVID Certificate would brighten up the prospects of air travel. In addition to stepping up vaccinations, it is definitely the most important of the measures to facilitate travel. With the help of an EU-wide Covid-19 certificate, the aviation and tourism industry could begin to recover safely and responsibly.

VACCINATION MUST BE GLOBAL AS WELL AS FAST

Another key factor in determining how quickly the aviation industry will recover is how successful vaccination programmes are. On the one hand, vaccinating enough of the global population might even remove the need for strategies such as the EU Digital COVID Certificate. On the other, even with a global effort, vaccinating most of the world population takes a lot of time.

The only way we’re going to get back on our feet in Europe is through a unified plan. It’s difficult for individuals to start planning travel if they have no idea how it’s going to happen in the future, and if plans vary from country to country. The unified direction is the ideal one, not only for Finavia or Helsinki Airport, but for all of Europe.

Think about it another way: to borrow a local example, the connection between Asia and Europe is particularly important for Helsinki Airport, and to be able to have European connections from Finland to Europe, we need to be able to have those transfer passengers. It’s all tied together.



© Arkkitehtitoimisto ALA Oy / Arkkitehtitoimisto HKP Oy

INNOVATING TO BOLSTER THE INDUSTRY

Finavia has been thinking outside the box to speed up industry recovery. LED-based Ultraviolet C (UVC), for example, is an emerging technology that has now been used at our airports for some time to disinfect security control trays. Security control is one of the most important parts of the airport. Everyone must travel through this area, so it's important to ensure that it is clean. Like many other airports, this is one passenger process that generates a lot of feedback, so the use of UVC technology will help us to serve passengers quickly and thoroughly.

We are proud of the innovations at Helsinki Airport, because we have always believed that it is important to focus on getting the basics right and doing them very well. But process speed isn't the only thing we can improve. We have, for example, also started to research how to deliver a contactless experience at the airport — a way of travelling without having to touch any surfaces. This could help to reduce the likelihood or effects of potential future events that might one day pose a serious challenge to the industry.

The industry will recover. It's not a matter of if, it's a matter of when. We must all play our role. The world powers are engaged in tough conversations. Our passengers act responsibly by wearing masks, cleaning their hands and staying socially distanced. And we at Finavia will continue to deliver a safe and smooth experience. ■

“The adoption of the EU Digital COVID Certificate would brighten up the prospects of air travel. It is definitely the most important of the measures to facilitate travel.”

THE IMPACT OF COVID-19

ON ETHIOPIAN AIRLINES, RECOVERY PREPAREDNESS AND CHALLENGES



A STAR ALLIANCE MEMBER 

Digitisation and agile diversification has allowed Ethiopian Airlines to weather the pandemic better than many other carriers, explains **Tewolde GebreMariam**, Group Chief Executive Officer

The emergence of COVID-19 has shattered economies on unprecedented scale. The pandemic has affected the global economy in general and the aviation industry in particular, bringing the global aviation industry to its knees. African airlines, which before the Covid crisis were already dealing with financial losses, have been particularly vulnerable and have had to seek bail-outs from governments which were already facing financial constraints. African carriers have taken different measures to deal with the crisis, including lay-offs, furloughs and fleet reductions.

Global demand for travel declined as a result of the pandemic, leaving a number of major airlines in bankruptcy. Some have ceased operations altogether. The aviation industry has been the hardest hit business as a result of the pandemic and Ethiopian Airlines is no exception. Its passenger service, the airline's biggest revenue generator, saw most of its revenue plummet, forcing it to ground many aircraft and operate at just 10% of its capacity. This created a huge financial burden on Ethiopian with unavoidable costs such as aircraft- and infrastructure-related payments as well as bank loan repayments.

But Ethiopian has kept its business afloat with diversification strategies and agile management, continuing operations by shifting its focus to cargo, hotel and MRO businesses. It implemented a cost leadership strategy to reduce expenditure while maintaining quality and efficiency.

THE AIRLINE'S DIVERSIFIED BUSINESS UNITS HAVE RESPONDED DIFFERENTLY TO CHALLENGES.

Ethiopian leveraged its cargo, maintenance, repair and overhaul (MRO) and hotel businesses to continue without laying off employees or making any pay cuts. These business units have been used to generate revenue and help it stay financially stable during the pandemic. The airline generated revenue by providing aircraft maintenance services to Middle East and African carriers. More than 40 aircraft from different airlines have received Ethiopian MRO services. Ethiopian cargo also played a critical role serving customers around the world by transporting essential medical supplies.

Using its in-house MRO professionals, it reconfigured about 25 passenger aircraft into freighters to boost its cargo capacity as demand to transport emergency medical supplies soared across the world. It operated more than 360 charter cargo flights and carried medical supplies to over 80 countries. Remaining loyal to its commitment to serve its customers in bad and good times, it carried out over 470 charter repatriation flights and reunited more than 63,000 citizens of different countries with families and loved ones. These charter cargo and repatriation flights together with the austerity measures Ethiopian put in place were instrumental in the fight to survive the pandemic. Ethiopian was one of the top three airlines to make a profit during this unprecedented crisis.

“Complete recovery is dependent on the confidence of travellers and airlines’ safety measures. “

RECOVERY PREPAREDNESS AND CHALLENGES

Ethiopian has a four-pillar growth strategy that has led to success during these difficult times: human resource development, a modern fleet, infrastructure development and technology.

In the wake of the pandemic, Ethiopian capitalised on these pillars and used its agile workforce and technology to cope with the crisis. The flexibility of the airline's management has been critical in devising new strategies to come through the crisis, including the reconfiguration of passenger aircraft into cargo and redeployment of its staff to its least affected business units and applying cost leadership strategies.

Ethiopian will continue to repeat the efficiency demonstrated during the distribution of essential medical supplies and personal protection equipment (PPE) to prevent the spread of the virus and it will continue to transport vaccines across the globe until everyone is vaccinated. Ethiopian has joined the global COVAX initiative and is currently transporting vaccines to and from different parts of the world.

When “normal” flight will be fully restored is not yet known and varies from country to country, depending on airport strategies of recovery and preparation for the new normal. Complete recovery is dependent on the confidence of travellers and airlines’ safety measures. For Ethiopian, safety has been at the heart of its operation and it has stepped up precautionary actions to help gain passenger confidence in travel and expedite recovery.

“The recovery plan predominantly focuses on the effective implementation of safety measures on board and on the ground.”



The coronavirus pandemic has completely changed the passenger flight experience and for this reason Ethiopian is taking various actions to ensure safety and meet travellers' changing expectations. Travellers are more cautious than ever now and consider airport cleanliness, cabin safety and an airline's overall precautionary measures as essential to their safety. Ethiopian's precautionary measures to protect passengers and staff include digitising all its operations for a safer airport experience.

Ethiopian's priority has always been the safety and security of passengers and staff, even before the pandemic. So the recovery plan predominantly focuses on the effective implementation of safety measures on board and on the ground. Ethiopian has been meticulously implementing precautionary measures recommended by the International Air Transport Association (IATA), the World Health Organisation (WHO) and other national and regional health regulatory bodies such as Africa Centres for Disease Control and Protection (CDC), national public health institutes and ministries of health.

Digitisation has been a priority to bring about a contactless passenger experience from booking all the way to boarding. At the airport, customers experience is contactless, easy and convenient with the newly designed terminal equipped with the latest aviation infrastructure. The airline has digitised most airport activities and passengers can book, check-in or change travel dates from home. Most customer flight needs can be met via the Ethiopian Mobile App. The majority of passengers' queries are addressed online; travellers get any travel- and safety-related information via the airline's chatbot and social media channels.

Meanwhile, Ethiopian is taking additional measures in the cleaning and disinfection of all touch points on board and at the airport. Aircraft undergo deep disinfection after each flight and masks have been mandated since the outbreak. Hand sanitisers have been made available at airport gates, toilets and other places for passengers and staff to use. Airport terminal floors, baggage trays and trolleys are frequently disinfected. Social distancing measures are also in place with markings on the floor to remind passengers, for example, while standing at airport checkpoints for security clearance.

“Despite the effort to make travel safe and secure, there are challenges in gaining passengers' confidence globally.”

These measures have significantly changed passengers' experience.

Despite the effort to make travel safe and secure, there are challenges in gaining passengers' confidence globally. Regaining trust could take some time even with the introduction of vaccination and the possibility of a global vaccine passport. New coronavirus variants emerging in some parts of the world have also posed an additional challenge to the global economic recovery. Ethiopian is working in collaboration with governments, airports and aviation authorities around the distribution of accurate COVID-19 information and regulations. Consistent flow of information among countries helps customers understand variations in entry regulations and requirements which in turn could affect travel. Ethiopian believes that coordination with stakeholders will help to ease travel. The airline plans to attract more customers into Africa as countries reopen borders and IATA works towards a digital health pass that will help airlines restore travellers' confidence in travel and contribute to the revival of passenger business; Ethiopian has trialled this IATA Travel Pass which is expected to ease air travel globally when it comes into effect.

The skills of adaptability and resilience Ethiopian developed over its 75-year journey are significant at this time when countries start easing restrictions and airlines need to adapt themselves to new challenges to restore business. In collaboration with other airlines, airport operators and aviation regulatory bodies, Ethiopian is determined to recover soon with the effective practice of safety measures to boost passenger confidence. ■





PARTNERING FOR A SUSTAINABLE AEROSPACE FUTURE



Boeing's **Brian Moran**, Vice President Global Sustainability Policy & Partnerships at Boeing, details the company's intensified focus on sustainability

Environmental stewardship, social progress, inclusion and values-based transparent governance have always been important to Boeing, but recently we have accelerated our sustainability efforts.

"Chief" among these efforts has been appointing and empowering Chris Raymond as the company's first Chief Sustainability Officer, an executive committee (ExCo) level leadership position dedicated to galvanising and advancing our environmental, social and governance (ESG) priorities. We did so in the midst of a pandemic which continues to challenge society, industry and national economies. Then in January 2021, we announced our intent that all Boeing commercial aeroplanes will be capable and certified to fly on 100% sustainable aviation fuels by 2030. In the near future, we will release our inaugural annual Sustainability Report, the first time our technology, innovation, community and social leadership performance will be presented in chorus as one comprehensive record.

A few months ago, I was honoured to be asked to serve our stakeholders and company in a new capacity as leader for Boeing's newly created Global Sustainability Policy and Partnerships team. In this new role, my aim is to partner with colleagues to build on and strengthen our company focus on sustainability outside the United States by identifying and responding to global sustainability trends, informing emerging regulations and creating innovative partnerships that advance our environmental stewardship efforts.

Safe, reliable, efficient and cost-effective air transport is an essential component of a broader mobility strategy to help achieve the United Nations 2030 Agenda for Sustainable Development. The global aviation sector has an important contribution to make to many of the UN Sustainable Development Goals. As an economic engine, in normal pre-pandemic circumstances, air transport supported 87.7 million jobs worldwide and \$991 billion in European economic activity (\$3.5 trillion globally) in 2018, which was 3.6% of all employment and 4.4% of all GDP in European countries in that year (Source: ATAG).

As our company continues to adapt to the impact of the global pandemic, transform our operations for the recovery and rebuild stakeholder trust, we are creating a future for our business and industry that is safe and sustainable. Sustainability at Boeing is as much about *what* we do as *how* we do it. Over the past months, our sustainability team has built a strong foundation for a transparent, integrated and data-driven ESG sustainability strategy and resulting plan of action.

We recognize the need to decarbonize aerospace for sustained long-term growth. Safe and sustainable aerospace is non-negotiable to us or our stakeholders. The world will continue to fly and rightly so. There were 4.5 billion passengers that flew in 2019 and ATAG estimates that number will reach 10 billion a year by 2050. The aerospace industry can continue to grow but we must get to net zero carbon flights. Boeing is at the forefront of this journey. Our people around the globe and partnerships in our local communities are fundamental to this success. Below I describe our efforts that will allow our industry sector to decarbonise while ensuring the human connectivity, societal and economic benefits that come from aerospace are available to people everywhere.

OUR OPERATIONS

Decarbonising aviation begins at our manufacturing facilities and worksites. Boeing has bold goals to further reduce companywide greenhouse gas emissions from our operations by 2025. To that end, in 2019 we made strides in securing more renewable energy to power operations, building on our strong track record. Additive manufacturing, also known as 3D printing, is changing the way we design and build lighter products with fewer raw materials, creating less waste and improving fuel efficiency. Innovative materials and processes are improving product efficiency in several ways. Boeing's



Recycled Car Bumper: UK-based ELG Carbon Fibre Ltd. recycles carbon composite waste from Boeing's airplane production, which is sold to manufacturers that make car parts, computer laptop cases and other items. The first-of-its-kind partnership diverts about 1 million pounds of waste a year from landfills and has created a new circular supply chain.

product designs enable disassembly of parts and materials recovery resulting in aeroplanes that are nearly 90% recyclable by weight for parts reuse and scrap.

The company achieved net-zero emissions at manufacturing and worksites in 2020 by expanding conservation and renewable energy use while tapping responsible offsets for the remaining greenhouse gas emissions. New renewable energy procurements reduced greenhouse gas emissions by 10% in 2020 to significantly lower environmental impact. In support of our global sustainable manufacturing efforts, Boeing works with UK-based ELG Carbon Fibre Ltd to recycle excess carbon fibre material from the aeroplane assembly process. This first-of-its-kind partnership prevents about one million pounds (453.6 tonnes) of waste a year from going to landfills. The renewed carbon fibre is used by manufacturers to make computer laptop cases, automobile parts and other products. These efforts are rapidly developing into a scalable supply chain.

“Boeing has bold goals to further reduce companywide greenhouse gas emissions from our operations by 2025. The company achieved net-zero emissions at manufacturing and worksites in 2020.”

OUR PRODUCTS AND SERVICES

Boeing's commitment to energy-efficient and cleaner products supports the aviation sector's global commitment to carbon neutral growth from 2020 and approaching net-zero emissions around the middle of the century. When it comes to shaping the future of sustainable air travel, we know that decarbonising aviation and enabling people to fly safely and

sustainably will require different solutions tailored to needs, capabilities and constraints of different regions and markets.

Boeing is focused on a portfolio of solutions that encompasses airline fleet replacement, network operational efficiency, transition to renewable energy and advanced technology.

Airline fleet replacement

Boeing and the aviation industry have always made it our mission to improve fuel efficiency and reduce greenhouse gases through innovation. It's in our DNA to make flying more economical for airlines, affordable for more travellers and better for the environment. The company has invested more than \$60 billion over the last 10 years in key strategic areas including innovative technologies such as digital manufacturing, carbon composite materials, advanced high bypass-ratio engine designs and other aerodynamic improvements such as natural laminar flow that reduces drag to improve environmental efficiency.

As we continue to accelerate our focus on developing future technologies, the next generation of aircraft will incorporate the latest digital design, test and production tools, airframe, propulsion and systems technology, and different power solutions for different market segments and aircraft sizes. These latest commercial aircraft are 80% more fuel-efficient than the first generation of jet aircraft, and each new generation of aeroplanes reduces fuel use and emissions by 15 to 25%.

Network operational efficiency

The aviation industry continues to collaborate on how to operate and fly more efficiently, which collectively can reduce emissions by nearly 12% (Source: EUROCONTROL). Boeing works with airlines, government customers, air navigation service providers (ANSPs) and airports on efficiency improvements.

A tangible place where this type of collaboration comes to life today is the Boeing Global Services Digital Solutions and Analytics site in Frankfurt, Germany. This innovation hub features a digital laboratory with demonstrators and simulators including an Airline Operation Center (AOC), Boeing 787 cabin demonstrator and 787 flight simulator, an indoor drone test fly range and a Reduced Crew Operation (RCO) cockpit, where customers and visitors can learn about and experience innovative digital solutions for the future of civil aviation.

“Boeing is focused on a portfolio of solutions that encompasses airline fleet replacement, network operational efficiency, transition to renewable energy and advanced technology.”


Renewable energy transition and advanced technology

Another important lever at our disposal is the use of renewable energy, which is crucial for aviation to reduce carbon emissions. Here, different solutions make sense for different markets and different aeroplane sizes and missions. Renewable energy can include sustainable aviation fuels, but also green hydrogen or electric propulsion, and Boeing has a wealth of experience with all of them.

For example, we have established a joint venture called Wisk that is building and certifying an autonomous battery-electric aircraft for use in urban environments and very short-range missions, which not only has zero carbon emissions but also radically reduces noise pollution relative to helicopters. Battery-electric aircraft are intriguing and can be configured to support unique missions, but they're fundamentally limited to very few passengers and short ranges. Last year, Wisk and the New Zealand government announced a trial to advance autonomous passenger transport. Wisk is nearing completion of the planning phase for the trial and will be bringing our subsidiary Insitu Pacific into the programme to support the trial. Implementation, which is the next phase of the trial, is expected to begin later this year.

Boeing has also innovated with hydrogen, green hydrogen (created using renewable energy) and fuel cell applications for over 15 years. We have developed learnings and insights through four separate flight demonstration programmes with crewed and uncrewed aircraft using hydrogen fuel cells and combustion. We also have decades of hydrogen insights from our space programmes. These programmes, alongside our latest research, are informing future studies and partnerships. While these technology demonstrators and space applications are helpful to understand the underlying technology, there are still large science and engineering leaps required to mature these systems to work reliably, robustly and safely in a commercial aircraft environment. The aviation community needs to develop the commercial aircraft propulsion technology itself, the integrated aeroplane design and fuel systems and the supporting system infrastructure for production, storage, handling and delivery. All this innovation must ultimately meet or exceed today's high safety threshold and we will have to support and answer to regulators as they develop the new certification criteria. While we are encouraged by the investments going into this area, these considerations and the production of sufficient green hydrogen supplies will govern the pace of adoption, market penetration of fully hydrogen-powered airplanes and ultimately the net emissions reduction, placing hydrogen on a longer timeline.

As we mature these advanced technologies for mid- to long-term applications on select missions, we see scaling the production and use of sustainable aviation fuels (SAF) as the most direct way to make substantial reductions in net carbon emissions for aviation in the near term. SAF is proven, in use and widely recognised as offering the most immediate and largest potential to decarbonise flying over the next 20 to 30 years as a drop-in ready solution. It is not a silver bullet, but SAF is certainly a catalyst to decarbonising flight and achieving net zero climate goals.



“We see scaling the production and use of sustainable aviation fuels (SAF) as the most direct way to make substantial reductions in net carbon emissions for aviation in the near term.”

Boeing ecoDemonstrator SAF Testing: Boeing has been a pioneer in making sustainable aviation fuels a reality, including performance assessments conducted on the company's ecoDemonstrator flying test bed.

Boeing has been a pioneer in making sustainable aviation fuels a reality, partnering globally with airlines, industry, governments and research institutions to expand limited supplies and reduce the cost. We worked with airlines, engine manufacturers and others to conduct biofuel test flights starting in 2008 and gain approval for commercial use in 2011. In 2018, the Boeing ecoDemonstrator flight test programme made the world's first commercial aeroplane flight using 100% sustainable fuels with a 777 Freighter, in collaboration with FedEx Express. The company plans to work with regulatory authorities and across the industry to raise the current 50% blending limit for expanded use of SAF.

Since 2012, the ecoDemonstrator programme has accelerated innovation by taking nearly 200 promising technologies out of the lab and testing them in the air to address real-world challenges for the aviation industry, the environment and the passenger experience. ecoDemonstrator test flights are flown on a blend of petroleum and sustainable aviation fuel (SAF), which reduces life-cycle CO₂ emissions by up to 80%.

Despite all this progress, there remain challenges in scaling the use of SAF in aviation. As with many innovations that cross a valley from being technically feasible to commercially viable, SAF requires a framework that promotes further technology development, increases the supply and stimulates demand. Through various forms of incentives and public-private partnerships, SAF production can increase by ensuring that more technologies reach commercial scale.

Regulators play an important role in providing a clear path to scaled commercialisation. Policy is a key instrument for incentivising SAF production because it reduces perceived risk for prospective investors. More specifically, an incentive-based approach would create stable production and, as a result, market demand as the industry continues to innovate.

Furthermore, this can enable end users to make purchase commitments at prices approaching conventional fuel.

In our view, regulatory schemes that allow fuel producers to receive credits which are monetised based on fuel carbon intensity can send a positive market signal and create additional production capacity demand. A range of regulations are being implemented across the globe that offer effective mechanisms to support SAF market uptake using market-based mechanisms that allow providers to choose how they will reduce emissions while responding to consumer demand, such as the Renewable Transport Fuel Obligation in the UK, the Dutch Bioticket programme, Brazil's RenovaBio or the Low Carbon Fuel Standard in California.

When considering the scaling of SAF supply, it is vital to ensure the environmental integrity of the feedstock supply. This is why we support and rely on third-party sustainability standards to enable a diverse and sustainable feedstock supply such as the 12 Principles of the Roundtable on Sustainable Biomaterials.

As part of our global policy and partnership mission, we look forward to continuing our contribution to advancing the use of SAF in Europe; the upcoming release of the ReFuelEU Aviation regulation will be an important platform to further engage on the aforementioned opportunities and we look forward to working with our local partners to facilitate the growth of SAF.

Achieving an energy transition in air transport will require continued collaboration between industry, government, academia and civil society. As Boeing intensifies its focus on sustainability, we will continue to help advance policies, form partnerships, and share our position on sustainable aviation growth for the benefit of our sector and society at large. ■

DELIVERING A SUSTAINABLE AVIATION RECOVERY



Sustainability as a real and effective commitment to the environment is no longer an ethereal notion: it is essential and unavoidable, says

Amparo Brea, Innovation, Sustainability and Customer Experience Director at Aena



Environmental, social and corporate governance criteria are no longer an option to bring about change. The European Union's framework plan for green transformation, growing social awareness and the consequent regulatory pressure are forcing the industry to reflect deeply on sustainable practices. The path is already marked; it is not advisable to be left behind.

Additionally, the uncertainty derived from the impact of the COVID crisis and the necessary allocation of European Recovery Funds to projects that prioritise sustainability and digitalisation, has provided an even greater boost.

If we focus on the air transport sector, the COVID-19 pandemic and its ramifications are posing a major challenge for our industry's survival. It is especially significant in Spain due to the importance of tourism for the country, an industry that currently accounts for more than 12% of national gross domestic product (GDP) and where four out of every five international travellers who come to Spain choose air travel as their means of transport.

This has made us realise the importance of thinking ahead as a way to address the major threat of climate change, and we were clear that the industry's recovery plan had to factor in the ongoing climate and ecological crisis we are facing. Therefore, in terms of sustainability, and in spite of the current situation, our environmental performance is still a key priority in our management approach. As such, our strategic strands are built on the principle of green reconstruction so we can accomplish our decarbonisation and environmental protection commitments by working in partnership with our stakeholders.

At Aena we have been working for years to protect our environment. We have a large team that watches over the protection and conservation of the environment at our airports, under the framework of the Quality, Environment and Energy Efficiency Policy that had its first version in 1999.

In 2018 Aena's Board of Directors approved the company's Climate Change Strategy. This strategy is aimed at maximising energy efficiency and promoting the use of energy from renewable sources for self-consumption, as well as the implementation of innovative solutions to reduce the company's carbon footprint.

At the same time and as a result of all the above, Aena's commitment to sustainability and the fight against climate change has been valued and recognised throughout 2019 and 2020 by the Carbon Disclosure Project (CDP), granting the rating "Management A". This is the highest level awarded by CDP, placing Aena among only seven Spanish companies that have obtained this score and one of the few European airport companies that have this rating.

The Strategy has recently been revised and reinforced, with more ambitious objectives:

- Aena's carbon neutrality programme in 2026;
- Advance to 2040 the Net Zero commitment of ACI EUROPE, to be 0 net emissions in all the airports of the network.

But it is important to note that airports account for only a small part of total emissions in the aviation industry. This means we need to work closely with aircraft manufacturers, airlines, air traffic service providers, fuel producers, handling firms and other partners and stakeholders as a coordinated action group to put in place projects taking an integrated approach to the challenge of decarbonising the industry. To this end, Aena is engaged in promotion and partnership initiatives such as:

- Implementing new collaborative measures to enhance the efficiency of airport operations and lessen European airspace congestion by cutting waiting times and flight times;
- Licensing requirements for handling agents to replace equipment with less polluting alternatives;
- Promotional actions to scale up production and subsequent distribution of sustainable aviation fuel (SAF) at airports.

But we can still do more and that is why this year we have taken a big step. We have recently presented the first Climate Action Plan of Aena to the Board of Directors. We are one of the first companies in the world to submit our Climate Action Plan to a consultative vote of shareholders. The General Meeting that we held in April was the first in which the company was accountable, scrutinised and showed progress in this matter, becoming a permanent independent item on the agenda of our annual meetings.

Beyond our plans to increase the percentage of self-sufficiency from renewable energies from 70% to 100% within five years or to advance to 2040 the commitment of 0 net emissions in all the airports in our network, at AENA we are convinced that sustainability is more than a manual of good intentions, it is a decisive factor in our management and performance. ■

"At AENA we are convinced that sustainability is more than a manual of good intentions, it is a decisive factor in our management and performance."



CLIMATE-NEUTRAL AVIATION: REDEFINING BUSINESS AS USUAL



AIRBUS

Now is the time to invest in all possible avenues to reduce aviation's climate impact, says **Glenn Llewellyn**, Vice-President of Zero-Emission Aircraft at Airbus, whose climate strategy involves accelerating several pathways simultaneously while fostering the development of a new energy ecosystem.

These are exciting times for the aviation industry. Innovative technologies and new energy pathways are putting meaningful reductions in aircraft emissions over the next decade tantalisingly within reach. It's now up to the entire industry to decide whether we're ready to seize this opportunity or simply carry on with business as usual.

At Airbus, we've made our decision. Yes, we're ready. Today. Now. Immediately. We want to be the catalyst for change and are prepared to explore and invest in any technology solution that has the potential to take us there. This innovative spirit is fully rooted in an overall ambition that acts as our North Star: a zero-emission aircraft by 2035.

Ever since we at Airbus introduced our zero-emission concept aircraft known as ZEROe to the world in September 2020, I've been pleasantly surprised — and deeply humbled — by the incredibly positive feedback we've received from the aviation industry, governments and partners alike. It appears our instinct was right: our stakeholders' and the public's appetite for a viable path towards climate-neutral aviation has never been greater. We're absolutely committed to delivering on this ambition to ensure the long-term viability of our industry. And we're convinced there has never been a timelier or more urgent time to do so.

FAST-EVOLVING SOCIETAL AND REGULATORY EXPECTATION

The aviation industry has already set itself some ambitious targets to reduce its carbon dioxide (CO₂) emissions. But we need to go further, particularly in the context of a growing aviation market. Aircraft performance improvements, in particular, will remain key, while new energy pathways will be vital to achieving the disruptive CO₂ reductions the industry is targeting over the medium to long terms.

But decarbonising aviation isn't just about reducing CO₂ emissions: contrails and nitrogen oxide (NO_x) are climate-relevant emissions, too. We fully understand that society expects the aviation industry to deal with all aviation-related emissions, not just CO₂.

This is why, at Airbus, our priority is to deal with the complete climate-impact challenge, which includes overall greenhouse gases and other aircraft emissions. To this end, our climate strategy for aviation focuses on accelerating several solutions

“Our priority is to deal with the complete climate-impact challenge, which includes overall greenhouse gases and other aircraft emissions.”

simultaneously: offsetting, operations and infrastructure optimisation, technology development and a dynamic deployment of sustainable aviation fuels (SAF).

Indeed, all Airbus aircraft are certified to operate on up to a 50% SAF blend. Our “*Emission and Climate Impact of Alternative Fuels*” project, which focuses on evaluating the performance of 100% SAF on overall aircraft emissions including contrails with our partner network, will undoubtedly support SAF's future certification for blends that exceed today's maximum of 50%. In addition, we need to accelerate the development of power-to-liquid synthetic e-fuel (PtL) made of renewable energy – which we at Airbus see as having huge scalability potential.

Although solutions already exist to ensure our aircraft are compatible with SAF, there's still a lot of work to do to encourage SAF's uptake, which accounts for less than 1% of today's flights. Incentives and long-term policies that encourage SAF use will be essential in this respect. Aircraft and engine manufacturers will also need to collaborate further to explore and make technically and economically viable as many alternative pathways as possible.

All of this underscores the need for the entire industry to start building the foundation for a future zero-emission aircraft because societal expectation and changing regulations are moving quickly. At Airbus, we recognise the time is now to invest in all possible avenues to reduce aviation's climate impact, especially technology development, an area in which we're committed to taking the lead. On this front, we're excited by the possibilities, including a future game-changer – hydrogen.

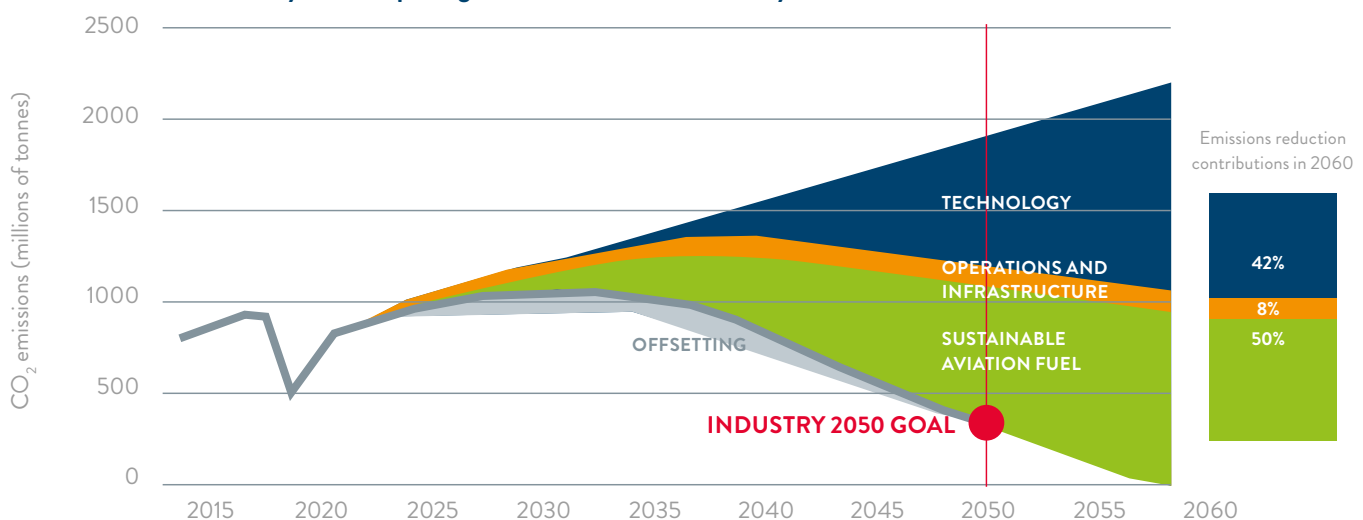
HYDROGEN: A GAMER-CHANGER IN ZERO-EMISSION TECHNOLOGY

As a potential fit for future aircraft, hydrogen stands out from the pack for a variety of reasons. It offers the highest potential to reduce aviation's climate impact. It is expected to be the most cost-effective fuelling option as the wider hydrogen ecosystem scales up. It has a higher power-to-weight ratio compared to batteries, which are the next best alternative. What is noteworthy about hydrogen is its high energy density (33 kWh/kg), which is nearly three times superior to jet fuel (12 kWh/kg). It emits no CO₂ if generated from renewable energy through electrolysis. This would essentially enable aviation to be powered by renewable energy. Hydrogen may also enable us to significantly reduce and maybe eliminate NOx and contrails. And as the energy sector continues its transition towards clean energy sources, we expect the cost of hydrogen to significantly decline over the next decade as its production ramps up at a large scale. This will make hydrogen increasingly cost-competitive with existing options, such as jet fuel and SAF.

Airbus is exploring a variety of technology options that leverage hydrogen, including hydrogen fuel cells, hydrogen combustion in modified gas-turbine engines and PtL synthetic e-fuel. Another option is a hybrid-hydrogen configuration in which the aircraft's gas-turbine engine could be augmented by an electric motor. The aircraft could thus potentially be powered by hydrogen and a hybrid-electric system powered by fuel cells. These technologies are complementary, and the benefits are additive.

Hydrogen is likely to be a solution for several industries to meet their climate-neutral targets, from automotive and marine to rail. At Airbus, we believe aviation should be no exception. In fact, recent internal Airbus calculations have shown that hydrogen has the potential to contribute up to 50% towards reducing aviation's climate impact through PtL synthetic e-fuel, which highlights just how important the scale-up of renewable energy is for aviation.

The aviation industry's roadmap to significant emissions reduction by 2050





“We recognise the time is now to invest in all possible avenues to reduce aviation’s climate impact, especially technology development.”

SAFETY AT THE HEART OF FUTURE AIRCRAFT

Today, hydrogen is a fuel we’re learning about from the automotive and space industries, both of which have been using hydrogen safely for decades. For the aviation industry, it will be mandatory to manage hydrogen at least as safely as kerosene.

Yes, the aviation industry can be proud of the impressive safety record we’ve achieved in the design and operation of today’s aircraft. This safety record is due to the enormous efforts made to make kerosene safe through special design and operating precautions.

It’s evident that hydrogen has different characteristics compared to kerosene. Nonetheless, safety systems and precautions, which will use different technologies and architectures compared to kerosene, will need to be put in place to meet or exceed the safety standards of current aircraft. On this point, Airbus will make no compromises.

At the same time, we won’t be satisfied with simply putting a hydrogen-powered aircraft into the air: we’re targeting wide-scale adoption and that starts with putting in place hydrogen infrastructure worldwide. The availability of hydrogen to fuel future aircraft is undoubtedly a key concern, but we’ve been carefully observing the hydrogen ecosystem and are excited by the incredible progress. In the European Union (EU) alone, the EU Hydrogen Strategy has been accelerating progress across the continent. Initial analyses show hydrogen production is shaping up to be much less centralised than oil production, which suggests this future energy ecosystem could benefit more countries compared to the existing fossil-fuel ecosystem. We expect all of this rapid development to help drive down the costs of hydrogen for aviation, while boosting its availability in the years to come.

THE ROAD AHEAD TO CLIMATE-NEUTRAL AVIATION

No single company can take on the Herculean task of decarbonising the aviation industry alone. An entire ecosystem will need to be put into place, one that will involve key players from a variety of different sectors.

Hydrogen-powered commercial aircraft may not take to the skies for another decade, but Airbus is already working to make it happen. We’re collaborating closely with a network of partners, including engine manufacturers, to push the development of the various hydrogen technologies. A final decision on technology choices and aircraft configurations is expected by 2025.

In parallel, we’re working alongside our airline and airport partners on “Hydrogen Hub at Airports” an initiative that investigates infrastructure requirements for hydrogen deployment. Specifically, we’re collaborating with airports that are planning a stepped approach to deployment, including using hydrogen to decarbonise airport facilities, ground operations and transportation (buses, tow trucks, cargo trucks, etc.). This is expected to pave the way to hydrogen availability for aircraft by the mid-2030s.

The road to climate-neutral aviation is already mapped out and we at Airbus strongly believe we have the duty to accelerate new energy pathways to make this vision a reality. To get there, significant investment and cross-industry collaboration will be required — two areas in which Airbus is fully committed. ■

IMPROVING NETWORK PERFORMANCE BY INTEGRATING OPERATIONAL AND TECHNICAL WORKING GROUPS




The Network Directors of Operations (NDOP) and Network Directors of Technology (NDTECH) working groups work together with the Network Manager Management Board to ensure the Operational Excellence programme is fully supported by specialist technical and operational expert stakeholder representatives. **Ulf Thibblin, Chair of NDTECH, and Xavier Benavent, Chair of NDOP, report.**

If Europe's air traffic management (ATM) system is to optimally support a recovery in European aviation and then evolve to a new ATM architecture which can flexibly adapt to rapidly changing market conditions, it will require a new way of linking the EUROCONTROL Network Manager (NM) and stakeholder interests within the framework of the Single European Sky vision.

The Network Directors of Operations (NDOP) and Network Directors of Technology (NDTECH) working groups are working with the NM Management Board (see "NDOP and NDTECH – providing stakeholder support to operational excellence") to do exactly that: bring together all relevant stakeholder groups to define priorities within EUROCONTROL's Operational Excellence Programme. These have changed. Conceived at a time when capacity optimisation was one of the key drivers - behind safety enhancement - for the operational excellence programme the work of NDOP and NDTECH in 2020 has focused on redefining the programme's priorities to ensure they are relevant to the new market conditions.

"It has been a challenge," says NDOP Working Group Chair Xavier Benavent of ENAIRE. "Collaboration is crucial for the recovery but the onset of the pandemic has meant we have to deal with different recovery plans at air navigation service provider (ANSP) and State levels, different budgets and different strategies for surviving the pandemic. So it has been very important to understand each other's position. Some States have seen traffic levels decline deeply while others less so and we still do not know when the recovery will happen."

"What we have seen during the COVID-19 crisis is that as a community we can't easily scale up and down at a technical level," says NDTECH Working Group Chair Ulf Thibblin of LFV. "Our airspace is not designed to be changed that rapidly and we apply quite rigid rules on the numbers of controllers per sector, for



“One of the main achievements of collaboration between NDTECH and NDOP is that there is now more awareness of the needs of the network”

example. But it is clear that we will need to change both technical and operational aspects together, so if we introduce a more flexible system on the technical side we will be able to translate this to more flexibility on the operational side.”

In September 2020 NDOP/NDTECH organised a joint workshop in cooperation with SESAR Joint Undertaking and the SESAR Deployment Manager to finalise and agree the new priorities of the Operational Excellence Programme. The workshop was an important milestone in bringing together more than 200 representatives from all stakeholders – including civil and military airspace users, ANSPs and airports – to re-examine new ways of collaboration to improve the recovery process. It has also helped to build new levels of trust between different stakeholders, say work group experts. In Europe politics is never far from the surface but if smaller stakeholders see their future independence will not be compromised by data sharing they start to become more open, more willing to share, and everyone gains from this process.

NDOP AND NDTECH’S WORK HAS ALREADY STARTED TO YIELD OTHER IMPORTANT RESULTS

“One of the main achievements of collaboration between NDTECH and NDOP is that there is now more awareness of the needs of the network,” says Xavier Benavent. “Everyone has been understandably focused on their local levels without taking into account the needs of their neighbours. Now we have weekly meetings to look at what will happen next week, what weather to expect, potential industrial action, so we can think of solutions

altogether. To the external world this may not seem very much, but it is.”

In January 2021 EUROCONTROL launched a new portal that provides detailed information on the teams and groups working on NM issues. The portal maps the various groups and sub-groups linking NM and operational stakeholders in the collaborative work to ensure capacity matches demand while helping stakeholders meet their goal of close-to-zero air traffic flow management (ATFM) delays and develop more efficient and green trajectories.

Another key benefit from this cooperation has been the increased sharing of data among stakeholders, a vital element to improving the performance of the network at all levels.

“When it comes to collecting data from the communications, navigation and surveillance (CNS) infrastructure there are many stakeholders involved” says Ulf Thibblin, “including airlines and the military. Some are amenable to sharing data but other less so. We have been working on improving the collection of data monitoring and how this relates to the evolution of the CNS infrastructure, which is starting to provide multiple benefits. We have the NDTECH meeting the day after the NDOP meeting and that gives the technical side the opportunity to comment on operational aspects - and vice versa. It also means that the Operational Excellence work programme has been given more substance because it has been approved by both groups.”

This is particularly important currently as many ANSPs are reducing their infrastructure as a result of the COVID-19 crisis and it is vital that the operational implications of this are fully explored. It is also important to ensure that when money is available for investment it is used in the right way. “This process has to be customer driven and therefore it’s very important

NDOP AND NDTECH – PROVIDING STAKEHOLDER SUPPORT TO OPERATIONAL EXCELLENCE

The Network Directors of Operations (NDOP) and Network Directors of Technology (NDTECH) are two of the three working groups of the Network Management Board (the third is the Budget Working Group). In late 2019, EUROCONTROL launched the Operational Excellence programme, in cooperation with operational stakeholders, to improve European network performance by identifying and agreeing optimal operational and technical evolutions required to meet improvement targets. NDOP and NDTECH have pivotal roles to play in this initiative and are working with stakeholders across the aviation community to prioritise performance improvements from 18 workstreams - including procedures, resources, ATM throughput, CNS, interoperability and so on - across five different domains: Operational, Capacity, Network, Airports and Infrastructure.

to keep this close cooperation between operations and technology,” says Ulf Thibblin.

That means the NDOP/NDTECH teams are addressing not just technical and operational issues but critical funding issues, too. For example, discussions are underway among stakeholders about progress on strategic programmes such as datalink, which will require a coordinated approach among ANSPs and aircraft operators – if these critical programmes are slowed because of funding issues it is important to explore new financing avenues to ensure the benefits are realised as widely and as quickly as possible.

As well as ensuring resources are properly matched to the current demands of airlines and the wider aviation ecosystem, NDOP/NDTECH experts are also looking to the future, to plan for a post-pandemic world where Europe's ATM system will again face major capacity issues. In the short term this means evolving the airspace, operational concepts and the infrastructure to provide optimal levels of capacity so airlines can grow their services in line with market demand without restrictions and at the most affordable cost. In the longer term, it will mean developing an ATM system which will rapidly be able to adapt to sudden peaks and troughs of demand.

NDOP/NDTECH TEAMS WORKING IN CLOSE COLLABORATION WITH NM WILL HAVE A CRITICAL ROLE TO PLAY IN THE LONGER TERM

Accelerating automation and digitalization will create a more flexible total system that better can manage traffic fluctuations and capacity-versus-workforce levels. *“That will change the way the system is managed and will require technology and operations to be more closely coordinated and involves many change management aspects,”* says Ulf Thibblin. *“If Europe were a single country we wouldn't need the number of control centres, controllers, radars we have today so from a theoretical perspective it's very simple. If we strengthen cooperation and build trust we can work towards common goals and move faster, even though we are not one country.”*

“Collaboration is vital to our future,” says Xavier Benavent, *“and collaboration with the NM in particular is excellent. But our problems will not be solved purely by reactive cooperation, we have to work hard to achieve a proactive partnership to get a stable traffic prediction for staffing levels as airlines and States can overnight decide to cancel large numbers of flights. But at least we can work together to resolve these issues as best as we can despite budget restraints and limited staff availability.”* ■

“If we strengthen cooperation and build trust we can work towards common goals and move faster, even though we are not one country.”

“WE ARE NOW ALL COLLABORATORS WORKING WITHIN A SINGLE NETWORK”

The last 18 months has seen the EUROCONTROL Network Manager forge more collaborative relationships with aviation stakeholders, paving the way to a coordinated recovery, according to **Steven Moore**, Head of ATM Network Operations at EUROCONTROL.

How do you begin to develop a recovery plan when we don't know what the recovery will look like or when it's going to take place?

EUROCONTROL has been working on weekly recovery plans since the end of April 2020 so we're now very experienced at looking at the signs and trying to work out what recovery will look like over a six-week period. Since the start of the year, in consideration of COVID-19, European States have been trying their best to keep a lid on international travel so I think we have a good idea of what's going to happen, especially as we now have close collaboration with airports, airlines and air navigation service providers (ANSPs).

Our planning has become a great deal more precise as airlines are now providing us with much more accurate information. Airlines, especially the low-cost carriers, have done a lot more modelling around when passengers will be more likely to buy tickets if they are confident of their travel plans. And we have had a lot of practice now – we've produced over 24 rolling six-week plans, with many four-week plans prior to that.

We have released the network Ops Plan for the summer this year, predicated on many States opening up, and this been developed with more information than we've ever had before, mainly because airlines and airports have had more time to look scientifically at what they're going to do and how they're going to ramp up.

Low-cost carriers say they can get back to 80%-plus capacity in under ten days, so we have to make sure that ATC at airports and ANSPs are ready, not just from the point of view of air traffic but also practically on the ground with all the support that is required, at airports, which is why we are working with stakeholders like ACI EUROPE. Airlines understand that while they may be able to ramp up very quickly, they will need to give as much notice as possible to those suppliers in the network. This is where the close coordination and rolling plans really provide a single point of truth and focus.

We've also been running a series of webinars with ACI EUROPE around the spacing required in terminals for COVID-19 compliance – and understanding how their planning is linked to airline schedules.



“But as more countries get on top of their vaccination programme, I think we’re less likely to see these short, sharp lockdowns and we’re more likely to return to an era of consistent growth.”

We have seen a sudden flare-up of the pandemic in India, which shows just how unpredictable the market can be. Do we now have the tools in place to deal with these sudden troughs and spikes in demand?

Airlines are absolutely able to deal with this. Airports and ANSPs are becoming much better at it. For example, we have recently seen a pandemic flare-up in Turkey, which has been the one area driving most of the passenger traffic across Europe.

It has given us a very good pointer on what happens when a significant aviation market more or less closes.

But as more countries get on top of their vaccination programme, I think we’re less likely to see these short, sharp lockdowns and we’re more likely to return to an era of consistent growth.

Can you estimate how much capacity has been taken out of the European network since the start of 2020?

In theory, we haven’t lost any capacity and we’ve possibly gained some, because with the massive reduction in traffic we have managed to relax some of the Route Availability Document (RAD) measures.

But what we have lost is the recency in the ability of air traffic controllers and airport staff to handle efficiently the number of flights they were managing in 2019.

This means that potentially the capacity levels of ANSPs are not initially going to be the same as they were in 2019. Many have been running simulations and with the rolling NOPs we’re asking all ANSPs to plan for 10% greater demand than in the forecasts. But if low-cost carriers suddenly begin flying 80% of their 2019 schedules it would take more than eight or nine days for controllers to get back up to speed.

ANSPs have been using simulators to keep their controllers current – but this is not the same as pilots retaining their skills in flight simulators. There will potentially be issues regarding tactical restrictions when a significant spike in traffic demand occurs. Even if summer-sun traffic this year is just 60% of 2019, that is 23,000 daily flights in the network with concentrations of traffic down to the Balearics for example. There will be pinch points and it’s the job of the Network Manager Operation Centre (NMOC) to make sure that we are doing everything we can to alleviate those bottlenecks with a minimal amount of delay. Since 2012 colleagues in the NMOC have been working hard to reduce delays averaging 3-3.5 million minutes each year by tactical use of re-routings, off-loads, active slot list management, e-Helpdesk support, and more recently a dedicated Airport Position.

“We are all collaborators in that network, and we need to keep that close contact going. “

In 2021 we're still driving for as close-to-zero delay as possible, with the best trajectories. But if the traffic in the sectors is all more or less one-way heading southeast or southwest to the major tourist destinations in the sun at six in the morning, and then coming back in the opposite direction a few hours later, there's going to be some bottleneck capacity issues. We're going to have to work really hard in the flow management positions here in the NMOC, and with Air Navigation Service Providers (ANSPs), airports and aircraft operators to make sure we do everything we can with re-routing and tactical measures to keep delays to a minimum, always taking a network view for the best solution to ensure safety, best trajectories and keeping delays to a minimum.

There are two opposite drivers in the network – one is to ensure we protect the environment as much as possible and the other to enable as much growth as possible. Have we been able, in the last 18 months to square at least some of that circle by introducing better trajectories and using the network more intelligently?

The Operational Excellence Programme is a critical part of that and there is an ongoing commitment from the EUROCONTROL Network Manager to work with ANSPs to redesign route restrictions entirely and remove as many as possible. The relaxation of the route restrictions saved around 24,000 nautical flight miles, producing thousands of tonnes of savings in emissions. As aviation returns post COVID the environment is increasingly more likely to drive behaviours and changes – for example in some countries, “flight shaming” is an important factor in traveller decisions.

In the operations room we are actively working with airlines and the dispatchers day-to-day to make sure that flight plans are the most efficient possible, managing rerouting proposals with new tools and a dogged determination to offer the very best support and routings in terms of both delay and the environment.

We've also introduced the Airport Function as a permanent feature in the ops room. This allows airports to link as critical nodes into the network system, so we have a similar link to them as we have with airlines. This is going to make a significant difference, as we expect there will be concentrated traffic demand at certain airports and colleagues working within the NMOC will be there to support the airports in this critical recovery period.

We've also worked hard this past year on delay mitigation and how we can understand much better why delays have occurred in the network and then act on that to prevent or reduce the chance of reoccurrence. We are now much more proactive in our post-operations analysis than before, starting with critical operational feedback from the NMOC colleagues, and then from the actors involved from within the network. We have turned this process into a proactive and collaborative review with daily and hourly breakdowns where necessary, to make sure that the system capacity is optimised as far as possible and, importantly, sharing the output of such post-operative analysis not just with colleagues within the NMOC, but also the stakeholders in the network.

We plan the day, we execute the plan for the day, we review the plan of the day against the tactical reality, we learn from it, and then disseminate the lessons ensuring that the next plan picks up the salient elements thereby allowing for a cycle of continuous operational improvement.

But some things have changed in the market – France and Germany, for example, say they want to remove domestic flights and replace them with fast train services.

Yes and that's absolutely right, proper and understandable. That will remove localised pressure at airports like Charles de Gaulle and Amsterdam. But there aren't many people flying short internal flights and those that do tend to be travelling on business. From my personal experience, where the train is a viable alternative it's already the preferred mode of transport, but in many cases this is just not possible. Therefore credible changes must be made, and the system that remains must allow for the greatest reduction to the environmental impact must be upheld. Electrification of both aircraft for short trips, and at airports is a real key enabler, along with significant improvements in the network in terms of true gate-to-gate planning and execution.

“iNM is more than just a system upgrade. It's the systematic re-development of how aircraft trajectories are managed within the network and beyond.”

Has this crisis improved the dialogue between the various stakeholders?

Yes, undoubtedly. Competing airlines, airports and ANSPs are now much more interested in collaboration to do their very best for the combined interests of the network and to support the recovery for all.

Closer collaboration is key. In the past EUROCONTROL, I think, has been seen to be on the side of ANSPs but from my perspective as Head of Operations, it's very clearly now about taking all stakeholder views into account. We are all collaborators in that network, and we need to keep that close contact going. We need to work in a very agile manner to make sure that we're dealing with problems before they arise via the rolling weekly NOP meetings, and when they do arise, dealing with them tactically and feeding back to ensure lasting learning and change.

In the medium to longer-term we will need to use elements from the Operational Excellence Plan to work on the application of new measures, to evolve flight planning and improve system connectivity and interoperability. We are making sure that everything is optimised to the benefit of the customer - and stakeholders.

Airports don't need people sitting around waiting for an aircraft to turn up because of a weather problem that has been known about for three days. We are all getting better at information sharing and the next logical step is much closer collaboration and shared planning to address the challenges when they become clear, rather than wait for them to require last minute action.

What news is there on upgrading the NM's systems?

The integrated Network Management (iNM) programme of the software system is massively significant and heralds the start of nine years of exciting development and change. This is not akin to moving from an iPhone 3 to an iPhone 13, it's moving from a Bakelite phone on the kitchen wall to the latest smartphone in one go. It's more than just a systems upgrade, it's the systematic re-development of how aircraft trajectories are managed within the network and beyond.

The flight plan goes in the system and once it is accepted it is locked and subject to any regulations. But we're going to go to a more 4D trajectory-based operation where the trajectory of the flight is planned with target times over key positions, managed actively by NM in collaboration with ANSPs with full B2B data communication. We refine the plan up to an hour before the flight reaches points on its route and then the ANSPs continue to manage the tactical aspect of the individual flight, while we ensure the smooth passage through the network for all flights.

The buffers that currently exist in the network, the airline schedules, the capacity of the ANSP sectors and the runway slots will eventually be rooted out through the efficiency of the new technology - be under no illusion how significant the changes required are and how beneficial the output will be. But it will be five to nine years before we see that really maturing into operational reality - it is that seismic. In this way, the future of the network is truly exciting, while also allowing for significant environmental improvements along the journey and I am so very proud to be part of the team making this possible here at the EUROCONTROL Network Manager. ■



EUROPE IS NOW IN THE FAST LANE TO IMPLEMENTING UAS TRAFFIC MANAGEMENT SYSTEMS

With the adoption of the U-space regulatory package Europe is now on the fast track to implementing drone eco-systems throughout the continent. EUROCONTROL is providing key services to Member States and industry in developing a safe and profitable European-wide unmanned air systems (UAS) market. **Munish Khurana**, Business Development Manager at EUROCONTROL, explains.



In April 2021 the European Commission adopted the U-space package, three regulations that together create the conditions necessary for both drones and manned aircraft to operate safely in section of airspace known as U-space. The regulations introduce new services for drone operators, allowing them to carry out more complex and longer-distance operations, particularly in congested, low-level airspace (below 120m) and when out of sight.

In enacting the regulations, European Commissioner for Transport Adina Vălean said: *“Drones are a clear part of the future transport and logistics landscape. There is vast potential when it comes to new cargo and delivery services, as well as other innovative applications, including drone flights with passengers on board in the future. This has clear added value in terms of achieving our decarbonisation, digitalisation and resilience ambitions, and the U-space package is an important step towards creating the well-functioning, trusted and safe enabling environment that we need to develop a competitive EU drone services market.”*

Member States of the European Civil Aviation Conference (ECAC) now have the task of implementing U-space regulatory procedures so drone operators can build their businesses in a seamless European market. Some States - such as Poland, Belgium, Italy, Germany, United Kingdom, France, Spain and Switzerland - have already begun the process but many others have been waiting for the regulations to be enacted before starting the U-space implementation programmes.

This has created a patchwork of U-space service areas in Europe, some of which are relatively mature while others are still in the preliminary planning stage. The regulations are also at a relatively high level and considerable work needs to be undertaken to understand how they should be introduced at an operational level – the provision of aeronautical data for U-space areas, for example - and a standards level, where key standards for the exchange of safety data have yet to be fully agreed. Further work will also be needed to support the regulator in determining validation and certification of U-space service providers (USSPs) and defining acceptable means of compliance for national regulators in certifying U-space areas. The devil is in the detail.

EUROCONTROL is playing a pivotal role in supporting States introduce U-space concepts, while, in parallel, enabling industry take the next steps to developing commercial drone operations at scale by helping to support the creation of standards and regulations which will underpin a seamless European market.

“For the least mature States the major challenge is a lack of awareness,” says Munish Khurana, Business Development Manager at EUROCONTROL's Directorate European Civil-Military Aviation. *“Many can't get internal stakeholders to agree a common policy to implement U-space so we can help by offering a general overview of U-space developments in Europe to see how other States have developed a common approach. We offer this support as part of the regular training packages we deliver throughout the year. And, when requested, we can also provide more bespoke support to help EUROCONTROL Member States in implementing U-space in their country. We have developed a method for airspace assessments that we have applied to conduct an airspace assessment in Latvia (<https://www.eurocontrol.int/publication/riga-airspace-assessment>), and are currently applying it to conduct airspace assessments at Estonia, Israel and Italy. Based on our experience of conducting airspace assessment, we are constantly refining the method. We plan to publish a more mature version of the airspace assessment method on the EUROCONTROL website.”*

EUROCONTROL's U-space/drone industry support programme now spans a wide range of activities (See: *“Six work programmes to advance UTM and drone integration”* box), from helping to define outstanding regulations and standards (See: *“Supporting the development of standards and regulations in U-space and counter-UAS”*) to providing the technical support to validate U-space operations and procedures.

Through its work in the network of U-space demonstrator programmes and supporting States implement U-space programmes, the Agency has become a unique repository of expert knowledge which it is making available to a wide range of stakeholders. For example, the Agency's communications, navigation and surveillance (CNS) expertise in UAS operations is supporting industry partners in cyber security matters, ensuring spectrum-for-drones policies are aligned with information gathered from relevant ICAO working groups and helping the Direction des Services de la Navigation Aérienne (DSNA) in France ensure security issues are properly addressed in U-space developments. The Agency is also promoting EASA initiatives on disseminating best practices and ongoing activities with non-EUROCONTROL International States as part of the EU/EASA international workshops and activities.

“We are also now developing a validation centre, a centre of excellence for drones and urban air mobility (UAM) in Bretigny,” says Munish Khurana. *“We want to be able to have the capability to validate U-space services in a simulator environment, something that our stakeholders have very much welcomed.”*

“The Commission has also requested that we look to expand the scope of the European Network of U-space Demonstrators beyond demonstration into implementation, including UAM.”

This will be challenging work - UAM involves the most highly complex type of operations supported by U-space, with relatively high levels of risk, so EUROCONTROL's role in this area will be crucial in operational integration of UAM in the airspace.

And timescales are tight. For example, France plans to have a UAM eco-system in place for the 2024 Olympics and Paralympic games and is setting up a dedicated test area at Pontoise airfield, around 35 kilometers northwest of Paris, to trial the various concepts. EUROCONTROL is providing support on technical and operational aspects.

“Work has also begun to define a global U-space/UTM concept of operations,” says Munish Khurana. *“There are concepts of operations in place in some parts of the world and increasingly being identified in others but they are not necessarily all interoperable and may be defined in different regions in different ways. For vehicle manufactures this would present a major challenge – it would mean that a vehicle developed for a region might not be suitable elsewhere. So we are starting work in a new group led by Airbus and Boeing, endorsed by ICAO, to define a global concept of operations and develop a global action plan. In this area, EUROCONTROL can be an independent, neutral stakeholder representing all stakeholders in Europe.”*

“We want to be able to have the capability to validate U-space services in a simulator environment, something that our stakeholders have very much welcomed.”

SIX WORK PROGRAMMES TO ADVANCE UTM AND DRONE INTEGRATION

EUROCONTROL supports the European initiatives related to U-space in six main areas:

Research and Development

Key research projects related to U-space that EUROCONTROL is actively involved in are:

Single European Sky ATM Research (SESAR) U-space projects

- **CORUS-XUAM** (Concept of Operations for euRopean U-space Services – eXtension for Urban Air Mobility)
- **BUBBLES** (BUilding Basic BLocks for a U-Space SEparation Management Service)
- **DACUS** (Demand and Capacity Optimisation in U-space)
- **ICARUS** (Integrated Common Altitude Reference system for U-space)
- **INVIRCAT** (IFR RPAS Control in Airports and TMA)
- **URCLerED** (Unified Integrated Remain Well Clear Concept in Airspace D-G Class)
- **AURA** (ATM U-Space Interface)

Horizon 2020 U-space related Research projects

- **5D-AeroSafe** (5 services of Drones for increased Airports and waterways Safety and security)
- **LABYRINTH** (Unmanned Traffic Management 4d Path Planning Technologies for Drones)
- **Drone4Safety** (Inspection Drones for Ensuring Safety in Transport Infrastructures)

Other research activities

In addition to its contribution to SESAR projects, EUROCONTROL via its Drone Unit and the SJU actively cooperate to develop and maintain the U-space research baseline (CONOPS, requirements, link to the Master Plan, Business Model) through regular review update of the U-space Baseline considering the latest **SESAR project outcomes** and update the European U-space community by organising workshops and events to promote, aid and accelerate the application of U-space/UAM research

U-space and drone related regulations

EUROCONTROL provides technical and operational support to development of International and European regulations related to UAS and U-space within both the International Civil Aviation Organization (ICAO) and European Union Aviation Safety Agency (EASA).

U-space and drones related standards

Within the European Organisation for Civil Aviation Equipment (EUROCAE), the Agency is working on counter-UAS standards and within the International Aviation Transport Agency (IATA) to provide domain expertise in developing a document on “Unauthorized UA incursions at the airport”

Support to States

EUROCONTROL supports them in technical and operational matters related to U-space and UAS. To promote interoperability of a future UAS and U-space system at global scale, EUROCONTROL coordinates and exchanges information with other geographical regions such as the United States, China, Japan and Australia.

Advisory services to transition from U-space demonstrations to implementations

In collaboration with its institutional and industrial stakeholders, EUROCONTROL provides technical advisory service on U-space matters, promotes harmonisation of U-space in Europe and in partnership with European Commission, DG-Move, EASA and the SJU, the Drone unit of EUROCONTROL facilitates sharing of lessons learnt via **European Network of U-space Demonstrators** to support European businesses to transition from U-space demonstrations to implementations. **EUROCONTROL monitors and reports on annual basis** the status of U-space demonstration projects and implementation status of U-space services.

Training

In partnership with EUROCONTROL Luxembourg, the drones unit delivers training virtually and physically on matters related to U-space and UAS on regular basis.



SUPPORTING THE DEVELOPMENT OF STANDARDS AND REGULATIONS IN U-SPACE AND COUNTER-UAS

EUROCONTROL provides technical and operational support to U-space and counter-UAS (C-UAS) regulatory and standards guidance.

For **EASA**, the Agency has and is providing support to

1. U-space Regulation, endorsed by the EASA committee
2. Ongoing development of Acceptable Means of Compliance and Guidance Material for U-space Regulation:
 - Lead WP1 Airspace Risk Assessment and WP5 U-space - Flight authorisation
 - Participate in development of WP5 U-space- Flight authorisation, WP7 Electronic conspicuity (reg. amending SERA) and WP9 - Coordination with local authorities
3. Drone regulation 947/2019 and 945/2019
4. Work package management and Technical support to EASA to prepare aerodromes to mitigate potential risks from unauthorised UAS (or drones)

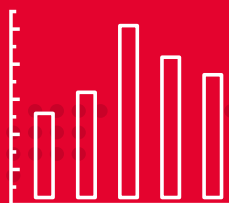
Promote the guidance material using the extensive stakeholder network of EUROCONTROL

For **EUROCAE**, the Agency is providing support to develop standards for

1. Counter UAS (C-UAS)
2. ED-286 OSED for C-UAS in controlled airspace
3. Interoperability requirements for C-UAS systems
4. System Performance Requirements for non-cooperative UAS detection systems

For **IATA**, the Agency is providing domain expertise in developing a document on “Unauthorized UA incursions at the airport”.

For ICAO, the Agency is a member of the ICAO Remotely Piloted Aircraft Systems Panel (RPASP) and co-rapporteur of its C2-link working group, defining a datalink critical for air traffic services (ATS) and air traffic control (ATC) data/voice communications. It is also a member of the ICAO UAS Advisory Group.



DATA

Traffic Evolution between worldwide regions (number of flights)

Jan-May 2021 vs. Jan-May 2019

REGION	JAN-MAY 2021	JAN-MAY 2019	CHANGE
Intra-Europe*	1,139,723	3,310,486	-66%
Europe <-> Asia/Pacific	60,865	116,978	-48%
Europe <-> Mid-Atlantic	12,342	27,289	-55%
Europe <-> Middle-East	80,400	196,622	-59%
Europe <-> North Atlantic	66,304	158,422	-58%
Europe <-> North-Africa	44,900	142,985	-69%
Europe <-> Other Europe	45,251	134,906	-66%
Europe <-> South-Atlantic	9,631	26,929	-64%
Europe <-> Southern Africa	27,617	46,778	-41%
Non Intra-Europe	347,310	850,909	-59%

* Europe = ECAC 44 Member States

Top 20 Traffic Flows

RANK	DEPARTURE STATE	ARRIVAL STATE	AVERAGE DAILY FLIGHTS (JAN-MAY 2021)	CHANGE VS. 2019 (%)
DOMESTIC FLOWS WERE THE MAIN DRIVERS OF EUROPEAN TRAFFIC DURING THE PERIOD JANUARY - MAY 2021				
1	France	France	674	-37%
2	Spain	Spain	567	-50%
3	Norway	Norway	545	-28%
4	Turkey	Turkey	504	-45%
5	Germany	Germany	348	-63%
6	Italy	Italy	346	-55%
7	United Kingdom	United Kingdom	321	-68%
8	Greece	Greece	171	-38%
9	Germany	Spain	150	-69%
10	Sweden	Sweden	133	-64%
11	France	Spain	101	-67%
12	United Kingdom	United States	95	-66%
13	France	Germany	90	-73%
14	Portugal	Portugal	87	-43%
15	Germany	United States	84	-43%
16	Germany	Italy	83	-78%
17	Germany	Turkey	82	-63%
18	Germany	United Kingdom	82	-80%
19	Russian Federation	Turkey	63	-50%
20	Poland	Poland	62	-46%

Market Segments

Jan-May 2021 vs. Jan-May 2019

TOTAL FLIGHTS

Jan-May 2021	1,550,125
Jan-May 2019	4,264,109

↓
-63.6%



Traditional scheduled

Jan-May 2021	721,524
Jan-May 2019	2,289,991

↓
-68.5%



Low-cost*

Jan-May 2021	204,357
Jan-May 2019	1,282,242

↓
-84.1%



Business aviation

Jan-May 2021	214,941
Jan-May 2019	265,648

↓
-19.1%



All-cargo*

Jan-May 2021	142,775
Jan-May 2019	130,548

↑
+9.4%



Other types

Jan-May 2021	111,480
Jan-May 2019	114,924

↓
-3.0%



Charter

Jan-May 2021	114,179
Jan-May 2019	135,653

↓
-15.8%



Military

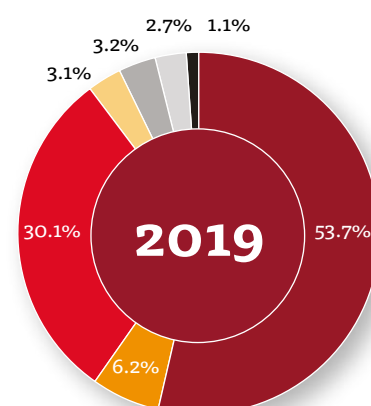
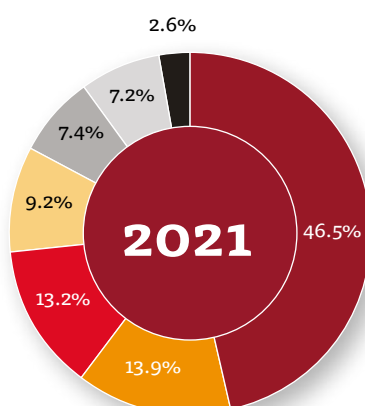
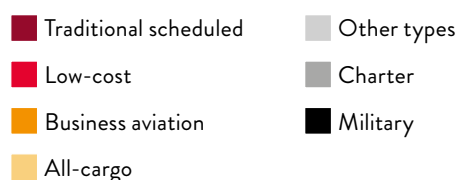
Jan-May 2021	40,869
Jan-May 2019	45,103

↓
-9.4%

Share of Total Flights for the period Jan-May

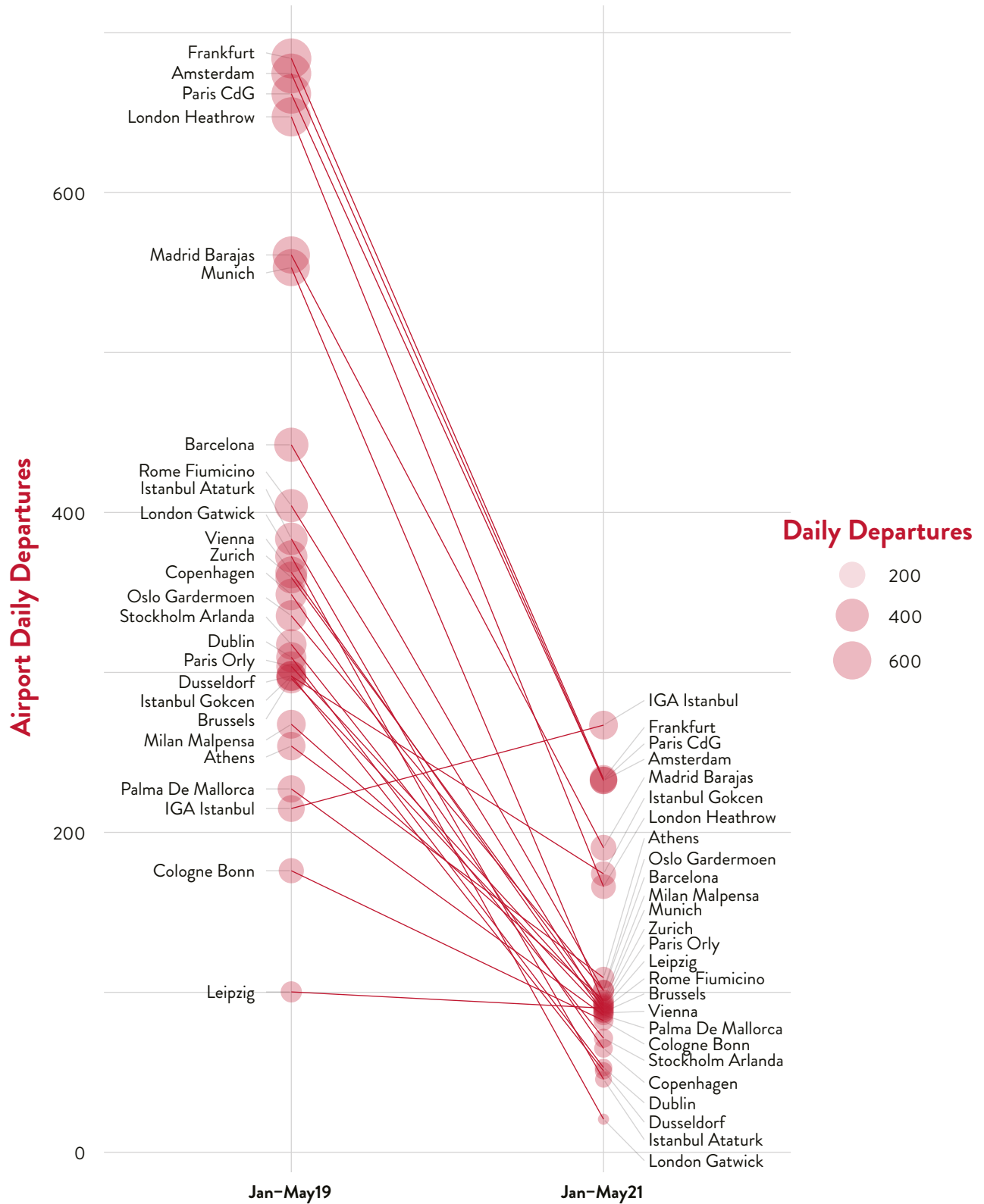
***All-cargo** was the only segment to record growth in Europe. The share of total flights tripled compared to the same period in 2019.

***Low-cost** flight volume was six times as less numerous as it was prior to COVID-19 and the segment reduced by more than half its share of total flights.



Daily Departures at Top Airports

Jan-May 2021 vs. Jan-May 2019



Top 20 Aircraft Operators

Average daily flights

Jan-May 2021 vs Jan-May 2019

1		Operated 645 flights	↓	-49% of same period in 2019	11		Operated 163 flights	↓	-33% of same period in 2019
2		Operated 426 flights	↓	-64% of same period in 2019	12		Operated 152 flights	↓	-71% of same period in 2019
3		Operated 320 flights	↓	-78% of same period in 2019	13		Operated 140 flights	↓	-73% of same period in 2019
4		Operated 300 flights	↓	-63% of same period in 2019	14		Operated 133 flights	↓	-62% of same period in 2019
5		Operated 273 flights	↓	-87% of same period in 2019	15		Operated 119 flights	↓	-87% of same period in 2019
6		Operated 266 flights	↓	-15% of same period in 2019	16		Operated 108 flights	↓	-49% of same period in 2019
7		Operated 253 flights	↓	-42% of same period in 2019	17		Operated 105 flights	↓	-60% of same period in 2019
8		Operated 207 flights	↑	+10% of same period in 2019	18		Operated 102 flights	↓	-81% of same period in 2019
9		Operated 175 flights	↓	-78% of same period in 2019	19		Operated 92 flights	↓	-51% of same period in 2019
10		Operated 172 flights	↓	-89% of same period in 2019	20		Operated 89 flights	↓	-74% of same period in 2019

* Reference is made to the airline's group



NEWS

FROM THE AVIATION NETWORK

4 June 2021

SESAR JU EXECUTIVE DIRECTOR ANNOUNCES DEPARTURE

The SESAR Joint Undertaking announced that Florian Guillermet, Executive Director, will step down from his role on 4 July to take up a new position as CEO of DSNA (Direction des Services de la Navigation Aérienne), France's air navigation services provider.

3 June 2021

COMMISSION PROPOSES A TRUSTED AND SECURE DIGITAL IDENTITY FOR ALL EUROPEANS

The European Commission has proposed a framework for a European Digital Identity which will be available to all EU citizens, residents, and businesses in the EU. Citizens will be able to prove their identity and share electronic documents from their European Digital Identity wallets with the click of a button on their phone.

3 June 2021

EU TRANSPORT MINISTERS ADOPT POSITION ON SINGLE EUROPEAN SKY

The Council agreed its position on the **reform of the Single European Sky**. The aim of the reform is to improve European airspace management and the air navigation services system in order to increase capacity, improve cost-efficiency and increase the system's ability to adapt to variations in traffic, while also trying to reduce aviation's CO₂ footprint.

The package consists of an amended proposal for the recast of the Single European Sky regulation (SES 2+) and a proposal for a regulation amending the EU Aviation Safety Agency (EASA) basic regulation.

3 June 2021

UNITED AIRLINES BUYS SUPERSONIC AIRLINERS

United Airlines has announced a commercial agreement with Denver-based aerospace company Boom Supersonic to add aircraft to its global fleet as well as a cooperative sustainability initiative. Under the terms of the agreement, United will purchase 15 of Boom's 'Overture' airliners, once Overture meets United's safety, operating and sustainability requirements, with an option for an additional 35 aircraft.

3 June 2021

PLANE AND TRAIN: GETTING THE BALANCE RIGHT

EUROCONTROL published its Think Paper #11 which looks at the role air and rail can play in achieving carbon neutrality by 2050. This Think Paper assesses the extent to which a shift from air to rail is feasible for travel below 1,000 km; where there are natural complementarities between the two industries; what impact such a shift would have in terms of reducing total transport emissions; and what environmental, economic and societal implications this would have.

2 June 2021

EASA PROPOSES USE OF NEW TECHNOLOGIES TO SUPPORT ALL-WEATHER OPERATIONS

The European Union Aviation Safety Agency published a proposal to update the regulatory framework applicable to all-weather operations (AWOs) and flight crew training to allow the application of latest technological advancements. This proposal would increase the number of medium-sized aerodromes which are accessible for flight operations.

2 June 2021

EUROPE'S NETWORK OF U-SPACE DEMONSTRATORS PUBLISHES INVENTORY OF TEST CENTRES

The European Network of U-space Demonstrators has created an inventory of U-space test centres, including their value proposition, the specific services they offer, organisations that can access their services and contact details of the test centres. This information is made available for each country in Europe that provided data of their U-space test centre(s). The information in this inventory allows individuals, organisations and institutions to obtain U-space test facilities from test centres of their choice and promote collaboration for future business between organisations. The information can be accessed at the home page of **European Network of U-space Demonstrators**.

1 June 2021

CLEAR HOPE FOR SOME RECOVERY THIS SUMMER AND BEYOND

EUROCONTROL has issued a new set of Traffic Scenarios detailing the monthly evolution for the period up to December 2021. Air traffic throughout Europe was 61% down in May 2021 compared to May 2019. While the crisis continues, the trend is moving upwards and there is hope of some recovery this summer.

1 June 2021

HALO TO BUY 200 EVE URBAN AIR MOBILITY SOLUTIONS EVTOL PASSENGER AIRCRAFT

Halo has announced an order for 200 Eve electric vertical takeoff and landing (eVTOL) aircraft, with deliveries expected to start in 2026. This order represents one of the largest in the UAM industry and secures Halo as the launch partner for Eve in both the US and the UK markets.

31 May 2021

EUROCONTROL AND EASA LOOK TO HELP DECARBONISE AVIATION PROPOSING "FIVE PILLARS FOR A GREEN SINGLE EUROPEAN SKY"

The publication of "Five Pillars for a Green Single European Sky", a joint non-paper co-authored by EUROCONTROL and EASA, the European Union Aviation Safety Agency, proposes five pillars that, if implemented together, would allow the European air traffic management (ATM) system to contribute its utmost to the EU's climate-neutrality ambition by enabling aircraft and airspace users to further reduce their carbon footprint.

28 May 2021

EUROCONTROL SUPPORTS NATIONAL JUDICIARIES IN NEED OF AVIATION EXPERTISE WITH THE FIRST LIST OF AVIATION PROSECUTOR EXPERTS

EUROCONTROL in cooperation with the International Federation of Air Traffic Controllers' Associations (IFATCA) and the European Cockpit Association (ECA) supports Member States and their judiciaries in finding aviation safety experts trained in Just Culture principles to assist national prosecutors entrusted with the judicial review of aviation incidents and accidents. Experts can be requested to help prosecutors understand the details of aviation occurrences so prosecutors can make an informed decision whether a judicial investigation or criminal prosecution is necessary or not.

26 May 2021

EASA COMPLETES FIRST CO₂ EMISSIONS CERTIFICATION FOR AIRBUS A330-900

The European Union Aviation Safety Agency (EASA) has for the first time certified an aircraft for CO₂ emissions, applying a new process and methodology and so progressing towards its vision for an ever safer and greener civil aviation. The new certification process provides an assessment of an aircraft's fuel efficiency and therefore of the CO₂ it emits while in operation.



Creating Skies Together

indracompany.com

In ATM we connect people, places and skies, making everything work. We partner with our clients building the future together.

indra