SKYWAY

AUTUMN / WINTER **2020**

SUPPORTING EUROPEAN AVIATION

THE IMPACT OF
COVID-19

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SMITH

CEO OF AIR FRANCE-KLM

THE NEED TO REINVENT THE AIR TRAVEL EXPERIENCE

RECOVERY WILL BE A LONG-HAUL FLIGHT

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COVID-19
HAS RADICALLY
CHANGED HOW WE UNDERSTAND OUR WORLD
AND OUR ABILITY TO MOVE FREELY AROUND IT

In 2019, over 11 million flights operated inside Europe, carrying over 2.4 billion passengers. So far in 2020, we have seen just over 4 million flights and as many as 1 billion fewer individual journeys. Tens of thousands of jobs have already been lost and an estimated six million more remain at risk; the overall loss to the aviation industry this year alone has been estimated at over €140 billion.

The pandemic has devastated our industry and the people who work in it; trying to ride it out is not an option. In order to survive, we need to take decisive and radical steps to mitigate the immediate impacts while putting in place the building blocks for a more robust and adaptable post-COVID aviation system.

> "COVID-19 has been an unprecedented calamity for European aviation and its effects will be with us for many years to come."

DECISIVE FINANCIAL SUPPORT

When the COVID crisis hit in March and faced with collapsing traffic levels and a catastrophic loss of liquidity in the system, EUROCONTROL reacted swiftly to support the European aviation ecosystem. With flights being cancelled and passengers unable to fly, by the end of the month it was already clear that the airlines were suffering a severe cashflow problem. In early April, the EUROCONTROL Member States took a major decision to defer up to €1.1 billion of route charges, easing the airlines' immediate liquidity burden.

And by June, EUROCONTROL reached an agreement with a major consortium of international banks to put in place a massive loan facility of €1.3 billion to support the air navigation service providers (ANSPs) whose revenues have been decimated by the traffic collapse. Securing a loan of this size, especially given challenging market conditions, was far from simple but it provided badly needed liquidity for many ANSPs and enabled them to continue to play their essential role in keeping the skies safe and operational.

Internally, EUROCONTROL has also implemented a number of emergency actions to reduce immediately costs and prioritise our activities going forward to concentrate on those that will best help our stakeholders – the airlines, airports, ANSPs, and our States – to survive the pandemic and then to recover – in fact, not just recover, but build back better.

AUTHORITATIVE DATA REPORTING ON THE CRISIS AND THE RECOVERY

Reliable facts are essential for decision-making in a crisis, and since the start of the pandemic, EUROCONTROL has massively ramped up its reporting and analysis, releasing our unique data to all aviation actors, from industry leaders to aviation stakeholders, press and public. Since the start of the crisis, we have released over 1,500 communications reporting on different aspects of the crisis with around 20 million views of our press releases, weekly status reports, animations, dashboards, tweets and other social media posts.

Key new weekly products like the Comprehensive Assessment, providing a regular snapshot of the challenges faced by the network, or the EUROCONTROL Network Manager Network Recovery Plan, which reflects a huge coordination effort by the EUROCONTROL Network Manager and its partners to balance capacity at airports and in airspace with airline demand, have proven essential for operational stakeholders as they plan their recovery. These have been invaluable in putting European aviation back on its feet and enabling a smooth recovery from the low point of April, with over 95% of traffic down, to a summer with traffic having recovered to around 50% of 2019 levels – an increase achieved with almost no delays and few surprises. This represents an impressive achievement, correctly identifying where the demand for traffic would be and what impact this would have on airports and ANSPs so that they could plan accordingly.

Our analysis and insights into the progress of the impact of the pandemic have proven reliable and accurate, with our Draft Traffic Scenarios estimating very accurately the recovery of traffic in light of demand and changing restrictions. These have been complemented by new interactive dashboards providing very detailed information on a daily basis at country, ACC, airport or airline level.

KEEPING THE NETWORK RUNNING WHILE IT RECOVERED

Our essential operational activities have continued in the EUROCONTROL Network Manager and at our Maastricht Upper Area Control Centre despite challenging conditions, with all the vital health and safety measures imposed by the pandemic to reorganise rosters so that business continuity was always maintained. This enabled us, even during the worst of the crisis, to keep the network running so that essential flights, such as cargo and repatriation flights, could continue safely. The European Aviation Crisis Coordination Cell (EACCC), co-chaired by the European Commission and by EUROCONTROL as Network Manager, has worked hard to improve coordination in much-needed areas, such as

EUROCONTROL DRAFT TRAFFIC SCENARIOS

PUBLISHED ON 14 SEPTEMBER 2020 (BASE YEAR 2019/2020)

● Actual
● Previous Scenario (24/04)
● Current Status Scenario (14/09)

harmonising NOTAMS; making the rules for cargo flights (and their crews) more practical and consistent; and achieving greater clarity and consistency on establishing the health procedures to be applied at airports and in aircraft. EASA was a key part of this work and we fully support their initiatives.

THE PANDEMIC – WHERE DO WE GO FROM HERE?

EUROCONTROL and our aviation partners have worked really hard to enable a smooth recovery. However despite research such as the one from IATA showing the very limited risk of in-flight transmission, the situation since the summer has shown that passenger confidence is heavily dependent on State decision-making. Faced with ever-changing colour codes for destinations and the risk of quarantine going out or returning, many have opted to stay at home. Put simply, quarantines are the kiss of death for our industry.

Unfortunately, States have responded to a resurgence in the pandemic by imposing a bewildering and rapidly changing set of travel restrictions. I welcome the work of the European Commission in pushing for more coordination and the decision by the European Council to put in place a common map identifying the level of risk across the Continent. This is vitally needed, both for greater understanding and acceptance of restrictions by the public and also for the aviation industry, which is finding it increasingly difficult to plan ahead. It's a start but will not be enough to create the environment in which people wish to travel and aviation can meet those needs.

We also need greater coordination in the approach taken by States to testing – both before and after travel. Greater availability and use of testing would really help to make travel possible for people who have a pressing need to travel but who are prevented from doing so by the need to quarantine either in the destination country or on their return. I hope that these are areas that will be further examined by the European Council in the coming weeks.

BUILDING BACK BETTER

COVID-19 has been an unprecedented calamity for European aviation and its effects will be with us for many years to come. But at the same time, I firmly believe it represents an unprecedented opportunity for all aviation actors to work together to make our industry better, to tackle the big, longer-term issues now, even while the crisis is continuing.

Central to this is the leadership of the European Commission, which has worked with everyone in aviation to put on the table proposals to reform the Single European Sky. These proposals have the potential to be a game changer in terms of helping European aviation to build back better. A vital part of that is making the Performance Scheme much stronger with improved and more meaningful incentives to encourage States and ANSPs to do what is best for the whole industry in the long term.

It is also the right moment to refocus research, to achieve a stepwise improvement ahead of the full return of traffic. Research must be focused on supporting the recovery and providing long-term resilience, making ATM more scalable and responsive. The Strategic Research and Innovation Agenda (SRIA) has huge potential to harness the potential of new technologies – exciting new ideas like Innovation Labs that bring innovation closer to the end user which Laurent Renou talks about in this magazine and tighten the feedback loop with those who will actually operate the innovations.

Another promising development is the evolution of the SESAR Deployment Manager into the Infrastructure Manager, which will massively improve feedback between operations, implementation and research. These better linkages will also be reflected in the work by EUROCONTROL to partner airspace users, airport operators and ANSPs, deploy solutions in tandem, and strengthen working relationships between the EUROCONTROL Network Manager, the SESAR Joint Undertaking and operational stakeholders.

As the recovery continues, the focus will increasingly be placed on sustainability in support of the European Green Deal. This summer, we have seen more efficient flights – shorter routes with better vertical profiles. At the same time, delays have been almost eliminated (less than a second of en-route delay per flight compared with 2½ minutes last year). The challenge facing us is how to make sure that we do not lose all the cost and environmental benefits we have seen this summer. We need to avoid returning to the capacity crunch expected before COVID-19 – and to make more efficient flights the 'new normal'.

At the same time, we will go on working with our partners across the industry and internationally to help drive the green transition. We are very focused on ensuring that Sustainable Aviation Fuel can be adopted swiftly and smoothly and that the investments will be there to ensure that a new generation of airframes can be smoothly integrated into the overall aviation system.

2020 has painfully demonstrated that a virus can radically change the world we live in, and the industry we believe in. While the situation today remains very difficult, as I look around, everywhere I see huge efforts to manage and mitigate the pandemic together; we need to carry that optimism forward and use it to make the big decisions to ensure that our industry can come out of this crisis more sustainable and more resilient, more able to confront the challenges of the post-COVID world.   ∎

BUSINESS CONTINUITY THROUGHOUT THE CRISIS

"BUSINESS AS USUAL" FOR ATM SYSTEMS' DELIVERY DURING COVID-19

The unprecedented challenges of 2020 have required us to demonstrate reliability and flexibility on a daily basis right across the business. When the COVID-19 pandemic erupted, we were proactive to trigger a wide range of business continuity measures to facilitate remote collaboration and continue to deliver on our commitments. Furthermore, due to the excellent collaborative relationships which Indra maintains with all our ANSP customers, we have been able to provide them support and guidance to address their challenges through the crisis.

As the coronavirus-related restrictions swept through Europe earlier this year, Indra employees were sent to work from home, including all the members of the Indra ATM European Programmes division working in Spain and UK on the NATS programme. This came at a critical time in the project: in the middle of a Factory Acceptance Test preparation, and just days in advance of a key user evaluation of the latest build of the iTEC software planned to be deployed in Prestwick and Swanwick.
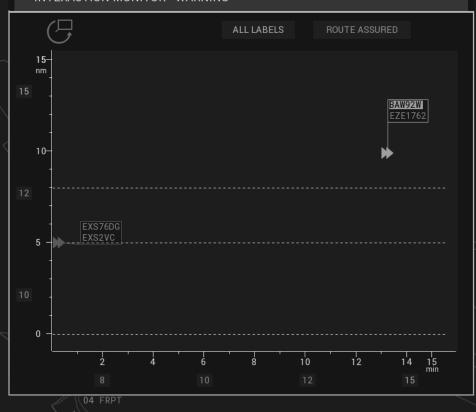
Indra was in parallel conducting a corporate digital transformation programme, and had just rolled out new collaboration tools. The sudden change to remote working forced us to adapt quickly to a new model of collaboration, immediately exploiting the new capabilities that these tools provided us.

The user evaluation of the latest iTEC release, normally a multi-day presential event attended by a number of NATS users at Indra's facilities near Madrid, was swiftly reconfigured to run virtually. NATS controllers – already working from home – attended the evaluation virtually with their devices plugged into large-screen home displays in order to be able to view the screen share adequately. The event was a real success in that – despite the lockdown – the output from the activity was considered "business as usual". Not only were users able to evaluate the latest operational improvements, with results comparable to a standard face-to-face activity, the new way of working made the evaluation much more accessible to a wider range of users, both during and – via the recordings – after the event.

An even more significant challenge posed by remote working related to the preparation for a Factory Acceptance Test. This phase of the project, characterised by intensive test activities, was performed completely remotely, with software and test teams sent home with large-screen displays and external, secure access to test environments. The culmination of these activities is the FAT itself, which was attended virtually by customer representatives who witnessed tests executed by Indra engineers using environments physically located in three different locations across two countries. The adaptability and commitment demonstrated by the

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BAW92W
EZE1762

EXS76DG
EXS2VC

04 FRPT

internal teams, together with the collaborative relationship with the customer, allowed this activity to conclude successfully and with no impact on the project schedule.

Also for the customer's onsite activities, there was an urgent need to adapt to the new situation. Indra, already familiar with the solutions needed to allow secure remote access to environments, and in collaboration with NATS and its eco-system of suppliers, provided technical guidance and support for the deployment and configuration of the facilities. This allowed a key set of customer onsite activities to continue in a remote manner.

These examples demonstrate Indra's flexibility and reliability – core values of the company – in the face of unprecedented circumstances. Nevertheless, how is Indra preparing for the new situation that we all find ourselves in? The rapid adoption of new technologies and ways of working that allowed us to continue throughout the lockdown goes - in fact - much wider than business applications. Indeed, Indra is already delivering the benefits of digital transformation to the ATM industry in taking the steps towards a Digital European Sky. In order for the European ATM network to recover from this once in a generation event, we consider that it is essential to work towards making the future airspace more scalable, sustainable, efficient, resilient, and predictable. Indra's

trajectory-based ATM systems such as iTEC can be deployed in a flexible, virtualised configuration, fully in line with the SESAR proposed Airspace Architectural Study. In particular, through cyber-resilient architectures and virtual centres, Indra's solutions are designed to provide the required business continuity.

The COVID-19 pandemic has brought an acceleration in the continual evolution of working practices, some of which it will be beneficial to maintain even after the crisis has passed. We are using technology and data in new ways, accomplishing difficult tasks remotely and achieving positive results.

Indra

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WE NEED TO REINVENT THE AIR TRAVEL EXPERIENCE

The COVID-19 crisis is forcing the airline industry to reinvent itself. Only those businesses that can transform themselves, quickly, deeply and sustainably will survive, says **Benjamin Smith**, CEO Air France-KLM

AIRFRANCE KLM
GROUP

In just a few weeks, the COVID-19 pandemic has turned the planet upside down: from an open and accessible world, we have changed into a compartmentalised world separated by borders. For several months, airlines suspended almost all their operations. And while we are slowly and conditionally regaining the freedom to travel within countries and across continents, the future of air transport is being jeopardised by this crisis, both in terms of its short-term economic impact and its longer-term values and responsibilities.

NEW RESPONSIBILITIES

Airlines will, of course, continue to connect continents and people, economies and cultures, because they play an essential role in sharing knowledge and in the perpetual progress of our global society. It is impossible to imagine the world we dream of without air transport. However, the crisis facing our industry must lead us to rethink the way it works, even reinventing itself in several respects.

As we know, the aircraft is the safest means of transport. Since its origins, players across the aviation industry have been pioneers in the field of safety, developing and sharing new technologies to make air travel ever more reliable. Today, we must extend the concept of aviation safety to include health and hygiene, to assume a vital new responsibility in the world that is opening up to us. At Air France-KLM, we have been working tirelessly since the beginning of the crisis to do just this. The Group's airlines have taken stringent measures to guarantee the highest level of health and safety, taking passengers' temperatures, wearing masks, ensuring the highest levels of cabin air quality, and implementing additional disinfection measures wherever possible. To remain a preferred means of transport in tomorrow's world, air travel must ensure health and hygiene safety remains just as much a priority as the strict physical safety of our passengers.

ACCELERATING THE INDUSTRY'S ECOLOGICAL TRANSITION

While the need for environmental stewardship has become increasingly obvious, the demands of governments, as well as of their citizens, have become ever more rigorous. This is a very good thing. It is essential to respond to the immense climate challenges ahead of us by collectively exploring all avenues to reduce greenhouse gases, noise pollution and all forms of negative environmental impact.

The entire air transport ecosystem must make a joint commitment: airlines must promote biofuels and develop eco-piloting, with a fleet of more modern aircraft.

Aircraft and engine manufacturers, too, are reducing their carbon footprint through innovation and construction processes and developing more fuel-efficient aircraft components. The most efficient aircraft are no longer the largest, and priority is being given to the latest generation of aircraft, such as the Airbus A350, A220 and the Boeing 787, which are marking the end of the four-engine aircraft era sooner than expected.

With this collective approach, we must one day succeed in designing a "clean" aircraft, as daring and sustainable as the electric car was for the automobile sector. In the great tradition of disruption in our industry, we must be at the forefront of innovation so that future generations can continue to travel, discover the world and connect people everywhere.

MEETING NEW DEMANDS

While air travel has become rather routine, our customers are now questioning the relevance of such a travel solution: why take the plane and not the train? Why even travel when global lockdown has proven the effectiveness of videoconferencing? Which airline can best meet passengers' new aspirations? Faced with these unprecedented questions from their customers, airlines will have to transform the experience they offer them. The travel experience must be re-thought: from flexibility during booking to the consumption of local produce on meal trays, and from the elimination of plastic on board to frequent flyer programmes offering "environmental miles". In this new paradigm, it is the most responsible airlines that will prove resilient in this historic crisis, because they will be the ones who rewrite the future of air travel and adapt to a new travel reality.

AIR TRAVEL WILL NEVER BE THE SAME AGAIN

Near the beginning of the COVID-19 crisis, we saw several airlines disappear within a few weeks. The consolidation of the sector, which had largely begun in recent years, is likely to accelerate, as well as new alliance strategies that will help restore profitability in a sector now affected by new challenges.

The aviation industry is (still) living through a crisis, and as it emerges it will have to align the aspirations of customers and global citizens everywhere with redesigned and renewed products and services. It is only by resolutely committing to this transformation that the air transport industry will contribute to reinventing the travel experience for the twenty-first century.

"In the great tradition of disruption in our industry, we must be at the forefront of innovation so that future generations can continue to travel, discover the world and connect people everywhere."

THE CRISIS IS ALSO AN **OPPORTUNITY FOR REBUILDING** EUROPE'S AVIATION SYSTEM

The current crisis provides an opportunity to make the sector more resilient, more sustainable and more competitive, says **Henrik Hololei**, Director-General for Mobility and Transport at the European Commission

I think we can all agree that the past six months have been particularly challenging for all of us. For aviation the world turned upside down as people simply stopped travelling, forcing us to adapt to a new grim reality.

At the same time, the coronavirus pandemic exposed many weaknesses across our aviation system for which we did not have a quick fix. Liquidity was an immediate concern, one that would threaten the existence of many players in the European aviation value network. Against this background, it is safe to say that the impact on the sector has been catastrophic, not only for aircraft operators, but for every player in this intertwined network: airlines, airports, air navigation service providers (ANSPs), aircraft manufacturers, ground handlers and those in travel retail.

That being said, I would like to pay tribute to the work of EUROCONTROL, under the strong leadership of Eamonn Brennan, to identify relief measures for ANSPs and Member States, and for the efforts to cut the agency's costs. This work has played a major part in stabilising the situation, in ensuring we have a safety net in place and ultimately preventing the collapse of the route-charge system. A crisis can put any partnership under pressure, but in this case I am more convinced than ever of how well EUROCONTROL and the European Commission (EC) are working together to support European aviation in these challenging times and to lay the groundwork for future recovery.

At the beginning of the crisis revenues in aviation evaporated overnight, and financial support was absolutely critical. We won't know the full extent of the impact for a while, but one thing is already certain: that we must now – together – rebuild a robust aviation system. This will be essential for wider economic recovery.

The European Commission will of course continue to ensure that the aviation sector receives the best possible support during these difficult times. For grants and loans, we need to ensure that taxpayers' money targets sustainable investment. The main challenges for aviation before the pandemic were to become sustainable and to address a lack of capacity. The sustainability challenge has not disappeared, and recovery needs to take that into account. Sustainable growth is essential across the entire transport sector once we are out of the coronavirus crisis.

As restrictions were lifted in a gradual and coordinated manner, passenger flights within Europe resumed in June and July. Unfortunately a second wave of uncoordinated and – arguably from a health perspective unsubstantiated – restrictions across Europe slowed down the recovery in early August. Traffic is now less than 50% of 2019 levels and might go much lower. The Commission will continue to play its part in ensuring that any measures taken by Member States that restrict free movement due to the coronavirus pandemic are coordinated and clearly communicated at the European Union (EU) level.

Longer term, our priorities from before any of us had ever heard of coronavirus still stand. We remain committed to the European Green Deal objectives, which means cutting transport emissions by 90% by 2050. Every transport mode must do its bit to cut emissions, including aviation. And we still need to tap into the enormous potential of digitalisation and smart solutions. Ultimately, pursuing these objectives is also key to greater resilience against future crises, as our forthcoming Strategy on Sustainable and Smart Mobility will make clear later this year.

For example, the Sustainable Infrastructure Window is specifically designed to support private investments in transport infrastructure and fleet renewal, with the greening of mobile assets already having been identified as a priority. The Recovery and Resilience Facility, the largest instrument created under Next Generation EU with a total budget of €560 billion, also offers opportunities for the air transport sector's green and digital transition. This funding will be used by Member States on the basis of Recovery and Resilience Plans, which will detail the sectors to benefit from such support. These plans will be embedded in the European Semester, and aligned with national energy and climate plans. Finally, a reinforced Horizon Europe budget will ensure that Europe continues to drive research and innovation in transport, as it has been doing through the SESAR and Clean Sky programmes. The final parameters of the plan still need to be agreed by the European Parliament and the Council of the EU.   ▸

RECOVERY PLAN FOR EUROPE

The Recovery Plan for Europe is the crown jewel of the EU's recovery process. It will help repair the economic and social damage inflicted by the coronavirus pandemic, harnessing the full potential of the EU budget. A new €750-billion recovery instrument called Next Generation EU, accompanied by a revamped EU budget of €1,100 billion, will support the hardest hit sectors of our economy, including the aviation sector.

"A new €750-billion recovery instrument called Next Generation EU, accompanied by a revamped EU budget of €1,100 billion, will support the hardest hit sectors of our economy, including the aviation sector."

REFORMS

Winston Churchill once said, "never let a good crisis go to waste". That is why I firmly believe that the recovery, and addressing the weaknesses that the crisis exposed, must also go hand in hand with the structural reforms that were already needed pre-coronavirus. They will not disappear, and we need to address them today.
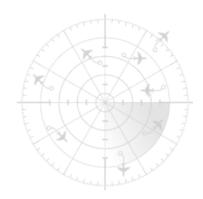
As a first step, we must have an open and constructive dialogue between all aviation stakeholders, national authorities and European institutions. This is why we launched our aviation recovery round table initiative. As painful as the current crisis is, we have no choice but to try to turn it into an opportunity – an opportunity to make the sector more resilient, more sustainable (both from an environmental as well as from a social perspective) and more competitive.

Second, we need a swift agreement on the Single European Sky (SES) reform, followed by an equally swift implementation. If our recovery fails to address our structural and capacity problems we will have failed. Flexibility and resilience must become part and parcel of air navigation services. Reforms are also necessary from an operational perspective to make sure that airspace design and configuration is up to date and ready to deal with future challenges. The crisis provides an opportunity for reflection, to ensure that infrastructure is neither out of date or redundant.

DIGITALISATION AND AUTOMATION

We need a sector that can reap the benefits of digitalisation and automation. For example, we need an optimal regulatory, operational and technical framework, if we are to benefit from unmanned aircraft operations, initially at low altitude. This is a prerequisite for safe, efficient and secure access to airspace for a large number of drones across both controlled and uncontrolled airspace. Together with the European Union Aviation Safety Agency (EASA), and building upon the results of the SESAR research and demonstration projects over the past three years, we are working on the creation of the U-Space, an unmanned traffic management system.

"We have no choice but to try to turn it into an opportunity to make the sector more resilient, more sustainable."

SUSTAINABILITY

The European Green Deal sets the EU's overall ambition of creating the first climate-neutral continent by 2050. Our objective is to use the recovery as an opportunity for aviation to become more sustainable. The ReFuelEU Aviation initiative has an important role to play here. Sustainable aviation fuels have the potential to significantly reduce aircraft emissions, particularly liquid advanced biofuels and electro-fuels, which are fully compatible with current technology and already certified by EASA for up to 50% of the fuel used during a flight. However, this potential is largely untapped as such fuels represent only 0.05% of total jet fuel consumption. This initiative is expected to deliver by the end of this year. I firmly believe this is doable. I have heard strong calls from the Member States, the aviation industry, the fuel industry and non-governmental organisations (NGOs), for EU policy action to bring sustainable fuels to aviation. We are ready to operate this transition and massively scale up our production in the EU.

The Commission will also continue to support the SESAR and Clean Sky joint undertakings. Under the latter, stakeholders from the aeronautics industry and research community have already proposed a Strategic Research and Innovation Agenda that acknowledges our climate goals and demonstrates an ambition to have new, disruptive technologies ready by 2030. This would create opportunities for industry to market these technologies towards 2035.

In addition, for carbon-neutral aviation to become a reality, we need the right infrastructure. Multimodality is key here, which is why the Commission will support projects creating greener access to airports by integrating them into a genuinely sustainable multimodal network. We have also published a call for research proposals under the Horizon 2020 Green Deal Call on "green airports and ports as hubs for sustainable and smart mobility", which focuses on large-scale demonstrations of green airports.

Finally, Europe cannot decarbonise aviation alone. We also need to continue working with our international partners, including on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The programme will kick off on 1 January 2021, and the offsetting programmes and emission units have now been set by the International Civil Aviation Organization (ICAO).

"Sustainable aviation fuels have the potential to significantly reduce aircraft emissions. However, this potential is largely untapped as such fuels represent only 0.05% of total jet fuel consumption."

REGIONAL AND INTERNATIONAL COOPERATION

Going beyond EU issues towards pan-European cooperation, ensuring close collaboration with our closest neighbours in the region remains a priority for the years to come. The European Civil Aviation Conference (ECAC) and ICAO are key partners to that end. We are collectively stronger when we act together to tackle global challenges.

Looking ahead, there will certainly be much to keep all of us very busy in the coming months. Recovery will not be immediate, and nor will the switch to a more sustainable and smarter way of flying. I would like to emphasise that while we are hopeful about recovery, we are not there yet, and I would therefore urge caution. However, I cannot underline enough the importance of smooth cooperation between European institutions, but also between Member States and industry. This really is the not-so-well-kept secret to success.

Finally, I just want to say that I believe in this sector and its ability to recover, modernise and continue to grow, offering people opportunities and choices to discover new places, visit old places and see friends and family across the world. And to offer businesses vast opportunities and to continue to support high-quality and highly skilled jobs. This sector has successfully gone through many crises and always learned from them. It is because of the dedicated people who work in this sector and I fully trust their ability to make this sector again a great success.

COVID-19
AND RECOVERY OF AVIATION
FROM TESTING TO THE NEW NORMAL

Olivier Jankovec, Director General of ACI EUROPE, argues that anticipating and embracing societal changes and economic transformation will be the most important challenge for aviation

For a trade association like ACI EUROPE, a crisis of the magnitude of the COVID-19 pandemic is a defining moment. It comes with the opportunity - or rather the imperative - to prove our relevance and provide tangible value for our airport members. But while we have certainly spared no effort to support airports across Europe navigating the shock of COVID-19, we still have a mountain to climb when it comes to securing the conditions that will finally see airports and the whole of aviation recover.

The restart came fairly quickly from the moment confinement policies were relaxed, with the Aviation Health Safety Protocol developed by the EASA in close cooperation with the ECDC playing an essential role. But as infections started to climb again, European States promptly reinstated travel restrictions. They did so in the worst possible way: without coordination, without reasonable advance notice, with quarantines – and very often with public expressions that demonised travel and tourism. And they did so despite the WHO and the ECDC conclusion that travel restrictions are ineffective where community transmission is already present.

This resulted in a total loss of public confidence in cross-border travel, and while the complete closure of borders generally remained the exception, the result was exactly the same: people stopped making plans to go places, and corporations kept banning business travel. This initially stalled the recovery in passenger traffic for Europe's airports, before sending it into reverse. Since mid-August, volumes are down week after week.

How do we get out of here?
Clearly, the priority is to replace quarantines by testing. This is the only way forward in a context where infections keep rising in many countries and the epidemiological situation remains uncertain, as do prospects for an effective cure or vaccine.

AIRPORTS COUNCIL INTERNATIONAL

"The priority is to replace quarantines by testing. This is the only way forward in a context where infections keep rising in many countries."

Joining forces with airlines, ANSPs, OEMs, ground handlers, travel retailers and most of the wider tourism sector, we have urged the European Commission to develop an EU Testing Protocol for Travel. Besides the survival of our industries and the livelihoods of our extensive workforce, this is about restoring one of the founding pillars of the EU: the free movement of people.

Together with A4E and IATA – we have thus tabled proposals on how such a protocol could work from an operational standpoint. The potential for the testing of travellers before departure to help reduce transmission risks in local communities as well as during air travel is there. We are convinced that testing travellers can contribute to the common EU testing strategy and this must be part of a more effective response to the pandemic. And while there are of course many issues that need to be addressed, testing capabilities are improving apace.

We need to get the ball rolling – and aside from ICAO's work on an international standard for testing travel, we are pleased to see EASA and ECDC now working on an EU protocol for testing air travellers.

Getting back on the path to recovery is urgent for aviation - and for Europe. Pouring even more billions into selected airlines is not what will get our sector on its feet, nor what it will take to restore the air connectivity that society has come to rely upon. We simply need people to be able to fly – not just safely, but also with full confidence about their travel plans.

The urgency is not purely about restarting travel in the short term, critical though this is. Aviation will face renewed challenges in the post COVID-19 era. The earlier the recovery, the better we will be able to address these challenges and adapt. Many are talking about COVID-19 triggering a "great reset" across the economy. This is especially true for aviation. ▶

"This is about restoring one of the founding pillars of the EU: the free movement of people."

The initial thoughts that the pandemic would be followed by a V-shaped recovery quickly gave way to predictions of a U-shaped recovery. Soon, some started talking about a W-shaped recovery, due to the risks of a second infection wave – which by all accounts is in the making. But what we are facing actually looks much more like a K-shaped recovery – in which some sectors are doing great (think tech and health) while others will keep struggling and sub-perform.

It is self-evident that aviation will be in the second category. Beyond the handicap of a slow and tedious recovery with lasting supply-side pressures induced by airlines generally flying fewer and smaller aircraft, what lies ahead is structurally lower demand for air transport. This will result from the combination of several factors.

With inequality increasing as a by-product of COVID-19, many people will have to cut discretionary consumption. Travel and leisure activities will logically be on top of the list. More generally, the pandemic is throwing our lifestyles and development model into question. It is magnifying and accelerating a societal shift towards sustainability that was already in the making. Slowness and happy localism are becoming the new cool. Taking the fast lane and jetting around Europe less so. While millennials are addicted to flying, generation Z is much less prone to ignoring its carbon footprint. These are our future clients.

Looking at demand from corporates, COVID-19 proved that video conferencing works and that executives do not necessarily need to be top tier frequent fliers. Combined with the imperative to both cut costs and demonstrate climate credentials, this explains why McKinsey sees business travel shrinking by -20% by 2024.

Without even factoring the very tangible – many would actually say inevitable – risk of more punitive policies and regulations impacting all fossil fuel intensive sectors, it is clear that the entire aviation eco-system will need to adapt to a new normal.

Business models will need to change. Just looking at airports, the fact that our own business model has both relied upon and been driven by the assurance of continued dynamic growth in air traffic is a case in point. This is something we will be addressing at our (virtual) Annual Congress on 17 November.

Anticipating and embracing societal changes and economic transformation will be the most important agenda for aviation, both as we recover from COVID-19 and beyond. But succeeding on our own will be challenging. Disruption will also be needed from policy makers, so that they provide the enabling regulatory framework. That should mean finally burying the ultimate legacy: the Chicago convention – and even more important, the legacy thinking that still permeates too many regulatory approaches.   ∎

> "It is clear that the entire aviation eco-system will need to adapt to a new normal. Business models will need to change."

> "Getting back on the path to recovery is urgent for aviation."

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AVIATION'S RECOVERY FROM THE COVID-19 CRISIS WILL BE A LONG-HAUL FLIGHT

Alexandre de Juniac, Director General and CEO of the International Air Transport Association (IATA), is working with industry and governments to restore connectivity and prevent an unemployment disaster

The COVID-19 crisis has caused a collapse in air traffic and had a catastrophic impact on the airline industry and the aviation value chain. The summer travel season has provided little reprieve from the impact of COVID-19; the situation is grim. We estimate that for 2020 air traffic (measured in revenue/passenger/kilometres or RPKs) will be down at least 50%. This figure was based on the assumption that international traffic would pick up in the third and fourth quarters of the year, although this is looking increasingly unlikely as many key markets remain locked down, with travellers banned or subject to significant quarantine periods on arrival. The slow speed of improvement means that we now think it will be 2024 before RPKs return to 2019 levels. And this could slip further if there are setbacks in containing the virus or finding a vaccine.

The fall in RPKs has had a disastrous impact on revenues: airlines will make a loss this year of $84 billion and our early estimate of 2021 losses is $15.8 billion. These are the worst financial results in aviation history. Some airlines have already collapsed, merged, or severely retrenched. Airports are mothballing terminals. Unless international air travel can restart effectively soon, the situation will become terminal for even more carriers – with disastrous effects for our aviation business partners, the wider economy and society.

SAFELY RESTARTING AIR TRAVEL

EUROCONTROL has been extremely supportive throughout the crisis through its financial support measures, network management recovery actions and the supply of key data. IATA, along with airlines and other industry stakeholders, has been working continuously with governments to safely restart flying.

The first priority is keeping people safe. Numerous studies have shown that the risk of COVID transmission on board is low. That's not just a happy coincidence. Movement of air forward and aft in the cabin is limited by seatbacks and a ceiling-to-floor airflow. With everybody oriented forward, there is limited face-to-face contact. The air is exchanged with fresh air from outside every two or three minutes on most aircraft. That's 20 to 30 times more frequently than most office buildings. And HEPA filters take out viruses—including the coronavirus—with each filtration.

IATA

In the face of COVID-19 we are taking extra measures. We have worked with the International Civil Aviation Organization (ICAO), the World Health Organization (WHO) and both national and regional health and transport bodies, such as the European Aviation Safety Agency (EASA), on global best practices and guidelines to operate safely during the COVID crisis.

These measures have given governments a solid basis to restart aviation and go a long way to addressing travellers' main concerns about sanitisation and human interaction.

"Airlines will make a loss this year of **$84 billion** and our early estimate of 2021 losses is **$15.8 billion**."

The outcomes of this work are clearly visible:

- Mandatory wearing of face masks at both the airport and onboard;

- Increased sanitisation of key airport and aircraft touch points;

- Enabling social distancing at departure and arrival and on board in terms of queuing for lavatories;

- Reduced service on board and

- Contactless processes that minimise human interaction.

All of this makes the aircraft cabin one of the least-risky public spaces that people could experience. Even if effective social distancing on board is not possible (even neutralising the middle seat does not create the recommended 1m-1.5m distance), the layers of measures will keep travellers safe. ▶

CHALLENGES FACING GOVERNMENT AND INDUSTRY

The industry has done a good job to safely keep our world connected during the COVID-19 crisis. But operations are far from normal and many challenges remain. These are challenges that we share with governments: avoiding the importation of COVID-19 through travel; restoring people's freedom of movement and repairing the economy.

To keep COVID-19 outside their countries, many governments have simply closed their borders. Others kept their borders open but imposed quarantine on travellers. The effect is the same – it halts travel, so we are not making progress in restoring the fundamental right of movement and the travel and tourism economy is effectively stopped. We must learn to live with this virus. The Stop-Go-Stop approach to lifting and reimposing restrictions does not bring us closer to that, nor will it enable economic recovery.

Already we are seeing some governments becoming more precise and targeted with preventative measures because it is clear we must limit any return to widespread lockdowns and the economic and social damage they cause. In this situation, the behaviour of the general public – wearing of masks, social distancing where possible, and continued hand sanitisation – is crucial. From an aviation standpoint we have asked passengers feeling ill not to travel, and many ticket options offer a no-penalty cancellation if the passenger suspects they might have COVID-19.

It is also becoming increasingly apparent that COVID-19 testing will need to play a role in facilitating travel. There are already tests that are accurate enough to be used to facilitate the relaxing of travel restrictions. Testing at the start of the travel process would create a "sterile" travel environment to reassure travellers and governments, and could be an effective risk equalisation measure to support the reopening of borders between countries where there is significant asymmetry in infection rates.

THE OUTLOOK

Unfortunately, there are few signs that we are going to win the battle to control COVID-19 in the immediate future, so we are relying on governments to help us avoid an unemployment disaster with relief measures – financial and regulatory – that will keep the industry afloat and ready to lead the recovery.

The collapse in connectivity puts tens of millions of jobs worldwide at risk. That's because each airline job supports a further 14 jobs in the wider economy. Half of all tourists arrive by air, and economies where tourism is a significant employer will be disproportionately hit by travel restrictions and quarantine.

The aid given by numerous governments worldwide will soften some of this blow, but it is sadly inevitable that there will still be heavy job losses. Each one is a tragedy for the individual and their families. Important skills will be lost. And it makes the task of returning to growth even harder – which in turn will affect the wider economy, which relies on global air connectivity to flourish.

We know that governments receive lots of pleas for help. But there is good reason to prioritise aviation because of the huge catalytic effect aviation has on social and economic development, on trade and prosperity, and on jobs and skills. It is a solid investment in the future. Protecting the air connectivity between countries helps strengthen the foundations for future economic growth.

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THE HUMAN NEED TO TRAVEL IS STILL WITH US

Recovery from the COVID-19 crisis will be a long-haul flight. Passenger confidence will take time to be rebuilt. But we must remain hopeful that, as people start to travel again, we will build up some momentum. For sure, business travellers will question their travel habits. And leisure travel will be impacted by economic uncertainty. It is going to be a very rough rest of 2020 and probably 2021.

But, as much as we are connecting through Zoom, Teams, Houseparty, or other technologies, it is not the same as being there. Flying is freedom, and travel is freedom. That is not something people forget or lose their desire for. It will take time for the market to return. But when it does, the long-term prospects are solid because we fulfill the fundamental human need for connection and mobility. ∎

"It will take time for the market to return. But when it does, the long-term prospects are solid because we fulfill the fundamental human need for connection and mobility."

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LIFE BEYOND
COVID-19
HOW WILL AVIATION
NEED TO CHANGE?

The pandemic has meant the aviation industry has had to redefine its aviation safety responsibilities, says **Patrick Ky**, Executive Director, European Union Aviation Safety Agency (EASA)

Safe flying during the pandemic

Aviation is in crisis. These four simple words already sum up the year 2020 for the industry, with no prospect in sight of a change to that statement or of a true recovery in passenger traffic.

Meanwhile we see every day that COVID-19 is bringing change at an unprecedented pace: office workers embrace (or hate) the opportunity to work from home; livelihoods are devastated as small businesses collapse; large companies fight cashflow issues; employees lose their jobs or face uncertain futures. Yet in other areas business booms, due to sudden and unexpected demand.

For aviation, the one prediction that can be made with confidence is that the entire industry will not be the same tomorrow as it was yesterday, before the pandemic. Any hopes that COVID-19 could spell only a few months of temporary interruption of normal business have been dashed – and deep-rooted change is inevitable. It is now essential that we keep proving that air travel can continue safely by maintaining a focus on the rules and processes that have made flying the safest way to travel. In parallel, we need to identify and embrace sweeping change in our industry, to ensure it emerges stronger and is able to cope with new challenges that will undoubtedly arise.

As a safety agency, EASA's role has always been to put everything in place from a technical viewpoint to ensure that aviation is truly safe. Many of those protective measures, designed and optimised through many years of rule-making and analysis, were undermined in a matter of weeks after the pandemic gained hold in Europe in March this year.

Previously simple requirements, such as the need for pilots to fly regularly to keep their licences current, suddenly posed immense challenges to the industry, as flights were cancelled and pilots' flying hours shrank. Aircraft certified for the safe transport of people were quickly converted for transport of cargo in passenger cabins, to deliver urgently needed protective equipment. The importance of regular and thorough cleaning and disinfecting of aircraft gained new urgency.

For each of these situations – and many more – EASA was called upon to make rapid and meaningful changes to existing operational practices, with safety being held paramount, to ensure that the reputation of the industry did not suffer collateral damage. As one example, EASA sanctioned new configurations for transport of cargo in passenger seating at no cost to industry. But we refused permission for hybrid configurations, which could place passengers at risk.   ▶

"The one prediction that can be made with confidence is that the entire industry will not be the same tomorrow as it was yesterday."

EASA
European Union Aviation Safety Agency

By mid-May, working at the request of the European Commission (EC) and in intense cooperation with the European Centre for Disease Prevention and Control, we published the Aviation Health Safety Protocol, which defined the measures airports and airlines should take to allow for a safe resumption of operations, keeping transmission of COVID-19 to a minimum.

Initial data gathered over the summer indicates that the protocol has been successful, although many other factors mean that passenger numbers are still much lower than had been hoped. Where the protocol is applied, there appears to have been a low incidence of COVID-19 related problems. We are awaiting further data but are cautiously optimistic that fear of contracting COVID-19 at the airport and in flight should not present a barrier to passengers who choose to travel by air.

Aircraft safety has also been a major focus during the pandemic. Commercial aircraft are not designed for long periods without use – they are simply too expensive to leave lying around. The extreme situation of the last several months has seen an unprecedented number of aircraft parked, and then later returned to service. We have monitored this closely, looking for patterns and prescribing solutions, for example in cases where engines needed additional maintenance steps which could not previously have been foreseen, as we lacked practical experience of such cases.

In air traffic management (ATM) we went in just a few months from under capacity to an environment where there were not enough flights to sustain the cost of the system. Again, EASA was active in monitoring the situation and coordinating with national supervisory authorities, so that air traffic controllers and ATM systems could maintain a high level of performance and safety.

The aim of all these activities was to lay the groundwork to allow the aviation industry to resume activities to match demand, but above all to do so safely. In the many conversations I have with senior industry executives, there is a common understanding that this is no time for cutting corners on safety – the reputation of the industry in this respect remains as vulnerable as ever. The public will not accept a lapse in safety standards because of the pandemic.

EASA's relationship with EUROCONTROL has been critical during this period. The industry-wide coordination through EUROCONTROL's European Aviation Crisis Coordination Cell has been invaluable in keeping the various parties informed and in step. I look forward to continuing this very fruitful relationship in coming years as the aviation pulls out of the current crisis and emerges in its changed future shape.

And what about that future?

The longer-term challenges facing the industry are huge. Aviation cannot emerge unscathed from this crisis and needs, wherever possible, to use it as a catalyst for change. I would like to highlight four areas that, as I see it, need to evolve as the industry reinvents itself.

Health safety is now an intrinsic element of aviation safety

Safety and security are long-accepted pillars of the aviation industry. The pandemic demonstrated all too painfully that health safety is now a third pillar that can pose an at least equal threat. As regulators, we are currently working out what this change means for our own role. While the immediate needs of the industry were addressed through the Aviation Health Safety Protocol, Europe needs now to determine how health safety can be built in as a core factor in aviation operations. There will be other pandemics, unfortunately.

Financial sustainability for the industry as a whole

In addition to the well-reported financial hits taken by airports and airlines as passengers stopped flying, the crisis threw into question some fundamental aspects of the industry's financial framework. What happens in such a crisis to niche suppliers of aircraft parts, who are so specialist that they have no other customers and no competitors, leaving manufacturing industry with delivery gaps if they go bankrupt? What to do about air navigation service providers (ANSPs), usually paid for their services by those who use them, who are required to keep up a service capability even when there is virtually no traffic? Who pays the bills to keep such services in place and prevent even greater long-term damage to the industry?

A green recovery is more important than ever

At the start of 2020, the need to make aviation sustainable and greener was top of the agenda. It is still up there, temporarily eclipsed by the more immediate health problems. While the crisis has led to the mothballing or retirement of an unprecedented number of old, fuel-hungry aircraft, it has done nothing to encourage the industry to invest in more fuel-efficient replacements. Movements such as flygskam, so active at the start of the year, are quieter for now, but such groups are starting to rally to encourage passengers to avoid flying, almost as a civic duty and commitment. The industry needs to be able to respond firmly with counter-arguments and demonstrable actions that make flying more sustainable.

Continue investing into new technologies

Any crisis presents a lot of opportunities. The main challenge is to find the resources and energy for the aviation sector to project itself into a new era. In the air traffic management sector in particular, it is widely accepted that the systemic capacity of European air navigation service provision can only be increased through the adoption of new technologies. It is now, while traffic is down, that investments must be made into the necessary technological leap for ATM. ∎

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BUILDING A **SUSTAINABLE MODEL** TO MEET COMPLEX ENVIRONMENTAL NEEDS

Aviation stakeholders are working together to deliver additional environmental benefits during the traffic downturn, says **Marylin Bastin**, EUROCONTROL Head of Aviation Sustainability

"If we really want to achieve the ambitious goals set out in the European Commission's Green Deal and reduce carbon dioxide emissions, we need to work closely together."

The environmental performance of the European sky is almost exclusively monitored using indicators based on horizontal en-route flight efficiency (HFE), which compare the length of actual (KEA) or planned (KEP) flight trajectories to the corresponding "achieved" distance. These indicators have remained extremely stable for the last five years at just over 97% and 95% respectively, a level that EUROCONTROL sees as near optimum taking into account weather, military training and other safety constraints. However, using just two indicators overlooks progress in other areas where the aviation sector is reducing its environmental impact, and in particular its ongoing contribution to Europe's goal of becoming climate-neutral by 2050.

The measures put in place to curb the spread of COVID-19 around the world nearly halted passenger air traffic for three months, and continue to slow significantly its rebound. As a result, capacity growth has become less urgent, with even the most optimistic forecasts predicting a return to pre-COVID-19 traffic levels unlikely before 2024. This leaves room for continuing and even accelerating efforts aimed at improving the efficiency of the aviation system, especially those that target reducing its environmental impacts. With this in mind, EUROCONTROL has taken the initiative to take a closer look at current system performance in order to establish a baseline of maximum achievable performance in different areas.

"EUROCONTROL has taken the initiative to take a closer look at current system performance in order to establish a baseline of maximum achievable performance in different areas."

For example, according to EUROCONTROL, average monthly taxi-out times dropped by a third between March and September 2020, and airport holding fell from an average of two minutes per arrival to almost zero. Most significant is the improvement in vertical flight efficiency, measured by the indicator developed by the European Continuous Climb Operations and Continuous Descent Operations (CCOs and CDOs) Task Force, now available on EUROCONTROL's Aviation Intelligence Unit portal (1). EUROCONTROL Head of Aviation Sustainability Marylin Bastin explains: *"This new indicator, a proxy for vertical inefficiency, shows, for instance, a decrease of up to 60 seconds of level flight between February 2020 and April 2020, which clearly indicates that arrival flights were able to optimise their descent profiles and the associated fuel consumption by almost one minute during their descent to an airport."*

This is because CCOs and CDOs allow arriving or departing aircraft to descend or climb continuously to the greatest extent possible. Aircraft applying CCO employ optimal climb engine thrust and climb speeds until reaching their cruising level. With CDO, aircraft use minimum engine thrust, ideally from top of descent and in a low-drag configuration, prior to the final approach fix. Using these techniques reduces intermediate level-offs and gives aircraft the opportunity to spend more time at higher, more fuel-efficient, cruising levels, reducing fuel consumption and lowering emissions and costs.

Together with the members of the European CCO/CDO Task Force, EUROCONTROL has developed a detailed European CDO/CCO Action Plan, which aims at increasing the number of CCOs and CDOs, along with a toolkit, monthly performance tables and guidance material. The recommendations in the Action Plan require airlines, airports, air traffic control and the EUROCONTROL Network Manager all to play their part. *"Sometimes the recommendations are obvious,"* says Ms Bastin, *"but it's important to stress how collaborative the process is. All stakeholders have to work hand-in-hand to support optimised trajectories. This is particularly true during the crisis, but will also be necessary when traffic increases again. If we really want to achieve the ambitious goals set out in the European Commission's Green Deal and reduce carbon dioxide emissions, we need to work closely together."* ▶

> "The key is to better understand and measure how SAFs, coupled with new kinds of aircraft technology, can contribute to the 90% in emissions reduction by 2050."

Flying an optimal climb or descent profile is not easy in a busy airspace where many constraints exist, which is why the appendices included in the Action Plan provide ideas and solutions designed to overcome some of the constraints, based on operational procedures and real-life case studies. *"This Action Plan is different from the previous action plans. We included actions, recommendations and best practices for each stakeholder to help them to optimise CCO and CDO."*

Continuing the process when traffic starts to grow again is the challenge facing us. *"We are using this time to look at how to maintain this level of optimised CCO/CDO and more efficient trajectories. In particular, we strongly believe in the potential of EUROCONTROL's Specification for Collaborative Environmental Management (CEM) to establish working arrangements to discuss and explore solutions to minimise the environmental impact from local operations."* CEM brings together airport stakeholders to address issues such as greenhouse gas emissions, noise, and local air quality, *"putting operational people from airports, airlines and air traffic around the same table"*. The next version of the CEM platform will include Sustainable Aviation Fuel (SAF) among potential collaborative solutions and implementation strategies to address environmental challenges at airports.

Ms Bastin says each airport needs a local solution. *"This is not a simple process, which is why we need to develop a platform at each airport and ensure that all stakeholders are working on the same objectives – reducing carbon dioxide emissions, reducing noise and improving local air quality."* The platform could also be used to introduce parallel research and innovation projects to focus on *"more drastic changes,"* she adds.

EUROCONTROL's aviation sustainability unit is collaborating with industry on a number of ambitious projects that aim at implementing SAFs. Among these, the EUROCONTROL Experimental Centre is working with leading manufacturers including Airbus and Safran to assess the impact of new generation aircraft on airspace management. *"SAFs are part of the future,"* explains Ms Bastin. *"We are in close contact with industry to better understand how we can help facilitate SAF implementation and how it affects aircraft performance. The key is to better understand and measure how SAFs, coupled with new kinds of aircraft technology, can contribute to the 90% in emissions reduction by 2050 as requested by the Green Deal."*

This activity includes gathering data and adapting tools and methodology to accommodate SAFs. *"There are different types of SAF – biofuels and synthetic fuels – but exactly how environmentally friendly are they?"* Ms Bastin asks. EUROCONTROL is examining future aviation models such as hydrogen and hybrid electrical aircraft to improve the understanding of future airspace operations.

SAFs are part of the measures identified by the International Civil Aviation Organization's (ICAO's) Long-term Global Aspirational Goal Task Group (LTAG-TG) for international civil aviation to reduce carbon dioxide emissions. As an LTAG-TG working group member, EUROCONTROL contributes to the development of technologies, fuels and operational scenarios that could be implemented in the future. EUROCONTROL also participates in the ICAO Fuels Task Group (FTG) established in 2020, which is examining sustainability criteria and production methods for SAFs, as well as at Lower Carbon Aviation Fuels (LCAF). The Task Group is working on the classification of feedstock as waste, co-products and main products with the aim of providing policy-making guidance in coordination with LTAG-TG work for deployment.

EUROCONTROL is also working with airlines and air navigation service providers (ANSPs) to better understand condensation trails (contrails). These upper troposphere (8–13 km altitude) aircraft-induced ice-particle clouds form in ice-supersaturated and low-temperature areas and can develop into larger cirrus clouds that have a net positive radiative forcing (i.e. warming) effect. According to research study by Imperial College London published in February 2020 (2), most contrail cirrus forcing can be attributed to a few large-scale events. Accurate and timely identification of these events remains challenging but could help reduce contrails formation.

EUROCONTROL's Maastricht Upper Area Control (MUAC) has in parallel launched a project to examine how relatively minor operational measures such as small flight path changes – e.g. diverting planes roughly 2,000 ft up or down from their normal flight path – can influence contrail formation, using weather forecasts to tactically push flights. Clearly, there has to be a positive balance between contrail avoidance and additional fuel burn, but Project Manager Rüdiger Ehrmanntraut believes the project will make a significant contribution.

"We want to have the best prediction model, because we want to minimise intervention and maximise the positive impact. We are working on an augmentation system for weather predictions, for example adding real-time sensors from Mode S data," explains Ehrmanntraut. MUAC is in the process of implementing the technology, and plans to validate the whole process by analysing satellite images after conducting live trials.

EUROCONTROL has also developed two valuable environmental tools to evaluate noise and emissions. The first of these is IMPACT, a web-based platform that allows both the production of noise and noise contours and the evaluation of the mass of 25 species of pollutants along flight paths. This type of study is very relevant for "*airports, ANSPs, national authorities and associations such as Airports Council International,*" explains Ms Bastin. IMPACT helps identify sources of inefficiency, supports development of new operational solutions and measures their benefits.

The second is ALAQS, the Airport Local Air Quality Studies platform, which provides a four-dimensional inventory of emissions from various stationary and mobile airport sources, including aircraft operations and landside/airside activities. The model also includes non-airport sources such as road traffic to/from the airport. Moreover, ALAQS provides a connection to the dispersion model AUSTAL2000 and thus, once an emission inventory has been established, it can simulate pollutant concentrations at the airport and in the surrounding areas. It is an open-source airport local air-quality tool which can be used to assess an airport's relative contribution to total ambient concentrations according to legislative requirements.

Metrics play an important part in EUROCONTROL's strategy towards a sustainable environmental future. The EUROCONTROL Aviation Intelligence Unit portal includes as a first step carbon dioxide metrics for States. However, to address air traffic management (ATM) performance, *"we need to develop other measurements, indicators, metrics to inform the general public about the progress the aviation sector is making to reduce the environmental impacts of operations,"* says Marylin Bastin. *"If we want to improve, we need better data."* This is particularly relevant for ANSPs. *"The indicators we currently have don't reflect the impact of ANSP's efforts to reduce emissions. They are working on reducing the carbon footprint of aviation, investing in new technologies and becoming more efficient."* This is the topic of a new EUROCONTROL working group looking at operational measures and their benefits.

"Sustainable aviation is a vast area of concern. We complement our work with training, including webinars on topics such as climate change and how stakeholders can adapt to the identified risks. We aim to launch training modules on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) introduced by ICAO to help to explain its goals and how it works," says Marylin Bastin. It is important to place aviation in the broader transportation context. *"One of our main priorities in the year ahead is to produce think papers and studies to shake up the preconceptions about the aviation environmental impacts of aviation and the solutions to them and as well as more accessible ones that can help inform the public about all the efforts that aviation actors are making to deliver on the sustainability challenge. Environmental solutions must also address societal*

and economic needs. We want to increase public awareness about challenges and dilemmas facing the aviation sector when it comes to environment and sustainability. Two recent examples of this strategy are the European CCO/CDO Action Plan and our Think Paper on "Does taxing aviation really reduce emissions?". The Action Plan is a valuable technical document that captures intensive work carried out with a large number of stakeholders, including airlines, airports and ANSPs on how to make CCO/CDO work, with examples of best practices and how constraints can be overcome. It builds on the extensive experience Europe already has in optimising the efficiency of vertical flight profiles. The Think Paper, on the other hand, is firmly aimed at a wider audience. Using exclusive EUROCONTROL aviation data, it examines whether taxes on aviation fuel or air tickets, or equivalent measures, do effectively contribute to a direct reduction of aviation emissions – reaching some interesting findings for policy-makers, in particular that the best way to reduce aviation's CO2 emissions is to support decarbonisation measures, with any European tax aimed at reducing emissions being ideally ring-fenced to fund such initiatives."

Indeed, as the Think Paper underlines, investing heavily in greener aviation is central to the process. Air traffic management can influence less than 10% of all aviation-derived carbon dioxide emissions in Europe, nevertheless it is an important part of the overall solution. According to Ms Bastin: *"If we want to achieve a green transition, we must invest in new technologies and sustainable aviation fuels. The four ICAO pillars of market-based measures (the Emissions Trading Scheme (ETS) and CORSIA), disruptive technology, improved infrastructure and operations, and the uptake of Sustainable Aviation Fuels (SAFs) are key to aviation sustainability."* ∎

> "We need to develop other measurements, indicators, metrics to inform the general public about the progress the aviation sector is making to reduce the environmental impacts of its operations."

(1)   https://ansperformance.eu/efficiency/

(2)   *Source: Teoh R. et al. "Mitigating the climate forcing of aircraft contrails by small-scale diversions and technology adoption." Environmental Science and Technology 2020.*

THE PANDEMIC HAS DEMONSTRATED
THE POWER OF PARTNERSHIP

Director General of the Civil Air Navigation Services Organisation (CANSO) **Simon Hocquard** reflects on his first year in post, exploring how the outlook for aviation has changed and the role of collaboration in recovery and future success

The aviation industry is being tested like never before. From the heady heights of record air travel last year to the rock-bottom demand we saw earlier this year, it has been a story of true grit and determination to keep air transport moving seamlessly and to pivot with ever-changing demand. It has also been a defining moment for aviation's key players, both in terms of how we've come together to ride out this challenge – and the work that's still left to be done. It is clear we each have our roles, but our pathways are intrinsically linked, and the more we can do to navigate this journey together, the stronger we will be at the other end.

This year marks 100 years of aviation (the world's first air traffic control tower was commissioned by the UK government, heralding the start of mass air travel), so it is ironic that at a time when we would have been celebrating the amazing growth of the industry and the benefits it delivers, we have been left wondering what our future holds. There's no doubt that air travel will remain an important part of our global infrastructure, but with dramatic fluctuations in traditional passenger demand coupled with the rapid rise of new airspace users like drones and commercial space vehicles, we are seemingly entering into a new era for aviation. One which will break the mould of the past and introduce new players into the mix.

"The aviation industry will have to continue to grapple with changing attitudes to air travel, competing priorities for State support, and the ongoing puzzle of reducing costs without hampering efficiency, innovation and skills."

When the COVID-19 pandemic first hit earlier in the year, it rewrote the plot for people and organisations worldwide. For air traffic management (ATM), and the aviation industry it serves, it was a twist like no other. Having navigated a decade of dramatic growth in every region in the world, we were suddenly faced with empty screens, vacant lounges and quiet skies as air traffic plummeted by some 80%.

Looking ahead, the aviation industry will have to continue to grapple with changing attitudes to air travel, competing priorities for State support, and the ongoing puzzle of reducing costs without hampering efficiency, innovation and skills. It therefore needs to find ways to work cross-sector to reduce gaps in coordination and deliver a robust model for the future.

LEARNING FROM CRISIS

The lack of demand and movements sent shockwaves through the industry, and airlines, airports and air traffic management faced significant and immediate losses in revenue and solvency. What followed was a period of acute uncertainty. With limited State support and an unknown future for travel, the aviation industry had to devise its own lifeline.

From the deferral of ATC charges by airlines, to securing financial aid for air navigation service providers (ANSPs), CANSO worked hard to help ensure the liquidity of the industry in coordination with EUROCONTROL. But it became clear that no one partner can navigate the industry's future on its own. ATM cannot bankroll operations, nor can airports fund prime aviation facilities, just as airlines cannot shore up much-needed passenger demand and revenue with ongoing travel restrictions.

WORKING TOGETHER

Collaboration comes in many forms – whether it's global cross-industry coordination or the regional or intra-industry initiatives that support it. Through collaboration we can learn from each other and share innovation.

Our collaboration in the International Civil Aviation Organization's (ICAO's) Council Aviation Recovery Task Force (CART), for example, was a prime showcase of the power of partnership – highlighting how the industry and its stakeholders can and should work together to secure the future of the industry and the vital connectivity it provides. We need to do more of this – and not only because of the crisis, but because it is what we need as an industry. It is far too easy to focus on our own concerns but it is much more fruitful to share these and navigate them together. ▶

"From implementing the latest tools to adopting smart infrastructure, partnership is key."

On a regional level, CANSO has embraced the benefits of regional coordination. These include **working together** with the International Air Transport Association (IATA), Airports Council International (ACI) and the Latin American and Caribbean Air Transport Association (ALTA) to ensure the viability of the industry during the crisis, and leveraging best practice initiatives like air traffic flow management (ATFM) in Africa, Asia Pacific and Latin America and the Caribbean, to keep the industry moving efficiently.

Cooperation is vital in mapping out the industry's future – whether that be implementing legislative change such as the Single European Sky (SES) in Europe or improving performance.

Take the environment for example. The industry is committed to ensuring not just a seamless recovery but a sustainable one too. It needs to continue the steps that have been taken to improve operational efficiency and reduce emissions, and collaboration plays a key role in this.

In Europe, CANSO has been working alongside IATA, A4E, European Regional Airline Association (ERA), the Atlantic Interoperability Initiative to Reduce Emissions (AIRE), the International Federation of Air Traffic Controllers' Associations (IFATCA) and EUROCONTROL Network Manager to launch an **ambitious environmental initiative** to facilitate "Perfect Flights" while traffic volumes are lower than usual.

By enabling aircraft to fly more direct routes and optimal vertical profiles, this joint initiative has set the aviation industry on a more sustainable trajectory as it recovers.

As we focus on strengthening our network and boosting performance, we must also consider how our airspace and airspace users are changing too. Drones, for example, have taken on an essential role in the remote provision of vital goods and services during the pandemic, and companies like SpaceX are propelling space travel forwards. These new users have new requirements that must be met alongside those of traditional users, and the industry must be ready for this. The **We Are All One in the Sky** initiative brings CANSO together in partnership with a range of aviation stakeholders to ensure a comprehensive and collaborative approach to integrating new entrants. Such cooperation is vital for safe and efficient air travel in future.

From a technology perspective, we must also embrace the role that collaboration can bring. This year CANSO took the opportunity to establish a number of key strategic technology partnerships to share knowledge, data insights and expertise among the ATM community. In recent months CANSO launched a partnership with Aireon to leverage valuable high-fidelity satellite-based ADS-B data and track global and regional traffic trends; Metron Aviation to benefit from their traffic demand prediction tool that matches resources to the ebbs and flows of traffic and Micro Nav to make their cloud-based BEST ATC simulator platform available to build air traffic controller confidence in dealing with increased traffic after a prolonged period of low traffic levels.

And from implementing the latest tools to adopting smart infrastructure, partnership is key. Take remote towers for example: as HungaroControl and Searidge Technologies have shown this year, smart/digital towers are key to our future infrastructure, helping to build resilience and enable flexibility. If the industry is to have the capacity to adapt to fluxing traffic patterns and different airspace user requirements safely and efficiently, it is going to need innovative partnerships to help deliver digitisation and automation, remote ANS, training and maintenance and UTM.

FUTURE FORCE

So while it has been a challenging year for the industry, it has also been an extraordinary year. Aviation has stood up to the biggest test in its history and delivered. What we do now, however, will determine the course of our future.

Collaboration has always been the cornerstone of the aviation industry's success, and as the crisis has taught us, it enables us to be both resilient and strategic in planning for our future. While each aviation partner can build its own contingency measures, it is by working together that we will truly succeed.

Now we need to take it to the next level. We have to take a holistic approach to air transport, sharing our challenges and embracing opportunities for cooperation and innovation across the aviation industry. It cannot be done alone – but together, we can be a force for the future.

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NETWORK OPERATIONS RECOVERY PLAN

CREATES NEW LEVELS OF

COOPERATION AMONG STAKEHOLDERS

New relationships have been forged and network performance structural weaknesses identified as part of the EUROCONTROL Network Manager's work to develop a unifying crisis management and recovery strategy for European aviation, explains **Iacopo Prissinotti**, Director of EUROCONTROL's Network Management (NM) Directorate

NETWORK
MANAGER

"We started to develop this weekly rolling plan, gathering information from all the relevant stakeholders so ANSPs and airports could get a consolidated view of what the major airlines planned to do in terms of flights."

Uncertainty is one of aviation's greatest challenges. For Europe's airlines, airports and air navigation service providers (ANSPs), whose operations rely on high levels of predictability for demand and capacity planning, it was becoming clear during the last few months of 2019 that the market had pivoted. Passenger numbers, measured year over year, were starting to decline. Economies were faltering. And then in March 2020 the pandemic swept across the continent. For Europe's aviation industry this was a new world of unprecedented uncertainty, where the fundamentals of demand and supply for aviation services no longer seemed to apply. Flights dropped to 10% of their predicted throughput and ANSPs and airports were confronted with the prospect of having to shut down frontline services if contagion spread through their operating centres.

The EUROCONTROL Network Directors of Operations Group (NDOP) meeting on 17 March 2020 agreed that the only way the industry could manage the crisis and then plan a coordinated recovery would be to work collectively to share data on airline schedules and capacity. It developed a new concept for initially a Business Continuity and afterwards a Recovery Plan, which included weekly conference calls sharing consolidated information on expected traffic and capacity delivery levels for the ensuing four weeks, extended afterwards to six weeks.

"We started to develop this weekly rolling plan, gathering information from all the relevant stakeholders so ANSPs and airports could get a consolidated view of what the major airlines planned to do in terms of flights," says Iacopo Prissinotti, Director of EUROCONTROL's Network Management (NM) Directorate. *"If they had tried to do this individually it would have taken a massive, confusing and uncoordinated effort because many would not have had the resources. When there is a huge amount of volatility you need to match airspace and airport capacity with demand. With traffic levels 80% lower than normal, in theory this should not be a problem – but if the epidemic hits an air traffic control (ATC) centre it could mean closing airspace. So one of the most important attributes of the plan was service continuity."*

At a time of continued uncertainty, the NOP 2020 Recovery Plan was a vital coordination and anticipation initiative that has provided aviation's key actors with the global view they need to plan effectively. Further building on this positive experience, the NDOP agreed that the NM would transit from the Recovery Plan into building a NOP Rolling Seasonal Plan, starting 23 October 2020, providing essential continuity of coordinated information to allow effective planning and decision making for all aviation stakeholders. The NOP Rolling Seasonal Plan will be updated weekly, focusing on operational planning six weeks ahead and on managing the execution and implementation of the five-year Network Operations Plan (NOP).

"It was an unprecedented effort by all stakeholders," says Razvan Bucuroiu, Head of Airspace and Capacity Division/Acting Head of Operations Planning Unit at EUROCONTROL's Network Management Directorate. *"We were coordinating with and receiving information from 140 airports, 68 en-route ATC units and 320 airlines, consolidating information on flight schedules and capacity to provide a traffic and capacity outlook. Safety, military and major events planning information was also updated weekly. We were the only source who could have provided this consolidated information."*

For the NM, it was a Herculean effort. To support this effort NM also monitored an average of 700 to 800 NOTAMs a day, each of which had an impact on the European air traffic situation. This took at least one major task away from the beleaguered airlines and meant all stakeholders could plan their crisis management and recovery operations on the basis of consolidated and trustworthy data. NM staff also swiftly developed "best-practice" procedures for ATC staff to work safely, so new work practices could be included in crisis management plans. ANSPs faced critical staffing issues: flight numbers may have been reduced by more than 50% but that did not mean controller numbers could be reduced by the same amount. Demand continued to be volatile and ANSPs had to build in capacity for sudden surges. Included in the NM's recovery plan was a requirement to identify where and how capacity could be added into the system as the recovery slowly gained hold. ▶

After just a few weeks the plan allowed every stakeholder to understand near-term traffic demand which allowed for more detailed resource planning. For ANSPs it meant they could introduce COVID-19 protection measures based on more accurate estimates of how many controllers would be working and which sectors would be open. Very quickly, NM began analysing the data in a more systematic way to provide even more accurate local traffic predictions.

"*When building our weekly traffic outlook we started seeing how the restrictions placed by each State – such as quarantine requirements or cancelled destinations – affected the network and we built a probability matrix between countries so we could assess what the probability level was for flights to happen or not,*" says Razvan Bucuroiu. NM also provided individual ANSPs and airports with large files of regional traffic data to assist in their own recovery plans – this had a doubly beneficial impact because it meant NM had more accurate understanding of local conditions once these recovery plans were fed back into its system.

"*Airports had slots which hadn't been removed from the slot coordination system but we were able to get information from airlines about which slots would be cancelled and pass this back to the airports,*" says Steven Moore, Head of ATM Network Operations Division, Network Manager Directorate. "*We commissioned a study from the Airport Research Centre in collaboration with ACI EUROPE and other partners into turnaround times and the effect of COVID on airports' airside and landside operations (see Table) which helped people to better understand the impact of pandemic measures on, in particular, passenger journey time, terminal throughput and boarding gate processing capacity.*"

A few weeks into the crisis, NM team began to work on a coordinated recovery plan and tie in some of the longer-term strategic network improvement objectives with the short-term recovery actions. The latter were championed by the operational staff at the NM Operations Centre who worked tirelessly in supporting ANSPs, airlines, airports and the military on a day-to-day basis from pre-tactical planning, through operational delivery, to post-operations performance analysis.

"*We had defined two major objectives – keep delays as low as possible and give airlines the best trajectories possible,*" says Iacopo Prissinotti. "*We relaxed 1,200 Route Availability Document (RAD) restrictions and will continue this relaxation until April next year and this will allow for continuous improvements in network performance. In the meantime, we improved our communications with State organisations and worked out how we could all work more closely together. We all agreed that the weekly coordinated conference calls on Monday afternoons will continue even after the recovery because they help us solve some immediate issues very quickly. This will eventually boost the capacity of the entire system via our Operational Excellence programme.*"

> "We have saved 26,000 nautical miles on improved trajectories as a result of improved planning."

This programme is focused on harmonising operational procedures, including Letters of Agreement, flight planning, air traffic flow management, airspace management and system support to reduce controller workload and harmonise operations in neighbouring centres.

"*We have saved 26,000 nautical miles on improved trajectories as a result of improved planning,*" says Steven Moore. "*We now need a coordinated plan to prepare for the major recovery once there is a vaccine.*"

Planning the recovery is a complex task and will require further and deeper stakeholder coordination. For example, controllers will have temporarily lost some degree of skill at handling complex traffic loads and it will take time to ramp up capacity levels to pre-COVID-19 performance.

But the dramatic fall in traffic numbers has given EUROCONTROL NM experts a clear view of some of the dynamic forces acting on the network. "*As soon as traffic reaches 70% to 80% of 2019 levels I suspect we will start to see structural issues in the network start to emerge and impact overall performance,*" says Razvan Bucuroiu.

It has become clear that a network operating close to its capacity has a very different environmental performance to a network where traffic levels are much reduced – adding just one or two flights to a constrained network increases CO_2 emissions over a very wide area. So NM managers are using the breathing space which the pandemic has delivered to rethink the way capacity can be managed, via the Operational Excellence programme, so a much more coordinated approach to capacity management can be developed among all stakeholders. For example, many of the previous restrictions which ANSPs regularly built into the system can now identified as not being required.

> "As soon as traffic reaches 70% to 80% of 2019 levels I suspect we will start to see structural issues in the network start to emerge and impact overall performance."

"It is also clear that ANSPs have not stopped doing good things during the crisis; we have been working with central European ANSPs to continue to build cross-border free-route airspace procedures and to plan for other major changes at network and local level," says Razvan Bucuroiu, *"and we will soon add new cross-border free route airspace (FRA) initiatives to that list with Slovakia joining the South East Europe (SEE) FRA initiative and later on Poland. Further significant efforts are made in Central Europe with the Functional Airspace Block Central Europe (FABCE). DSNA colleagues are continuing to work on bringing free route operations into service at the Brest and Bordeaux centres, as well as our Swiss, German, Spanish and UK colleagues."*

One vital outcome of the plan has been the development of new levels of trust between NM and stakeholders. NM had previously developed an internal training scheme to ensure each member of staff recognised the role of the organisation within the overall aviation value chain – supporting stakeholders, not dictating, and empowering ANSPs to make decisions based on the best available data.

"Airlines and airports have also been brought closer to NM; we have been able to use this crisis to fix issues as datalink usage, working individually with airlines to ensure avionics are compatible and datalink is used on a more regular basis, for example," says Iacopo Prissinotti. *"This cooperation will stand us in good stead for the future, allowing us to fully align operations, technology and research & development to deliver a fully scalable ATM system."* ■

HELPING AIRPORTS PLAN THEIR RECOVERY

Study by EUROCONTROL and partners highlights actions to improve performance when implementing COVID-19 measures

The study, commissioned from the Airport Research Center (ARC), aims to help airports understand the impact of implementing COVID-19 measures on airport performance. In collaboration with ACI EUROPE and other industry partners, the study assessed the impact of these measures on terminal operations, in particular passenger journey time, terminal throughput and boarding gate processing capacity.

The results show that, for the same passenger numbers in a pre-COVID queue:

- 50% more space is required at check-in;
- 100% more space at security control;
- 35-50% more space at boarding gates;
- Up to 10 minutes additional time to the departing passenger journey;
- 100% more space at immigration;
- 30-50% more space for baggage reclaim;
- 5-20 minutes additional time to the arriving passenger journey;
- Additional measures are needed to mitigate impact if health checks are required for arrivals/transfers.

The main conclusions of the study are:

- Airports need to focus on key limiting components – security control/immigration in terms of throughput challenges, and boarding gates and baggage reclaim in terms of space constraints.

- Airports already congested before the COVID crisis can expect to reach their maximum saturation capacity at just 60-75% of their peak 2019 traffic.

- To avoid further delays and conflicting requests to passengers, greater harmonisation in terms of COVID measures supporting passenger safety and re-building trust is essential across EU Member States.

TABLE 1

PANDEMIC REFOCUSES, DOES NOT SLOW DOWN, INNOVATIVE ATM RESEARCH

EUROCONTROL has refocused its research activity to support short-term recovery and long-term resilience, says **Laurent Renou**, Head of Air Transport Innovation at the EUROCONTROL Experimental Centre

The EUROCONTROL Experimental Centre (EEC) houses Europe's largest air traffic control simulator, supporting large-scale validation projects for Europe's Single European Sky (SES) initiative as well as third-party projects for air navigation service providers (ANSPs), airport operators, airlines and industry. The centre is a major contributor to Europe's SESAR modernisation research programme, providing design and development expertise for new airspace management concepts.

SESAR research continued uninterrupted during the pandemic, with the help of remote teleworking, and identified new areas of work in response to the changing market. In addition to launching Wave 2 projects, EUROCONTROL submitted proposals for Wave 3 in June 2020 – a series of research activities due to run from January 2021 to December 2022 and co-funded by the European Commission's Horizon 2020 programme.

"These latest solutions focus on scalability and sustainability of safe and efficient air traffic management," says Laurent Renou, Head of Air Transport Innovation at the EUROCONTROL Brétigny Experimental centre. *"There are short-term solutions that deliver added value to the community – ANSPs, airports and airspace users – and we are doing everything we can to accelerate these to support deployment as soon as possible."*

The industry was already under pressure to meet environmental targets set out in the Commission's Green Deal at the end of 2019, including a carbon neutral environment by 2050, and many government aid packages issued during the pandemic prioritise this activity. At the same time, Laurent Renou warns against slowing down during the traffic downturn. *"The industry does not expect the same level of traffic for a while so there is less urgency to meet capacity demand. However, in terms of research and development, we will need to work on these projects because traffic will be back in the future and it will take three to four years to address these issues."*

This is especially relevant to Laurent Renou who took over the leadership of EEC in March 2020 after 15 years in airspace management roles with Air France, and previously as a consultant for DSNA and Paris Aéroport. *"When the ATM system was not able to provide the capacity needed in 2019, the trajectory was moved to where spare capacity was available. This disrupted the trajectory and increased the carbon footprint. Now we are looking at providing capacity where the demand is."* Dynamic airspace configuration and the virtual centre are among priority projects submitted by EUROCONTROL in SESAR Wave 3.

FASTER DEPLOYMENT

"We are focused on accelerating project maturity with a goal of achieving Level 3 validation (V3) by the end of 2022, ready to start industrialisation by 2023 and deployment in 2024 or 2025," says Renou. This quickening of the transition from design and development to deployment and integration is a feature of the Airspace Architecture Study (AAS) commissioned by the Commission in 2019. Specifically, this recommends establishing a *"network of digital European sky demonstrators targeting early movers to accelerate SESAR delivery"*. Renou is optimistic that significant progress will be achieved on a ▶

> "There are short-term solutions to deliver added value to the community (…) and we are doing everything we can to accelerate these to support deployment as soon as possible."

"It is good to have a long-term vision, but the innovation cycle has to be closer to other industry practices. Shortening the air traffic management modernisation cycle is one of the key challenges."

virtual centre within the framework of SESAR Wave 3 activity including the implementation of a digital sky demonstrator of the virtual centre fielded by two ANSPs at the beginning of SESAR 3.

Speeding up the path to deployment includes shortening the development cycle. *"The current situation demonstrates the difficulty of anticipating the world beyond five years,"* says Laurent Renou. *"Technology used 10 years ago is now obsolete and technology is moving faster and faster. It is good to have a long-term vision, but the innovation cycle has to be closer to other industry practices. Shortening the air traffic management (ATM) modernisation cycle is one of the key challenges."*

Achieving this will depend upon on early participation by other industry players. Safety assessments need to start during initial phases of development and ANSPs, industry, airspace users, airports and research institutes need to be involved in the activity. "SESAR brings the added value of partnership to European research. There has to be a holistic view from the outset to understand not only the purpose of a new function but how it fits into the whole system."

Safety represents a core activity at Brétigny where a dedicated safety team provides independent and innovative ATM safety services based on experience across the entire safety assurance approach, including ATM and the flight deck domain. The safety team also develops generic safety cases to facilitate local deployment of new concepts or operations.

Among key projects the safety team is participating in the development of EUROCONTROL's Integrated Risk platform for Europe (IRiS), a web-based framework that hosts a set of barrier-based risk models describing how risk evolves in ATM in a holistic way. IRiS is a joint programme with the US Federal Aviation Administration (FAA) which uses the same platform to host its Integrated Safety Assessment Model (ISAM). Brétigny supported the EUROCONTROL Network Manager's (NM's) development of a roadmap for IRiS industrialisation released in order to ease its deployment at ANSP level.

INNOVATION LABS

Supporting the concept of short-term innovation, EEC is launching a Europe-wide network of innovation laboratories designed to bring innovation closer to the end-user. The initiative marks the start of a series of partnership ventures with universities, research centres, small- and medium-sized enterprises all over Europe. *"The idea is to develop solutions that address the needs of the end-user,"* says Laurent Renou. *"We will listen to these needs and develop solutions based on agile development methodology."*

An ambitious six-month cycle follows a three-step process: connect, build and promote. Connecting with the end-user identifies market need – for example addressing issues from controllers, pilots, dispatchers or airport operations. EUROCONTROL then builds a research team in partnership with the end-user at local level. Development of a prototype solution is then promoted to attract other end-users and increase participation. *"A prototype that addresses end-user needs is more likely to be deployed and bring value. It is also more likely to interest multiple parties,"* explains Laurent Renou.

EUROCONTROL has engaged with several potential partners and expects to launch the first innovation lab in Q1-2021. Early candidate partners include Air France, Transavia, Swiss, Paris Orly Airport, easyJet and Ryanair, with more anticipated. An innovation lab – for example at Paris Orly – would research specific solutions in partnership with specific end-users and research bodies. Additional labs in Dublin, Gatwick and Zurich, linked with the Experimental Centre in Brétigny, would start to form a network. *"EUROCONTROL shoulders the risk for a prototype to mature sufficiently for an investment decision. Once industrialised, it can be widely used and if developed by a university it could incubate a start-up."*

Renou is calling for a rapid development cycle. The first cycle started last September as a test case. EUROCONTROL has focussed on four topics and will develop prototypes within six months. A showcase event in April 2021 is intended to attract other end-users and start a new prototype development cycle. User needs collected for the test case include:

- Forecast of the ATC delay evolution for a regulated flight
- Improving chance to obtain a direct route
- Forecast of holding time at arrival
- Airlines flight priority integrated with EUROCONTROL NM system
- Curfew collaborative management
- European Airport CDM portal

The goal is to have 20 or more innovation labs across Europe by the end of 2023, creating a network managed by the Experimental Centre. *"The cycle complements the SESAR programme, providing opportunities to feed into Wave 3 from 2023 and giving the programme more agility,"* says Laurent Renou.

SUSTAINABLE AVIATION

Innovation will play a key role in meeting the Commission's Green Deal targets for European transportation and EUROCONTROL's Experimental Centre is leading a number of projects in this domain. The centre's large-scale simulation capability has supported implementation of Free Route Airspace (FRA) in many States, and is preparing to carry out some real-time simulations for Turkey's FRA project. The centre is also supporting implementation of continuous descent and climb operations, with a number of these projects due to start again soon. "We have an opportunity in the next few years to extend Continuous Descent Operations (CDOs), Continuous Climb Operations (CCOs) and FRA while traffic is low, so we can see how they can still be used when traffic returns," says Laurent Renou.

Under Laurent Renou's leadership, EUROCONTROL is excited to be a key player of the new initiative with airframe and engine manufacturers about to be launched to optimise the integration of new generation aircraft into the airspace. "The added value of EUROCONTROL is to assess the impact of new aircraft on the system in terms of speed, climb rate, descent rate and cruise level to enable the whole system to evolve in the most efficient way," Renou says. Based on lessons learned during A380 development, EUROCONTROL is engaging with industry players such as Airbus and Safran in early development stages.

Measuring the impact of aviation will allow EUROCONTROL to assess progress, with an emissions dashboard providing greater transparency. Laurent Renou adds: *"We are looking at two issues: emissions and noise. We are investigating procedures to reduce noise in collaboration with airports and engine*

> ## "Innovation will play a key role in meeting the Commission's Green Deal targets for European transportation."

manufacturers." Among the solutions, EUROCONTROL is exploring displaced runway thresholds and increased glideslope based on widespread use of satellite navigation and landing procedures.

This work will be supported by longer-term investment in the Centre's simulation platforms. In a phased programme expected to start in 2021, the simulation platform is due to be modernised over a five to seven-year period. In addition to upgrading individual components, EUROCONTROL plans to work with other research centres and ANSPs with simulation facilities to expand digital capabilities and network opportunities.

This work will be accompanied by increased activity with the emerging drone industry, where EUROCONTROL already leads a number of research projects to manage the safe integration of Unmanned Aircraft Systems (UAS) and Remotely Piloted Aircraft Systems (RPAS) in controlled airspace, for example supporting demonstration flights. *"The drone industry is growing rapidly and we plan to become a centre of excellence for drones and urban mobility,"* says Laurent Renou. *"We are already working with the community to help define services and we are cooperating with the European Union Aviation Safety Agency (EASA) and SESAR Joint Undertaking (SESAR-JU) to provide what the industry needs to develop. There is a need for a validation centre to enable these types of new services to grow."* ∎

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> EUROCONTROL plans to work with other research centres and ANSPs with simulation facilities to expand digital capabilities and network opportunities.

EUROCONTROL:
A VITAL FORUM FOR ALL STAKEHOLDERS
TO AGREE RECOVERY PRIORITIES

If all European aviation stakeholders can agree a common strategy, aviation recovery will be faster, stronger and more sustainable.

EUROCONTROL has a key role in supporting partners work together to set the priorities, says **Philip Hughes**, Head of European Aviation Plans, Cooperation and Stakeholder Support at EUROCONTROL

Whatever the scale of uncertainties currently engulfing the industry one fact is generally held to be true: COVID-19 will bring fundamental, long-term changes to aviation. Optimists hope the pandemic will be a catalyst to much-needed change, creating an air traffic management (ATM) system in Europe which is more scalable, flexible and able to react to changes in the marketplace in a more dynamic way than before, creating the framework for a recovery based on stronger environmental priorities linked to the European Green Deal. Pessimists fear the pandemic will lead to further entrenchment of silo-based mentalities, with each stakeholder group focused on protecting its own financial and business portfolio interests.

For EUROCONTROL these are critical times and its role as a strategic coordinating body for all stakeholders to develop mutually beneficial recovery plans has never been more important.

"We've already tried to help airlines and air navigation service providers (ANSPs) with loan arrangements and developed a clear, four-pillar strategy for supporting the industry in terms of deferring charges and other support mechanisms," says Philip Hughes, Head of European Aviation Plans, Cooperation and Stakeholder Support at EUROCONTROL. *"We now need to prepare for the next stage, which is focused on how the industry can recover. That requires a detailed engagement with the different stakeholders. We need to agree on what we want to do collectively, what we need to prioritise and what the next actions should be."*

There are both short-term and long-term considerations to be agreed upon. EUROCONTROL has put in an application for €3 billion of research funding to secure long-term

"We need to agree on what we want to do collectively, what we need to prioritise and what the next actions should be."

financing for technology improvements and in the short term has developed a Network Management (NM) Recovery Plan to help restore services. With the high-level plans in place the discussions are now focusing on more near-term priorities for enhancing the scalability of the industry – which operational improvements should we focus on? What benefits will digitisation bring and to whom? How do we continue to build capacity and efficiency into the system? When will these solutions need to be brought onstream? How can we do this in an environmentally friendly way and how can we communicate this message to the general public?

The Agency sees itself as a facilitator for these discussion among all stakeholders – the military, regulators, ANSPs, aircraft operators, social partners and more.

This is clearly the objective of the EUROCONTROL Stakeholder Forum webinars which we are currently running in order to engage with stakeholders, despite the challenges of remote interaction due to the pandemic, and to ensure that stakeholder views are firmly embedded in the work that the Agency does. The aim is to complement the existing formal consultation process to allow online fora for further discussion on specific topics.

"We're trying to create a clear value chain, a clear linkage between what operationally and technically we think is required for stakeholder-driven service improvements," says Philip Hughes.

There is less money available, capacity and efficiency need to be continually improved and the industry has to take account of the European Green Deal, says Hughes. *"We have as the basis for these discussions the conclusions of the Airspace Architecture Study and the Wise Persons' Group report, which*

describe how we use Europe's ATM infrastructure assets in a smarter way. In the Operational Excellence programme, which EUROCONTROL NM is putting together, there are 15 areas on which they are focusing and a number of near-term term initiatives which will enhance efficiency and capacity. But we also need to link these to longer-term initiatives, probably coming from the SESAR programme, which through industrialisation and deployment will deliver the solutions on time to meet those needs. Because once things start to recover the industry will move its focus away from 'you are spending too much money' to 'you need to deliver more capacity'."

This goes to the heart of the challenge for Europe's ATM sector: how can we make the system more scalable so that capacity can be deployed in a more dynamic way? Whatever the solution, there will have to be much greater degrees of cooperation and coordination at a European level between ANSPs to ensure that smart solutions are consistent with the conclusions of the Airspace Architecture study. This is not primarily a technical challenge but an institutional one.

"We know from the Master Plan and the recent Strategic Research and Innovation Agenda (SRIA) the roadmap which is required in terms of delivering the technical solutions and how this can be done," says Hughes. *"We think we need to accelerate the delivery of some of those technical solutions particularly to provide scalability. The larger issues relate to the political and institutional problems and we will need to build solutions around these. That's why this must be a stakeholder-driven discussion. In some ways the COVID crisis has become a catalyst for a new conversation because there won't be the money in the system to do everything; everybody will have to work in a better and smarter way, which is also environmentally friendly to achieve the results."*

▶

EUROCONTROL believes the institutional resistance to change within the European ATM system has meant that until now only a few very small steps have been taken to deliver on the business case possibilities of the Study. But the COVID crisis has meant that there is a new urgency to make significant changes to the way ATM services are delivered. For example, there are major savings to be made in reducing duplication of communications, navigation, surveillance/air traffic management (CNS/ATM) resources, such as the over-interrogation of aircraft because of duplication of interrogation systems. The emergence of Air Navigation Data Service Providers (ADSPs) will be significant because it will mean ANSPs will no longer have to own all their own infrastructure; they will be able to deliver the same or better levels of service by using the expertise of transnational ADSPs.

"There's nothing to stop you from consolidating CNS/ATM infrastructure now, first in areas such as communications, because digitisation has taken over in a really tangible way with initiatives such as the new Pan-European Network Service (newPENS) infrastructure programme, and then from the surveillance side," says Hughes. *"If you could create an ADS-B ground network together with space-based ADSBP you could start to seriously reduce the number of monopulse secondary surveillance radars (MSSRs) and navigational infrastructure in Europe. Digitisation should be about scalability and efficiency."*

In many ways this process has already started. The advent of digital towers has seen ANSPs and industry working together on consolidated programmes and in the training area Entry Point North is now providing training infrastructure in Ireland, Sweden, Denmark, Hungary and Belgium. In service delivery, ANSPs can be more open in the way they can dynamically reconfigure airspace to allow for cross-border management of airspace and enhance the mobility of the workforce to ensure there are always controllers available to meet traffic demand. This is a key element in developing a scalable ATM service delivery solution which can quickly adapt capacity levels to the needs of the market.

"I speak from personal experience here because after 9/11 I was given the job of putting 25 Irish air traffic controllers on secondment for three years into Germany, which was short of controllers at the time. We put them in three different centres following a very short conversion course and they were highly successful," says Hughes. *"So if you marry more flexibility and a better regulatory regime with technology there is no reason why you can't use your ATCO resources more efficiently and make them more mobile."*

The viewpoints of social partners to the coming changes will be crucial in ensuring new technologies and working practices can be delivered in a timely, efficient way. Philip Hughes says controllers recognise that the nature of their role will change as more artificial intelligence (AI) and automated decision-making tools become available.

"The tools that will be developed in the system will help the controller make decisions in a better way," says Hughes. *"We've already seen the benefit of this in technologies such as medium-term conflict detection and other planning tools. And if we can demonstrate how these new technologies will be introduced it will go a long way toward assuaging their fears. As with any form of change it's a cultural issue and the fear of the unknown."*

There is one other important priority which EUROCONTROL is working with other stakeholders to improve: the communication of aviation's achievements in improving its environmental performance and the importance it wants to give to environmental issues as part of the recovery process.

"I think the Green Deal is extremely important to us all but aviation generally has been poor at explaining the value of the initiatives we have undertaken in carbon dioxide and noise reduction programmes," says Hughes. *"We don't communicate this well enough and EUROCONTROL can bring all parties together to have a conversation on how we can improve this."* ∎

A UNIQUE OPPORTUNITY TO ACCELERATE DEVELOPMENT

The Maastricht Upper Area Control Centre (MUAC) is used to blazing a trail, says **John Santurbano,** Director MUAC. Europe's high performing multinational air navigation service provider manages the upper airspace over Belgium, the Netherlands, Luxembourg and north-west Germany – among the busiest and most complex in the region. It is Europe's only cross-border civil-military ANSP and uniquely provides services around traffic flows, not borders

Prior to COVID-19, MUAC was handling a growing share of European traffic, stretching controller capacity and curtailing qualified expertise available for research and development. The pandemic in contrast has allowed focus to shift even more to innovation and change, visible in the number of accelerated projects aimed at addressing long-term issues facing the industry.

SETTING PRIORITIES

The initial priority was keeping Maastricht's employees safe and protected against the virus. *"Our people are the fuel that enables the engine to run. We spent time and investment adapting the premises, introducing teleworking and communicating with staff,"* says John Santurbano, Director of MUAC. *"We also had to continue daily operations, supporting essential medical deliveries, cargo and repatriation flights as well as military traffic."* Retaining staff competences became more important as traffic fell more than 80%, prompting the deployment of enhanced digitalisation solutions. MUAC's test and training infrastructure - a highly complex software environment - was made available from outside the premises to designated users, allowing them to continue to work remotely through a secure interface, and certification activities were carried out in a simulated environment to maintain qualifications. ▶

Aligned with COVID-19 best practice, special rosters were formed to limit the number of contacts between staff and contain the spread of the virus. Added flexibility in shifts and standby rosters was agreed with social partners, including some shifts held over for when traffic resumes. To help predict future demand, special dashboards were developed to compare sector threshold values with forecast data received from the EUROCONTROL Network Manager. Separate arrangements were made for military sectors that took advantage of spare capacity to run supplementary training activity, matched by appropriate staff levels.

> "Our controllers do more than operate the airspace; they are multi-tasking and innovative, and they have a unique expertise. Our engineers hold the system's intellectual property. We have a significant advantage and we are using this time intelligently."

TIME FOR INNOVATION

Less than a year earlier Santurbano launched MUAC's Engagement and Innovation programme and in particular the so-called InnoLab, aimed at encouraging new ideas and modernisation. *"We are one of the best in class, but if you want to increase capacity and improve operations, this calls for new technology and new solutions. Our people already work in a performant and efficient way most of the time, so we focus on how we can make the airspace more efficient."* The work includes increased cooperation with the EUROCONTROL Network Manager, military partners and neighbouring ANSPs. It also includes special focus on technology and digitisation.

Collaborative actions were already in place in response to the capacity squeeze experienced in 2018. For some years Maastricht has consulted regularly with customers and with its 'Customer Initiative' in particular, it uses input from airspace users to help shape new developments designed to save time and costs for the airlines. This was formalised with the creation of the ATM Portal, an electronic platform which supports data exchange and helps to identify efficiency opportunities. It uses data analytics in a co-creational setting, drawing on MUAC's flight data processing and flow management system, combined with information supplied by the airlines, to identify local improvements. Its criticality indicators automatically protect against events such as airport curfews, crews running out of hours and schedule disruption, and provide tactical support to the integrated Flow Management Position (iFMP).

"The ATM Portal enables coordinated collaborative decision-making in real time."

"The ATM Portal enables coordinated collaborative decision-making in real time between aircraft operators' operations control centres, flow management positions and the EUROCONTROL *Network Manager, which helps make real savings,"* says Santurbano. The ATM Portal is trialled by other ANSP partners such as Karlsruhe and Reims UACs, as well as the Network Manager. Discussions are underway to expand the portal to include other users including UK NATS and Zurich airport.

Another activity accelerated during the traffic downturn which MUAC launched was a Pre-flight Check' to identify the best possible route and flying altitude for individual flights. The tool assesses each flight plan filed in fine detail and - where applicable - sends an offer to the aircraft operator with NM in the loop to optimise the route. The airline can refile if benefits justify this. Opportunities are based on aspects including aircraft performance, comparison of commonly flown routes, available capacity and inactive military areas. These improved flight profiles are often hidden or difficult to find by the aircraft operator. Developed and deployed in just six weeks, users are now gaining valuable experience on the system during a time of low demand with increased benefits anticipated as traffic returns.

MUAC has also introduced more flexibility to Route Availability Documents (RAD), or airspace measures, imposed to ensure sufficient capacity in congested airspace. While many RAD restrictions were lifted as a result of COVID-19 traffic downturn, airspace users still encounter military airspace restrictions and sub-optimal routing which raises cost and lowers efficiency. MUAC is offering tactical changes via a new service called MUAC-AO AIRAC brief which shares the latest data about RAD changes with airspace users to improve flight planning. This, together with the Pre-Flight Check, is due to be integrated into the ATM Portal, which in turn can be added to neighbouring flow management positions, for example in Karlsruhe and Reims.

"We are using working groups and collaborating with our partners to implement these procedures," explains Santurbano. *"The further we come during this COVID-19 period, the more we can consolidate these developments. You have to put yourself in the shoes of the other players and understand all the issues. The network is only as good as the weakest link in the system."*

SHARED AIRSPACE

Collaboration is central to MUAC's civil-military operations, shown in the recent creation of the MUAC Flexible Use of Airspace (FUA) Cell to manage daily allocation of flexible airspace in the Netherlands in June 2020. Established in cooperation with the Royal Netherlands Air Force, the Dutch Ministry of Defence and Ministry of Infrastructure and Environment, the cell replaces the Dutch Airspace Management Cell and improves real-time civil-military cooperation, reduces airspace segregation needs, and increases flight efficiency in the Netherlands.

With the creation of the MUAC FUA Cell, airspace management became an integral part of the air traffic flow and capacity management process within the Netherlands, in preparation for the Dutch airspace redesign planned for 2023.

Equally significant is MUAC 's Shared ATS System (SAS2), MUAC's flight data processing system deployed and operational at Belgian military facilities since December 2019. The common platform benefits civil-military operations, enhances interoperability, while also reducing investment, maintenance and training costs. *"We are analysing how we can do the same with other partners including Belgium's civil air navigation service provider skeyes, and with Slovenia Control,"* says Santurbano. *"Delivering the same or similar services with the same technical infrastructure adds efficiency and synergies. It also fosters excellent cooperation between key partners."*

CLIMATE IMPACT

In December 2019, MUAC introduced free route airspace around-the-clock enabling airspace users to select preferred routes between entry and exit points, two years' ahead of the European deadline. Cross-border options were also extended with Germany and the Danish-Swedish functional airspace block. Before the pandemic environmental benefits of free route airspace in the MUAC area were estimated at 40 tonnes of fuel and 150 tonnes CO2 emissions saved per day if all flights take advantage of the more flexible route structure. Additionally, airspace demand becomes more predictable

and the remaining route network is being optimised to provide vertical connectivity between the free route zone and the lower airspace.

Minimising environmental impact is high on Santurbano's policy agenda. A new initiative launched in April 2020 plans to validate ways of avoiding contrails using operational methods. The Contrail Avoidance Project examines a concept highlighted in previous studies showing that aircraft can be rerouted around atmospheric conditions which are conducive to contrails. Using predictions about atmospheric conditions, flights will be using more efficient profiles on the basis of weather forecasts to prevent contrails. The aim is to minimise intervention and maximise the positive impact, starting with validation of the whole process as well as individual components.

As a very small percentage of flights are responsible for most of the climate impact of contrails, the research examines whether reduced warming from contrails outweighs the extra fuel burn generated by a small number of diversions. The project will include live trials accompanied by analysis of satellite images to examine the results. MUAC expects the project to make a significant contribution to the sustainability of the industry by reducing its ecological impact.

The environment presents a tough challenge, says Santurbano, who also provides leadership to the Functional Airspace Block Europe Central (FABEC) Environment Standing Committee in his role as CEO Champion. *"Our environmental footprint has to be as good as possible. We also need to be aware of the financial crisis for the airlines. Our focus has to be on realistic, feasible projects generating tangible benefits at the earliest opportunity."* With innovation at the heart of MUAC operations, this period of low traffic demand provides an ideal opportunity to develop new solutions for the challenges ahead. *"Our controllers do more than operate the airspace; they are multi-tasking and innovative, and they have a unique expertise. Our engineers hold the system's intellectual property. We have a significant advantage and we are using this time intelligently."* ∎

EUROCONTROL IS BUILDING MORE
COST-EFFECTIVE, WIDE-RANGING CYBER RESILIENCE CAPABILITIES

As the air traffic management industry embraces a more digital future, the Agency is developing new programmes and assets to ensure all aviation stakeholders will have access to more capable and affordable cyber security services, explains **Patrick Mana,** EUROCONTROL Cyber-Security Programme Manager

> ## "Around 39% of all cyber-attacks are launched by cyber-crime organisations and their motivation is financial."

Cyber-attacks on Europe's air traffic management (ATM) system will become more numerous and complex. As aviation businesses of all types increase their digital working practices in the wake of the COVID-19 pandemic, accelerating long-term ATM towards replacing legacy human-centric systems with more digital systems, EUROCONTROL is scaling up its support programmes to deliver cost-effective cyber-security services to a wide range of stakeholders.

There are, broadly, three levels of cyber threat: State-sponsored groups conducting cyber-attacks mostly for political reasons; cyber-crime organisations for financial reasons by for example stealing and reselling information, ransomware, impersonating aviation stakeholders to extract money from legitimate organisations through deception or blackmail, and "hacktivists", activists wanting to disrupt the aviation industry for motivational reasons.

While state-sponsored actors are responsible for around 23% of overall cyber-attacks they so far did not tend to target ATM organisations which are recognised as essential safety-of-life services – according to the current shared records of incidents. Will this remain? But cyber criminals are another matter. Their methods are becoming more complex and difficult to detect. They have begun adapting their operations from directly stealing money to stealing data and finding multiple ways of exploiting its value. These range from bombarding contacts with emails and only stopping when a ransom has been paid to encrypting part of a network and threatening to keep it locked – or expose it – unless money is handed over.

"Around 39% of all cyber-attacks are launched by cyber-crime organisations and their motivation is financial," says EUROCONTROL Cyber-Security Programme Manager Patrick Mana. *"This is achieved by stealing money via fraudulent websites – impersonating airlines for example and selling fake tickets, or via frequent flyer programmes, where they sell miles from accounts to which they have access. But it can also be a scam impersonating EUROCONTROL."*

In general, the COVID-19 pandemic has seen a significant increase in phishing especially using COVID-19 attractive themes (fraudulent attempts to obtain sensitive information or data, such as usernames, passwords and credit card details, by disguising oneself as a trustworthy entity in an electronic communication) and malware (software designed to cause damage to a computer, server, client or computer network) attacks. These have become particularly harmful as the increase in remote working has given criminals a greater opportunity to access digital information. With so many people working in new ways it is more difficult to detect intruders when new working practices are being introduced. Many organisations are focused on survival, rather than expanding cyber security, and this has made the criminals' job even easier.

"More digitalisation means a larger cyber threat," says Mana, *"and we are now working with a wide number of stakeholders – including air navigation service providers (ANSPs), airport operators, airspace users and other aviation stakeholders – providing services such as vulnerability scanning and Indicator of Compromise (IOC) scanning not just to support them but to support them in a cost-effective way."*

Cost-effectiveness is becoming an increasingly important component of the Agency's cyber security operations – which means acquiring core skills and programmes which can then be distributed across a range of aviation stakeholder groups. "We are purchasing services that we provide free to our customers because they fund us," says Mana. "Buying one licensed service that we can provide freely to a range of customers can be 12 to 15 times more cost-effective than if each organisation were to purchase a single licence.

"For example, we can provide a list of IOC scanners whereby stakeholders install the software free-of-charge and use our list of IOCs. But stakeholders can check their own data to see whether there are any files which have been compromised. We can also conduct penetration tests of organisations, where de-identified generic lessons can be learned and then shared with the community. When we identify incidents we can help stakeholders correlate that with what is happening in other places." ▶

> ## " More digitalisation means a larger cyber threat."

"We have recently started a new project to assess how we can use AI in cyber-security."

Most of this work takes place via the EATM-CERT, which works both proactively and reactively to prevent security breaches and then manage and recover from incidents when they do occur. But more long-term programmes are also being developed.

One strategically important programme is the development of a trust framework for public key infrastructure (PKI) programmes such as system-wide information management (SWIM), which provides users with a digital certificate guaranteeing the validity of source material and originators, a kind of digital passport for SWIM as well as other aviation data providers and users. This Connecting Europe Facility (CEF) co-funded project under SESAR Deployment Manager portfolio is led and coordinated by EUROCONTROL. Thirty stakeholders (air navigation service providers, airspace users, airports and the military) contribute to it.

"This solution will provide and develop the means to ensure interoperability while securing the exchange of information," says Mana. *"It will ensure that information is shared using a network which accepts data from trusted parties. We are working initially on SWIM services but eventually this solution will be provided for other aviation information purposes. For example, it could be used to ensure that each radar sensor is identified and authenticated."*

The objective is to provide all users a level of assurance – from a security point of view – that network stakeholders are able to perform at a minimum level and this level can change depending on the nature of the data. It is a complex challenge because it means assessing what minimum level of data security is required for each aspect of data provision and then ensure via an audit that the stakeholder is performing to the required level of data security and, if not, develop a system which automatically rejects the inputs.

"We are working to determine what are the criteria needed to become a member and what are the criteria which should be used to periodically audit and potentially reject a member," says Mana. *"We are aiming for interoperability first within Europe then interoperability beyond, so we can have an operating solution in place by 2022/2023."*

Another strategic programme is the work to enhance the EUROCONTROL Network Manager (NM) infrastructure cyber security. In February 2020 NM launched a tender for the integrated Network Manager (iNM) project, designed to move NM's legacy systems towards digital products based on an open digital platform. This will deliver innovative capabilities that harness artificial intelligence, robotic process automation, data analytics, and so on. Enhanced cyber security will be an integrated asset.

"We want to make sure the new system is developed in accordance with the best practices and that the life cycle of the system includes the security for the iNM," says Mana.

Another strategic programme is OPTICS2, a research project connected to the European Commission and the European Union Aviation Safety Agency (EASA) which looks at the wide picture of future security and cyber security threats to the European aviation industry as more digitisation and artificial intelligence (AI) technologies are introduced. AI offers a number of challenges – and potential benefits – which will need to be fully understood.

"We have recently started a new project to assess how we can use AI in cyber-security," says Mana. *"For example, we are searching the dark web for relevant information and finding ways to extract it. Using humans for this work is time-consuming and costly, especially to the mental health of people who have to spend time in this very nasty environment. So we are using AI to analyse all the data that we have found and focus on what we think is probably most relevant. That project started at the beginning of June."*

AI-based technology, like all forms of digital systems, can provide multiple benefits and security challenges.

"If some guys want to corrupt the response by inserting fake data that will obviously influence the way the AI/machine learning system will behave," says Mana. *"The other challenge is how can you certify these kinds of systems? Because we are very much used to a functional approach where we can conduct a test which clearly shows what output will occur from any given input. AI/machine learning operates in a different way. The response to a certain set of data today could be quite different in a year's time, because the system will have learnt to react in a more optimal way. And that's very difficult to certify."* ■

THE AVIATION INTELLIGENCE UNIT PROVIDING TIMELY AND PRECISE AVIATION INDUSTRY DATA DURING THE CRISIS

EUROCONTROL's role in providing key operational data has become even more significant as aviation stakeholders seek firm facts and figures on which they build their survival and recovery plans explains **Denis Huet**, Head of Aviation Intelligence at EUROCONTROL

"In terms of data provided to the outside world we have not limited ourselves to an operational assessment and the daily update, we have also incorporated data from States and airlines outlining their COVID-19 responses."

Europe's aviation stakeholders have had a unique resource to support them in managing operations following the outbreak of the COVID-19 pandemic and then plan for a coordinated recovery. Since the start of the crisis EUROCONTROL's Aviation Intelligence Unit has published daily updates on the traffic situation in Europe[1], tracking movements throughout the entire European network, at major airports, air traffic control (ATC) centres and for major aircraft operators, enhanced by more regular detailed traffic analysis such as weekly Comprehensive Assessment reports.

"Back in February we saw what was happening in the Far East and we realised that something important was coming – and then we decided on a number of actions," says Denis Huet, Head of Aviation Intelligence at EUROCONTROL. The Agency urgently needed to collate as much relevant traffic data as possible from all known sources so the unfolding traffic patterns could be assessed at the weekly Director General of Civil Aviation (DGCA) meetings. But from the start it was clear that this data would also be of invaluable use to all aviation stakeholders, so it quickly became publicly available.

"We proposed at the start of the crisis to set up a daily traffic dashboard in an interactive way so that our stakeholders could query the data, analyse the trends and add their own inputs, to give a precise view of overall flight numbers, variations from the previous year and a weekly moving average," says Denis Huet.

Since then, the daily traffic updates have been enhanced with a growing amount of more wide-ranging and precise indications of traffic demand as the number of data sources has increased and additional analytical tools introduced to interpret the raw data in more meaningful ways.

"In terms of data provided to the outside world we have not limited ourselves to an operational assessment and the daily update – we have also incorporated data from States and airlines outlining their COVID-19 responses, Denis Huet says.

Over the ensuing weeks and months the Unit has increased not just the amount of data it publishes but has added new sources and media. It uses various social media channels to update stakeholders and the website currently records 1,200 users downloading 3,000 pages of records every day. The audience is global. But the effort to develop and maintain this flow of reliable, validated data on a daily basis has been immense.

"One challenge has been to organise the data flow and quality checks to ensure a continuous update every day," says Denis Huet. *"For the Comprehensive Assessment reports we use this core data but also data from as many other reliable sources as we can: ACI EUROPE airport passenger throughput reports, Aireon ADS-B surveillance data for Middle East and China traffic flows as well as open-source ADS-B data for other parts of the world like North America."*

Another challenge has been to ensure the quality of the data, which has involved a mix of manual inputting and automatic extraction from stakeholder databases. *"It required some internal organisation here but we are fully comfortable with the quality of the data; it's done on a daily basis using the data from the day before,"* says Huet. *"During the crisis, we have always ensured that everyone would be comfortable with what we have published, avoiding in particular releasing commercially sensitive information."*

The work of EUROCONTROL's Aviation Intelligence Unit – which hosts the Performance Review Unit (PRU) charged with delivering to interested stakeholders relevant, high-quality information on Pan-European ANS performance, as well as the Business Intelligence and Statistics Unit – has cemented the Agency's role as a unique source for reliable data provision, ensuring a key and timely delivery of operational data for all stakeholders.   ■

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1   *https://www.eurocontrol.int/Economics/DailyTrafficVariation-States.html*

INTERACTIVE DASHBOARD

DAILY TRAFFIC VARIATION (STATES, ACCs, AIRPORTS, AIRCRAFT OPERATORS)

Check our most recent air traffic statistics available here on our
interactive dashboard

https://www.eurocontrol.int/Economics/DailyTrafficVariation

DATA

Traffic evolution
between worldwide regions

REGION	OCTOBER 2020	OCTOBER 2019	CHANGE
Intra-Europe*	**346,606**	**763,601**	**-55%**
Europe <-> **Asia/Pacific**	11,218	25,186	-56%
Europe <-> **Mid-Atlantic**	1,930	4,675	-59%
Europe <-> **Middle-East**	15,951	44,380	-64%
Europe <-> **North Atlantic**	13,661	39,149	-65%
Europe <-> **North-Africa**	9,013	32,202	-72%
Europe <-> **Other Europe**	11,383	34,320	-67%
Europe <-> **South-Atlantic**	1,726	5,807	-70%
Europe <-> **Southern Africa**	5,324	9,702	-45%
Non Intra-Europe	**70,206**	**195,421**	**-64%**

| REGION	YEAR TO DATE (JAN-OCT) 2020	YEAR TO DATE (JAN-OCT) 2019	CHANGE
Intra-Europe	**3,457,794**	**7,368,699**	**-53%**
Europe <-> **Asia/Pacific**	129,248	242,596	-47%
Europe <-> **Mid-Atlantic**	25,013	52,233	-52%
Europe <-> **Middle-East**	177,380	440,055	-60%
Europe <-> **North Atlantic**	148,704	373,328	-60%
Europe <-> **North-Africa**	112,355	316,775	-65%
Europe <-> **Other Europe**	112,995	330,110	-66%
Europe <-> **South-Atlantic**	22,779	56,444	-60%
Europe <-> **Southern Africa**	52,511	93,895	-44%
Non Intra-Europe	**780,985**	**1,905,436**	**-59%**

* Europe = ECAC 44 Member States
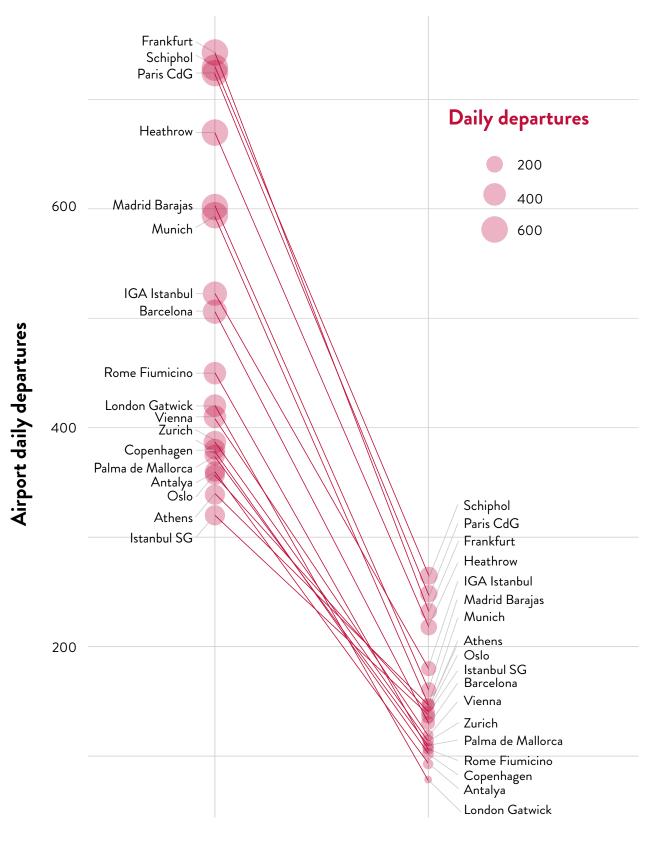
Top 20 traffic flows

Mar-Oct 2020 vs Mar-Oct 2019

RANK	DEPARTURE STATE	ARRIVAL STATE	AVERAGE DAILY MOVEMENTS (MAR-OCT 2020)	SHARE OF MAR-OCT 2019 MOVEMENTS
DOMESTIC FLOWS WERE THE MAIN DRIVERS OF EUROPEAN TRAFFIC DURING THE PERIOD MARCH-OCTOBER 2020				
1	France	France	611	53%
2	Norway	Norway	547	71%
3	Turkey	Turkey	478	51%
4	Germany	Germany	419	44%
5	Italy	Italy	403	47%
6	UK	UK	361	34%
7	Spain	Spain	332	42%
8	Greece	Greece	209	56%
9	Spain	UK	165	22%
10	Sweden	Sweden	143	40%
11	Germany	Spain	143	27%
12	Canary Islands	Canary Islands	131	51%
13	Germany	UK	129	31%
14	Germany	Italy	124	27%
15	France	UK	112	27%
16	France	Germany	112	32%
17	Germany	Turkey	109	31%
18	Italy	UK	103	28%
19	France	Spain	102	29%
20	France	Italy	92	26%

Daily departures at top airports

Mar-Oct 2019 vs Mar-Oct 2020

Airport daily departures

Daily departures

- 200
- 400
- 600

Mar-Oct 2019 (top to bottom): Frankfurt, Schiphol, Paris CdG, Heathrow, Madrid Barajas, Munich, IGA Istanbul, Barcelona, Rome Fiumicino, London Gatwick, Vienna, Zurich, Copenhagen, Palma de Mallorca, Antalya, Oslo, Athens, Istanbul SG

Mar-Oct 2020 (top to bottom): Schiphol, Paris CdG, Frankfurt, Heathrow, IGA Istanbul, Madrid Barajas, Munich, Athens, Oslo, Istanbul SG, Barcelona, Vienna, Zurich, Palma de Mallorca, Rome Fiumicino, Copenhagen, Antalya, London Gatwick

Mar-Oct 2019   **Mar-Oct 2020**

600
400
200

Market segments
Mar-Oct 2020 vs Mar-Oct 2019

TOTAL FLIGHTS — **-64.5%**

Mar-Oct 2020	2,823,343
Mar-Oct 2019	7,963,686

✈ Traditional scheduled — -71.7%

Mar-Oct 2020	1,171,788
Mar-Oct 2019	4,133,796

Low-cost — -72.7%

Mar-Oct 2020	670,343
Mar-Oct 2019	2,456,601

Business aviation** — -29.8%

Mar-Oct 2020	359,856
Mar-Oct 2019	512,664

All-cargo* — 0.8%

Mar-Oct 2020	220,019
Mar-Oct 2019	218,375

Other types — -21.5%

Mar-Oct 2020	168,285
Mar-Oct 2019	214,483

Charter — -51.6%

Mar-Oct 2020	169,517
Mar-Oct 2019	350,272

Military — -18.0%

Mar-Oct 2020	63,535
Mar-Oct 2019	77,495

Market shares
Mar-Oct 2020 vs Mar-Oct 2019

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

****Business aviation** declined less than the other main segments and doubled its share of total flights compared with the same period in 2019.*
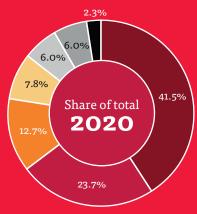
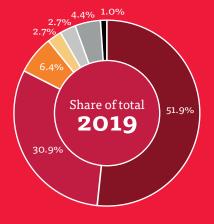Legend: Traditional scheduled, Low-cost, Business aviation, All-cargo, Other types, Charter, Military

Share of total 2020: 41.5%, 23.7%, 12.7%, 7.8%, 6.0%, 6.0%, 2.3%

Share of total 2019: 51.9%, 30.9%, 6.4%, 2.7%, 2.7%, 4.4%, 1.0%

NEWS

FROM THE AVIATION NETWORK

ENAIRE PRESENTS ITS MOBILE APPLICATION FOR FLYING DRONES SAFELY

ENAIRE launched its ENAIRE Drones application, so users can plan their drone flights from any Android mobile device. This app shows a map of Spanish airspace, indicating those areas where these remotely operated aircraft are permitted to be used.

This application seeks to address the needs of professional and recreational drone pilots by making it easier to identify fly zones, as well as by providing active NOTAMS and identifying protected natural spaces and bird protection areas.

EASA DELIVERS BROKER SOLUTION TO ENABLE EUROPEAN-WIDE SHARING OF DRONE REGISTRATION DATA

The European Union Aviation Safety Agency (EASA) has delivered a digitalised and secure system for the exchange of drones registration data among the national authorities of the Member States, putting the technical framework in place to allow registered users to fly their drones anywhere in the European Union with a single registration.

NEW EUROCONTROL R&D DATA ARCHIVE LAUNCHED

EUROCONTROL's new R&D Data Archive gives a huge boost to AI and machine-learning applications, providing researchers with access to detailed flight data of 12 million commercial flights across the European network spanning a four-year period. Drawing on the EUROCONTROL Network Manager's unique data repository, the Archive offers the best possible air traffic management picture available, covering data from airlines, aircraft and air navigation service providers on flight plans filed, aircraft used, actual routes flown, ground-air communications, radar tracking, market segments, etc.

THE "WORLD'S LARGEST" REMOTE TOWERS CENTRE OPENS IN NORWAY

Avinor, the Norwegian airport operator and air navigation service provider, opened what is believed to be the World's largest Remote Towers Centre in Norway on 20 October 2020. Avinor's new Remote Towers Centre located in Bodø, north of the Arctic Circle, will play an important role in maintaining a sustainable aviation structure in the future. Avinor already has two towers operating from the centre and will roll out a further 13 airport towers within the next two years, according to Avinor CEO, Mr Dag Falk-Petersen.

10 October 2020

SESAR JU LAUNCHES ISOBAR ARTIFICIAL INTELLIGENCE-BASED WEATHER FORECAST PROJECT

SESAR JU has launched the ISOBAR project which aims to show how artificial intelligence solutions can help predict stormy weather, leading to better planning and traffic predictability. The main objective of ISOBAR is to design a service that supports flow management in the analysis and mitigation of convective storms or thunderstorms. The project focusses its research in four key aspects: integration of dynamic weather cells in collaborative air traffic flow and capacity management (ATFCM) processes; more precise characterisation of demand and capacity imbalances relying on the processing of complex probabilistic weather products and ATM and weather data integration; a user-driven mitigation plan considering airspace users' priorities (and fluctuations in demand based on weather forecasts); and an operational and technical roadmap for the integration of ancillary services.

30 September 2020

AVIATION LEADERS STRESS NEED FOR A GREEN RECOVERY

Speaking at the Global Sustainable Aviation Forum, Executive Director of the cross-industry Air Transport Action Group, Michael Gill said: "Air transport is in the midst of the deepest shock in its history. We expect a reduction of up to 4.8 million jobs in the sector by the end of the year and a massive hit to our ability to connect the world. However, as we plan for the recovery of air connectivity, we also must prioritize our environmental progress....Our sector has a long-term climate change goal to cut CO2 emissions in half by 2050. With the right help from governments, the energy sector and technologists, we expect that global aviation will be able to hit net zero emissions a decade or so later. Some parts of the world will be able to meet this point earlier and a number of individual companies have already set goals along these lines. To achieve this will require a transition in our energy source from fossil fuel to sustainable aviation fuel, the acceleration of research and development of electric, hybrid and potentially hydrogen aircraft."

23 September 2020

EUROCONTROL U-SPACE SURVEY REVEALS SLOW IMPLEMENTATION – BUT MORE STAKEHOLDERS AND PROJECTS

EUROCONTROL has issued a new edition of the U-space services Implementation Monitoring Report which assesses implementation progress of the main elements underlying the provision of U-space services enabling very low level (VLL) drone operations in the 30 Single European Sky (SES) area Member States. The report covers the results of an implementation survey carried out in the period December 2019 – April 2020 using a dedicated online monitoring tool.

22 September 2020

SINGLE EUROPEAN SKY: FOR A MORE SUSTAINABLE AND RESILIENT AIR TRAFFIC MANAGEMENT

On 22 September, the European Commission proposed an upgrade of the Single European Sky regulatory framework which comes on the heels of the European Green Deal. The objective is to modernise the management of European airspace and to establish more sustainable and efficient flightpaths. This can reduce up to 10% of air transport emissions.

"An efficient air traffic management system means more direct routes and less energy used, leading to less emissions and lower costs for our airlines," said Commissioner for Transport, Adina Vălean. *"With the new proposed rules we help our aviation sector advancing on the dual green and digital transitions,"* she added.

22 September 2020

IATA CALLS FOR SYSTEMATIC COVID-19 TESTING BEFORE DEPARTURE

The International Air Transport Association (IATA) called for the development and deployment of rapid, accurate, affordable, easy-to-operate, scalable and systematic COVID-19 testing for all passengers before departure as an alternative to quarantine measures in order to re-establish global air connectivity. IATA will work through the International Civil Aviation Organization (ICAO) and with health authorities to implement this solution quickly.

21 September 2020

AIRBUS REVEALS NEW ZERO-EMISSION CONCEPT AIRCRAFT

On 21 September, Airbus revealed three concepts for the world's first zero-emission commercial aircraft which could enter service by 2035. These concepts each represent a different approach to achieving zero-emission flight, exploring various technology pathways and aerodynamic configurations in order to support the company's ambition of leading the way in the decarbonisation of the entire aviation industry. All of these concepts rely on hydrogen as a primary power source – an option which Airbus believes holds exceptional promise as a clean aviation fuel and is likely to be a solution for aerospace and many other industries to meet their climate-neutral targets.

15 September 2020

NEW CANSO REPORT DEMONSTRATES STRENGTH OF ATM PERFORMANCE
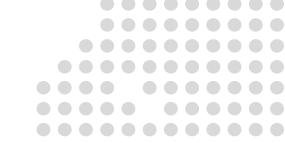
CANSO published its tenth Global Air Navigation Services Performance Report that uses key performance metrics to measure the cost-efficiency and productivity of air navigation service providers (ANSP). The report also considers trends over the past 10 years, and the factors that have influenced performance, including traffic fluctuations, new technology, changes in human resource and legislation. It finds that ANSPs have a strong record of productivity improvement over the past decade, largely rooted in their ability over the years to handle growing traffic volumes without a corresponding increase in costs.
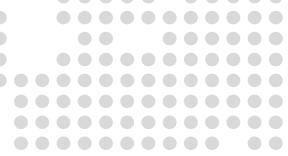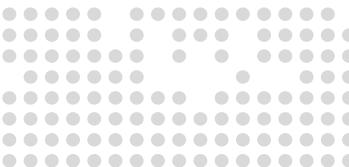
10 July 2020

NEW JOINT UNIT CEMENTS COOPERATION BETWEEN EASA AND EUROCONTROL

On 10 July, Director General EUROCONTROL Eamonn Brennan and the European Union Aviation Safety Agency (EASA) Executive Director Patrick Ky together officially opened the joint EASA-EUROCONTROL Technical and Coordination Office (TeCO) at EUROCONTROL's Brussels Headquarters. The Office is designed to improve the efficiency of the two organisations' joint activities. *"Through the Joint TeCO, we will be able to provide the required technical support to EASA, further improve our cooperation and avoid duplication,"* said Eamonn Brennan. *"The joint Office will take our cooperation to a new level. This is a very visible sign of the close relationship between our two organisations,"* added Patrick Ky.
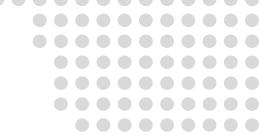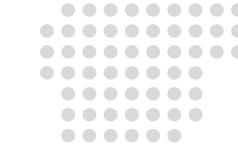
EUROCONTROL
AVIATION HARDTALK
LIVE

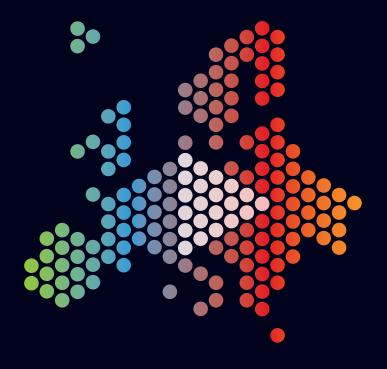## The latest views from aviation's key players

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