FABEC

# PERFORMANCE 2021

## PROVIDING **RESILIENT** AIR NAVIGATION SERVICES

ANA Administration de la navigation aérienne

skeyes nice to guide you

DFS Deutsche Flugsicherung

dgac DSNA

EUROCONTROL

Luchtverkeersleiding Nederland Air Traffic Control the Netherlands

skyguide

# Highlights 2021

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## JANUARY

**DSNA - Paris-CDG tests feasibility of round-the-clock Continuous Descent Operations**

This trial with incoming westbound flights demonstrated the successful operation and environmental efficiency of extending CDO from FL 70 all day long in a highly dense and complex airport environment. The final axis was reached using satellite-sourced performance-based navigation (PBN) with RNP 1 accuracy.

**MUAC - First worldwide live operational trial on contrail prevention**

From 25 January 2021 to 22 October 2021, MUAC, in partnership with the German Aerospace Center (DLR), conducted the first worldwide live operational trial on contrail prevention aimed at mitigating non-CO2 emissions. In total, 209 aircraft trajectories were included in the trial. During the trial, the technical feasibility of contrail prevention, the accuracy of ice-super-saturated regions forecasts and the operational feasibility of vertical contrail prevention at specific traffic loads were carefully evaluated.

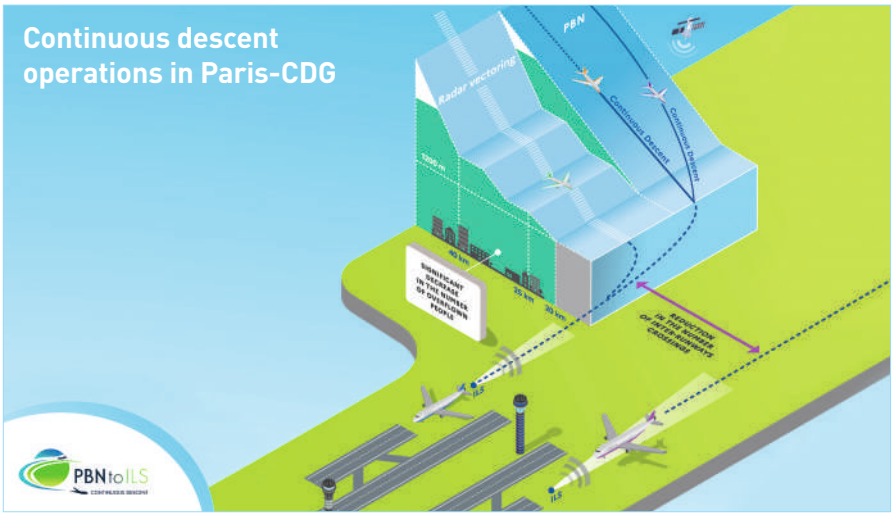
## FEBRUARY

**LUX - ANA strengthened its environmental activity with EMAS registration**

Following ISO 14001 certification in 2017 and Environmental Statement 2020, the Air Navigation Authority (ANA) became EMAS (Eco Management and Audit Scheme) registered to further reduce the environmental impact of air traffic.

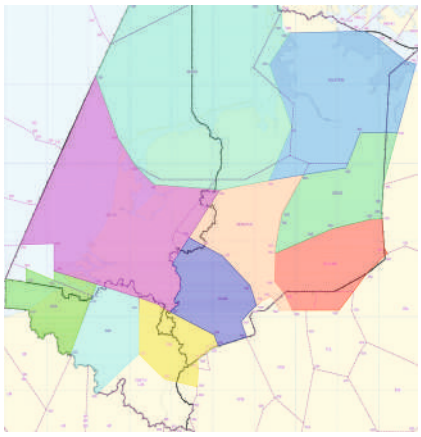
**SKYGUIDE - Digital authorisation for unmanned aerial systems and special flights**

Skyguide launched a digital flight planning and airspace authorisation service for drones and other special flights (such as survey flights or parachute jumps). This deployment follows the development and testing of digital authorization capabilities as part of the Swiss U-Space roll-out.



## MARCH

**MUAC - Airspace sectors optimised to fully benefit from free route airspace**



MUAC reviewed its sectorisation to be more compatible with free route airspace, airline flight planning, and tactical working methods. The measures reduce complexity, improve capacity and flight efficiency as well as the stability of traffic predictions.

**LVNL - Further reductions in noise nuisance follow Schiphol local community input**

Schiphol and LVNL added 16 new measures to reduce noise nuisance and improve the living environment around Schiphol following consultation with local residents, provincial officials, municipalities, councils and social organisations. The measures optimise existing take-off routes to relieve residential areas; take advantage of new technology to enable aircraft to turn more accurately; and improve runway maintenance and works schedules.

## APRIL

**SKEYES - A pioneer in the field of U-Space**

skeyes added new features to its Droneguide Platform, the tool used by drone users to find out about active drone zones and operating conditions. Together with Brussels Airport, skeyes conducted tests in a secure environment at the airport to see how drones can increase the safety, security and efficiency of airport operations. Tests included detecting unwanted drones and the use of drones for bird control at the airport.

## MAY

**SKEYES - Successful Collaborative Environmental Management**

To support environmentally friendly and sustainable aviation, skeyes has actively and successfully promoted Collaborative Environmental Management by concluding agreements with major Belgian Airports and their partners since 2018. Liege Airport and Brussels South Charleroi Airport became the latest partners in 2021 to join forces with skeyes, exchange experiences, and set up common projects that contribute to sustainable aviation.

## JUNE

**DSNA - WAM system commissioned at Nice airport, a first in mainland France!**

In this mountainous region, Wide Area Multilateration (WAM) as an independent surveillance system improves the radar coverage for helicopter traffic between Nice and Monaco, aerodrome control at Cannes airport, and within airspace above Nice. It complements the existing surveillance of ground movements provided by the Advanced SMGS at Nice airport.

**LVNL - GoDrone app successfully issued air traffic control instructions to drone pilot**

LVNL tested the GoDrone app in cooperation with Dutch Drone Delta, successfully issuing air traffic control instructions to a drone pilot in controlled airspace around Rotterdam The Hague Airport, supervised by the control tower. The aim of the test was to gain knowledge and experience for further development towards an operational UTM system for managing unmanned aircraft.

**SKYGUIDE - Continues energy efficiency improvements and commits to Energy and Climate Exemplarity**

Skyguide is continuing its efforts to reduce fuel consumption and to increase its use of clean energy. The Swiss ANSP committed to the Swiss government's "Energy and Climate Exemplarity" initiative and is following clear targets and implementing concrete measures.

## JULY

**DSNA - An innovative solution to reduce aviation's environmental footprint**

DSNA developed the SEPHER project to produce renewable energy (photovoltaic and hydrogen-based) to supply isolated ATC ground stations. A first demonstrator project on the radiocommunication antenna located in Dordogne used by Bordeaux ACC reduced CO2 emissions by nearly 60%, and won a Solar Impulse foundation efficient solution label.

**LVNL - Groningen Airport Eelde installs new remote camera mast**

LVNL installed a camera mast at Groningen Airport Eelde in an important step towards providing remote air traffic control services in place of the airport's physical control tower. The next step is construction of the technical infrastructure and extensive system testing.

## AUGUST

**SKEYES - Tangible steps in the Remote Tower Centre project**

skeyes signed an agreement with SOWAER (Walloon airports authority) to install Belgium's first digital tower centre in Namur. The new facility, built with technical partner Saab Digital Air Traffic Solutions, will guide air traffic at Liege and Charleroi Airports, while increasing safety thanks to augmented reality.

**LVNL - Switches entirely to satellite navigation**

By introducing new virtual navigation points LVNL switched entirely to innovative satellite navigation. This means that aircraft will no longer navigate runway approach and departure routes using physical beacons on the ground, but use satellite signals instead. This is a major step forwards by LVNL in terms of modernising Dutch airspace.

**SKYGUIDE - Swiss rollout of digital authorization for unmanned aerial systems**

Skyguide rolled out its digital flight planning and airspace authorization service for drones and special flights across Switzerland. After an introductory phase in Geneva, Lugano, Dübendorf and Zurich the online service became available throughout Switzerland as part of Switzerland's U-Space rollout. The online service makes it easier for Skyguide to process requests for special flights in controlled airspace.

## SEPTEMBER

**ANA LUX - Mobile Foreign Object Debris Detection System**

ANA Lux took delivery of its mobile Foreign Object Debris (FOD) detection system. The "microwave" type radar offers accurate detection capability and operates optimally at any time of day in all weather conditions.

**DFS - Fewer and fewer radio beacons required to guide aircraft**

DFS, the German air navigation service provider, is dispensing with the majority of radio beacons on the ground as it introduces satellite-based approach and departure procedures at airports as part of a comprehensive innovation programme. Modernisation of the air navigation infrastructure also makes room for more wind turbines, with 10 radio beacons due to be decommissioned by 2025.

**MUAC/SKEYES - Belgian Ministry of Defence sign shared ATS Systems agreement**

As a result of this agreement, all civil and military air traffic controllers will use the same system to manage Belgian airspace. The aim is to have this operational within six years. The biggest gain lies in the real-time exchange of air traffic data between civil and military air traffic controllers. This increases safety and efficient use of airspace, while reducing delays and greenhouse gas emissions.

## OCTOBER

**DSNA - Environmental strategy for a sustainable recovery**


DSNA has developed an environmental strategy for the entire flight phases (departure, climb, cruise, descent and arrival). By optimising flight efficiency, the French air navigation service provider improves environmental performance and helps to develop greener aviation. This vision for 2025 was laid out at the FABEC OPS Theatre at the World ATM Congress in Madrid.

**MUAC/DFS - First package of large-spectrum airspace optimisation implemented**

MUAC, Karlsruhe UAC and Langen ACC introduced three airspace design changes in October 2021. Thanks to these, airlines can plan shorter routes in advance and therefore reduce fuel consumption and CO2 emissions. Further adjustments have been implemented to reduce complexity and increase air traffic management efficiency in the complex and dense cross-border area between Belgium, France, Germany and Luxembourg.

## NOVEMBER

**MUAC AND PARTNERS - 2021 Customer Initiative trial delivers results**

Eighty-seven aircraft operators, London Heathrow Airport, seven air navigation service providers and the Network Manager participated in the 2021 Customer Initiative trial. The measurable results revealed that for a total of 1,686 flights which benefited from the service, the savings amounted to 177,000 kg of fuel; 556,000 kg of CO2; 6,842 NM; 9,778 minutes (equating to €977,000 saved on the basis of the economic value of 100€/minute) and €3,923 in route charges. In addition to the measureable benefits, other non-quantitative improvements were identified.

**MUAC/SLOVENIA CONTROL - Cooperation agreement to deploy ATM data as a service**

The agreement established a framework of cooperation between MUAC and the Slovenian air navigation service provider to deploy the ATM Data as a Service (ADaaS) concept. In a first implementation step, Slovenia Control's flight data processing system (the KAMI FDPS) will be adapted to serve as a new and enhanced fall-back system for MUAC.


## DECEMBER

**DSNA - First step in the implementation of Free Route in France**

DSNA successfully implemented Free Route Airspace (FRA) in most of its airspace above FL 195 managed by Bordeaux, Brest and Paris ACCs. An important milestone for more environmentally-friendly FABEC airspace.

**DFS - Successful trial of Germany's U-space traffic system for drones**

Droniq and DFS have submitted their findings from Germany's first U-Space real-life trials to the German Ministry of Transport. The U-Space tests in Hamburg have proven that the EU's U-Space concept works in practice.

**MUAC/DFS - Declaration of intent for greater cooperation signed**

The 2021 Maastricht and Karlsruhe Networks (MAKAN) study sets out plans to achieve considerable operational and technical convergence between the two control centres by the end of 2028. This convergence will mean compatibility not only in data exchange but also at an operational and technical level. To support the operational convergence, a new system architecture and infrastructure will be developed in line with data centre technology.

# TRAFFIC: Prioritising green objectives in volatile times

**3.2 million**
flights handled in 2021

**18.5%**
traffic increase over 2021

**48%**
below 2019 movements

The foremost strategic objective of all FABEC partners is to ensure that flying through our airspace is safe, which was clearly demonstrated throughout the pandemic crisis. After two years of unprecedented low passenger demand, when COVID restrictions caused flight movements to drop to their lowest level for 25 years, Functional Airspace Block Europe Central (FABEC) traffic recorded an upturn in the second half of 2021 which brought the year-end total to 3.2 million flights (-48% compared to 2019). While still only half the 2019 total of 6.2 million flights, it represents an important turning point on the road to recovery and a welcome increase on 2.7 million movements recorded in 2020.

Passenger demand is far from uniform however, and this rise in volatility is challenging for air navigation service providers (ANSPs) working towards Europe's green agenda. For example, flights above France soared by more than 30%, while controllers managing the adjacent Maastricht Upper Area Control (MUAC) airspace handled 12.4% more movements. Airport results were even more pronounced, with wide variation between FABEC member states during the summer months. Traffic volatility is hard to predict and puts pressure on airspace capacity and staff resources, but despite this, FABEC member states ensured critical airspace infrastructure remained open day and night for airspace users to receive the expected high level of service.

As COVID continues to evolve from pandemic to endemic stage, building a high-performing and resilient ATM infrastructure has become more important to providing safe and efficient services in an increasingly unpredictable market.

FABEC joined with other members of InterFAB to host a series of six Expert Talks between March and September 2021 to address key issues relating to air traffic management data and performance. Addressing the topic 'Volatility in air traffic', experts identified the need for greater flexibility in response to changing demand patterns. Participants called for wider participation by stakeholders through increased data-sharing to improve trajectory prediction, slot management and sector planning. Moving to new concepts of digital transformation and big data analysis is part of this transition to more resilient infrastructure.

**Regulatory challenges**

FABEC will contribute to Europe's ambitious Green Deal which aims to reduce aviation CO2 emissions by 90% by 2050 compared to 1990. These priorities are not yet recognised by the existing Single European Sky performance scheme, which has remained largely unchanged since its introduction a decade ago, and the targets applied to airspace capacity and efficiency do not yet reflect more recent sustainable aviation objectives.

FABEC members control Europe's busiest airspace and manage approach and departure routes to and from five of Europe's largest hub airports. Until the rules governing the trade-off between maintaining airspace capacity and reducing environmental impact are reconsidered, current cost-cutting targets will continue to hamper efforts to modernise infrastructure and ATM systems to provide more sustainable solutions.

**Keeping delay to a minimum**

The combination of reduced traffic and fewer route restrictions meant there were very few delays in 2021. Although traffic rose by 20%, delays attributed to air traffic flow management (ATFM) rose only 15%, totalling an average 0.4 minutes of delay per flight compared with 0.41 minutes in 2020. Despite this performance improvement – delays were almost 90% lower than delays experienced in FABEC airspace in 2019 – they were above the target level of 0.27 minutes per flight set by national supervisory authorities in the revised RP3 performance plan.

The InterFAB Expert Talk hosted by FABEC in April 2021 addressed 'The cost of delay' in a detailed review of the methodology and indicators used to calculate delay and its cost. Analysis of post-operational data revealed significant cost differences compared with official publications such as the Performance Review Report and Air Traffic Cost Effectiveness Report and concluded that more detailed research is needed to improve the calculation of ATFM delay. This would result in a better understanding of delay distribution and its impact on flight efficiency and cost.

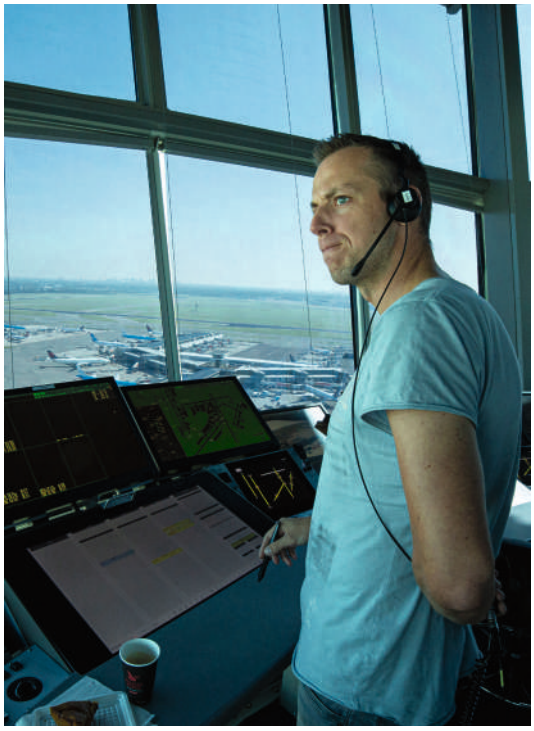
High level forecasts at European level also lack sufficient granularity to enable states to accurately predict and allocate resources at local level, while more extreme weather, geopolitical events and changing airline preferences add to demand fluctuations. The Expert Talk reviewing 'The accuracy of forecasts', found the same forecast scenario applied across all European states can result in excessive costs arising from unused resources. Experts demonstrated how enriching the forecast data with additional indicators and including more qualitative data such as surveillance data and emissions results, staff costs and charging differences, offers the opportunity to develop a platform with strong environmental credentials for the years ahead as air traffic recovers from the pandemic.

**Critical airspace infrastructure**

FABEC continued to provide insight and analysis in support of future policy development during World ATM Congress 2021 when the FABEC OPS Theatre hosted several thought leadership sessions. Topics discussed included managing volatile traffic recovery; accommodating new entrants; and the urgent need to balance environmental goals with rising capacity demand as traffic accelerates towards pre-pandemic levels. The sessions brought together experts from all sectors of the industry to engage in open and informed debate.

# ENVIRONMENT: Embedding more sustainable priorities

**97.04%**
horizontal flight efficiency



The focus on environment related topics remains high on FABEC's agenda, and new measures introduced in 2021 are helping to reduce emissions. However, the rules governing priorities for FABEC ANSPs must be aligned with the necessary trade-offs between traffic volume, capacity and environmental impact. The pandemic enabled airspace users and service providers to prioritise fuel-efficient routes and take advantage of flexible use of airspace managed by an advanced civil-military coordination. However rising demand, for example during summer 2021, brought trade-offs between efficiency and capacity. Clear directions on the competing priorities of airspace capacity and environmental impact, is absolutely paramount to balance these objectives and deliver Single European Sky performance targets.

Horizontal Flight Efficiency (HFE) – the performance measure used to assess how close a flight flies to the great circle distance – remained above 97% throughout 2021, continuing the exceptionally high results achieved in 2020. The average HFE flown trajectory (excluding the 10 best/worst days) reached 97.04% in 2021, slightly lower than the 2020 value of 97.06%, and below the 97.25% FABEC target for 2021. Scope for improvement is limited due to the complexity of the route network and the fact that inefficiencies are created outside our airspace illustrated by the small change in HFE despite the huge traffic reduction.

Continued high-performing HFE, despite rising traffic, is due in part to several new measures introduced by FABEC members during 2021. The Operations Standing Committee accelerated the rollout of Free Route Airspace (FRA), starting with a joint initiative with FAB CE to enable airspace users to plan optimum routes across large areas of European airspace. The cross-border interface between Germany and Austria introduced in 2021, soon to include the Czech Republic, is part of a stepped approach that follows implementation of FRA around the clock by Maastricht and Karlsruhe control centres. Aircraft operators can now freely choose their routes using entry, intermediate and exit points across half of French upper airspace, and Switzerland is introducing the first cross-border FRA operations between Zurich, Munich and Karlsruhe centres.

Full implementation of FRA by the end of 2025 in line with European regulation enables airspace users to benefit from fuel savings and reduce greenhouse gas emissions by providing many more flight planning options, for example when military training areas are active.

**Improved vertical flight efficiency**

Although not currently a key performance indicator, vertical flight efficiency also offers the opportunity to improve environmental performance by reducing fuel consumption and noise emissions in the descent and climb phases of flight. For example, new cross-border routes between Belgium and Germany have shortened distances between Frankfurt and Munich airports and enable more efficient continuous descent and climb operations. Based on pre-COVID annual movements of 37,600, these measures reduce track miles by up to 300,000 nautical miles and carbon dioxide emissions by 5,200 tonnes a year. Frankfurt is also designing a new arrival route for suitably-equipped aircraft to ensure continuous descent approach operations continue even in high traffic conditions.

**Reducing non-CO2 emissions**

New findings relating to non-CO2 emissions such as NOx and contrails were presented at the InterFAB Expert Talk entitled "Climate change and the role of ATM" in May 2021 which explained how aircraft exhaust gases cause both warming and cooling effects. The German research center DLR is a leading research activity into climate-optimised trajectories and Maastricht Upper Area Control (MUAC) launched a 10-month operational trial aimed studying the effect of contrail prevention. Further research is needed to understand the influence of factors such as altitude, latitude and local weather patterns on non-CO2 emissions, estimated to account for more than half total aviation emissions, in order to inform policy making.

A wider discussion involving regulators, academics and industry experts took place during the InterFAB "Climate change" workshop in September 2021 when the European Environment Commissioner underlined the commitment to climate neutrality by 2050. Among measures discussed, delegates highlighted the role of artificial intelligence and machine learning in the development of informed and effective mitigation measures and policy decisions.

FABEC hosted a workshop on vertical flight efficiency in December 2021 attended by air navigation service providers, airspace users, military and industry experts. The benefits of optimised vertical profiles are under-reported despite their impact on fuel consumption and noise in the terminal manoeuvring area. Participants agreed to launch an initiative to develop meaningful metrics and indicators to measure performance improvements and increase data sharing between different stakeholders.

Adding further support to the European Union's Green Deal initiative, FABEC organised its first Environment Day in July 2021 to discuss these challenges and concluded with four key messages:

- The scientific understanding of environmental impact is growing but it still lacks key data and metrics to drive further improvements in a systematic way;

- There is a need to balance and prioritise different key performance areas based on gate-to-gate operations;
- Industry-wide improvements can only be reached in collaboration with all partners within the aviation chain;
- FABEC members are committed to reducing the environmental footprint of aviation.

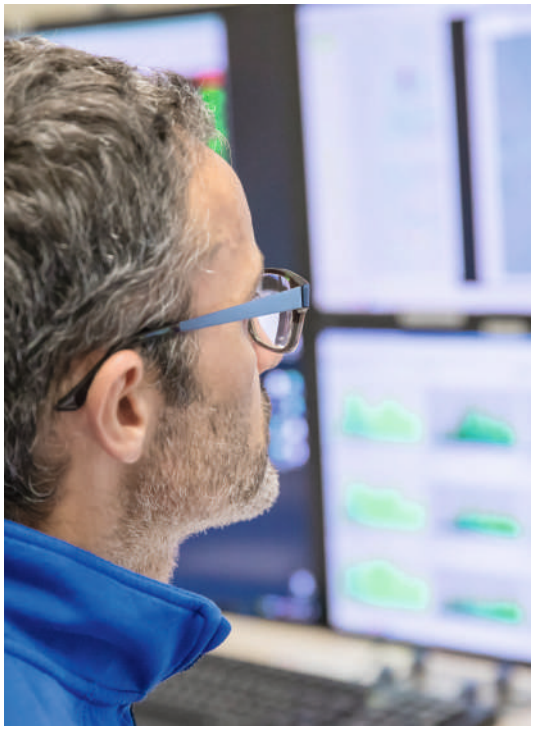
FABEC continues to work towards further environmental performance improvement through closer alignment between the activities of the FABEC Environment and Operations standing committees, commencing with a joint workshop in 2022.

As a result of FABEC's comprehensive package of environmental programmes, the alliance won the ATM 2020 Research, Innovation and Environment Award in February 2021 in recognition of multiple achievements including fewer restrictions, shorter routes, advanced flexible use of airspace and optimised flight efficiency.

# COST: Critical infrastructure available 24/7 despite collapse in revenue

**100%**
traffic recovery in 2024

**300**
new trainee controllers



The slight recovery in air traffic in the second half of 2021 signals improved revenue streams, however with passenger demand still half pre-pandemic volume, income remains woefully lower than operating costs. This comes hard on the heels of a 70% decline in revenue passenger kilometres in 2020, which EUROCONTROL estimates cut European en-route income by EUR 4.8 billion. Yet FABEC skies remained open without interruption day in day out, ensuring the safe delivery of essential medical supplies, cargo, military and passenger services throughout the pandemic.

FABEC became the only functional airspace block to submit a joint revised performance plan by October 1, 2021 with RP3 targets to support the recovery of air traffic after the pandemic. Due to the complexity and close interconnection of the airspace in the core area of Europe, regional coordination is central to meeting safety, capacity and environmental targets set for the Single European Sky and helps to realise more sustainable aviation.

FABEC staff continue to operate flexible rosters to minimise COVID disruption and enhanced training sessions ensure essential skills and qualifications are maintained. Europe's critical airspace infrastructure relies on a workforce of highly qualified staff and advanced technology that is continuously upgraded to keep pace with traffic demand, complexity and emerging threats. This large fixed cost base hampers the ability of ANSPs to respond quickly to fluctuations in demand and continued reliance on state funds and loans adds to pressure on resources.

With traffic forecast to return to 2019 levels in 2024 according to the most recent STATFOR forecast published in October 2021, air navigation service providers must continue to invest in system replacement and modernisation to avoid the capacity squeeze experienced before the pandemic. There are additional opportunities: digital skills are increasingly important in the transition to the European Digital Sky and attracting the right competences is crucial to providing the specialised expertise needed in the future airspace environment.

**Timely recruitment drive**

FABEC launched a recruitment drive in 2021 that aims to enrol over 300 air traffic control trainees to help manage returning traffic. Preparations need to start now in a training process that typically takes between three and four years in order to meet the EUROCONTROL forecast recovery of traffic by the end of 2023(1). Further measures included expanding simulator training for existing personnel to maintain proficiency in more complex traffic scenarios and enhancing research and development projects with more controller input made possible because of smaller rosters.

In a parallel activity, FABEC released a Training & Qualification Manual (TQM) for airspace management staff - the first publication of its kind. The manual defines a general framework at FABEC level for training and qualification of airspace management staff working in the national airspace management cells in

order to harmonise training services. While providing a common basis to train and qualify staff in a manner that is harmonised throughout FABEC, it also leaves flexibility for FABEC states to adapt to their own training programmes and methods.

The development of common solutions is central to meeting the challenges ahead, as Europe is recovering from the pandemic on the one hand and is already facing a new crisis caused by the war in Ukraine on the other, the impact of which on the aviation industry is not yet foreseeable. FABEC air navigation service providers are committed to building on improvements made over the past two years to create a more resilient ATM infrastructure. This calls for not just close cooperation between FABEC members, but also closer collaboration across the industry to ensure policy decisions in one sector result in benefits across the entire aviation transport chain.

*(1) Eurocontrol forecast for Europe 2021-2027 https://www.eurocontrol.int/publication/eurocontrol-forecast-update-2021-2027*

# Acronyms and abbreviations

**ACC**: Area Control Centre
**ANSP**: Air Navigation Service Provider
**ATC**: Air Traffic Control
**ATFM**: Air Traffic Flow Management
**ATM**: Air Traffic Management
**ATM** related delay: Delay which ANSPs can influence, like capacity or staffing, but excluding weather etc.
**CDO**: Continuous Descent Operation
**DLR**: German Aerospace Centre
**EC**: European Commission
**EMAS**: Eco Management and Audit Scheme
**FOD**: Foreign Object Debris
**FRA**: Free Route Airspace
**HFE**: Horizontal Flight Efficiency
**ICAO**: International Civil Aviation Organisation
**IFR**: Instrument Flight Rules
**MAKAN**: Maastricht and Karlsruhe Network
**PBN**: Performance Based Navigation
**PRU**: Performance Review Unit (Eurocontrol)
**RNP**: Required Navigation Performance
**SESAR**: Single European Sky ATM Research Programme
**SOWAER**: Walloon airports authority
**TQM**: Training & Qualification Manual
**TWR**: Tower
**UTM**: Unmanned Aircraft System Traffic Management
**WAM**: Wide Area Multilateration

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