

SMARTER FLIGHT MEASURES

NETWORK COLLABORATIVE MANAGEMENT (NCM)



Supported by: LUFTHANSA GROUP

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ABOUT SESAR

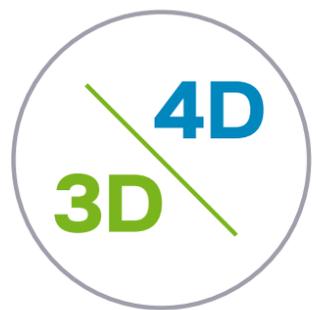
THE OBJECTIVE OF SESAR IS TO MODERNIZE AND IMPROVE EUROPEAN ATM PERFORMANCE

Europe's ATM system is based on ageing technology and procedures and needs updating, particularly in light of the expected traffic growth.

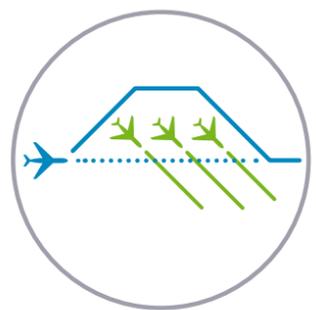
The role of SESAR (Single European Sky ATM Research), as one of the most innovative infrastructure projects ever launched by the European Union, is to

define, develop and implement what is needed to increase ATM performance and build Europe's intelligent air transport system. It was launched in 2004 with the main objective of delivering high performing airport operations, advanced air traffic and optimized ATM network services and enabling aviation infrastructure.

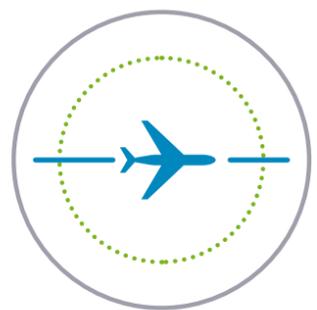
Extended Flight Plan



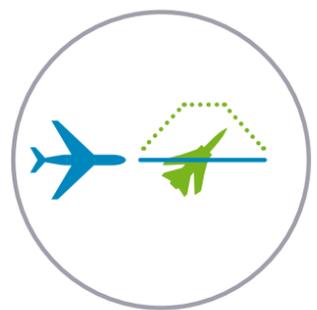
Short Term Air Traffic Flow and Capacity Management Measures



Free Route Airspace



Rolling Airspace Management



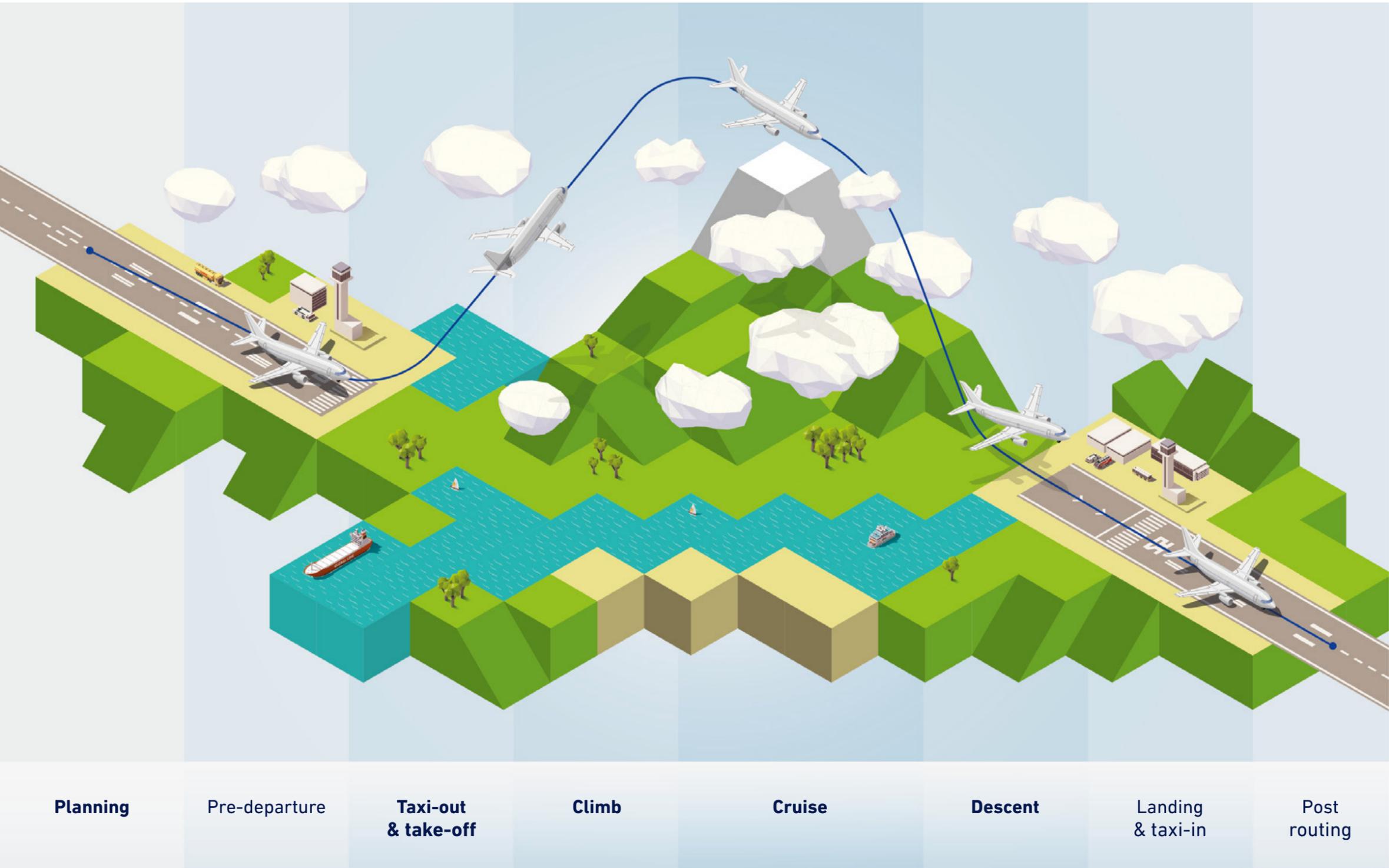
Network Collaborative Management (NCM)



Extended Arrival Management



↑ Example of other collaborative SESAR measures that are supported by Lufthansa Group and ATEAM members



↑ SESAR and NCM concepts contribute to all phases of flight.

KEY FEATURES



High-performing airport operations



Advanced air traffic services



Optimized ATM network services



Enabling aviation infrastructure

DELIVERING PERFORMANCE



Fuel consumption and emissions per flight



Flight time variance



Airport capacity



En-route capacity

↑ Features and performance addressed by NCM



NETWORK COLLABORATIVE MANAGEMENT (NCM)

SMARTER FLIGHT MEASURES

We all know the feeling: You are on your way to the airport, your bags are packed and you are ready to catch a flight. You arrive in time, get through check-in and security quickly, but at the gate you realize that your flight is delayed or even cancelled and there is a good chance you will miss your connecting flight...

Unfortunately, this scenario is very common, especially as air traffic is growing rapidly every year. To minimize the negative effects on travellers as well as the negative

impact on the economy, environment and the general public, the project NCM, including five major European airlines, air navigation service providers, the Network Manager and airports, was set up under the umbrella of the European Commission.

The project aims to demonstrate performance improvements to all actors by identifying and applying smarter, more synchronized measures and closer cooperation throughout the European network.

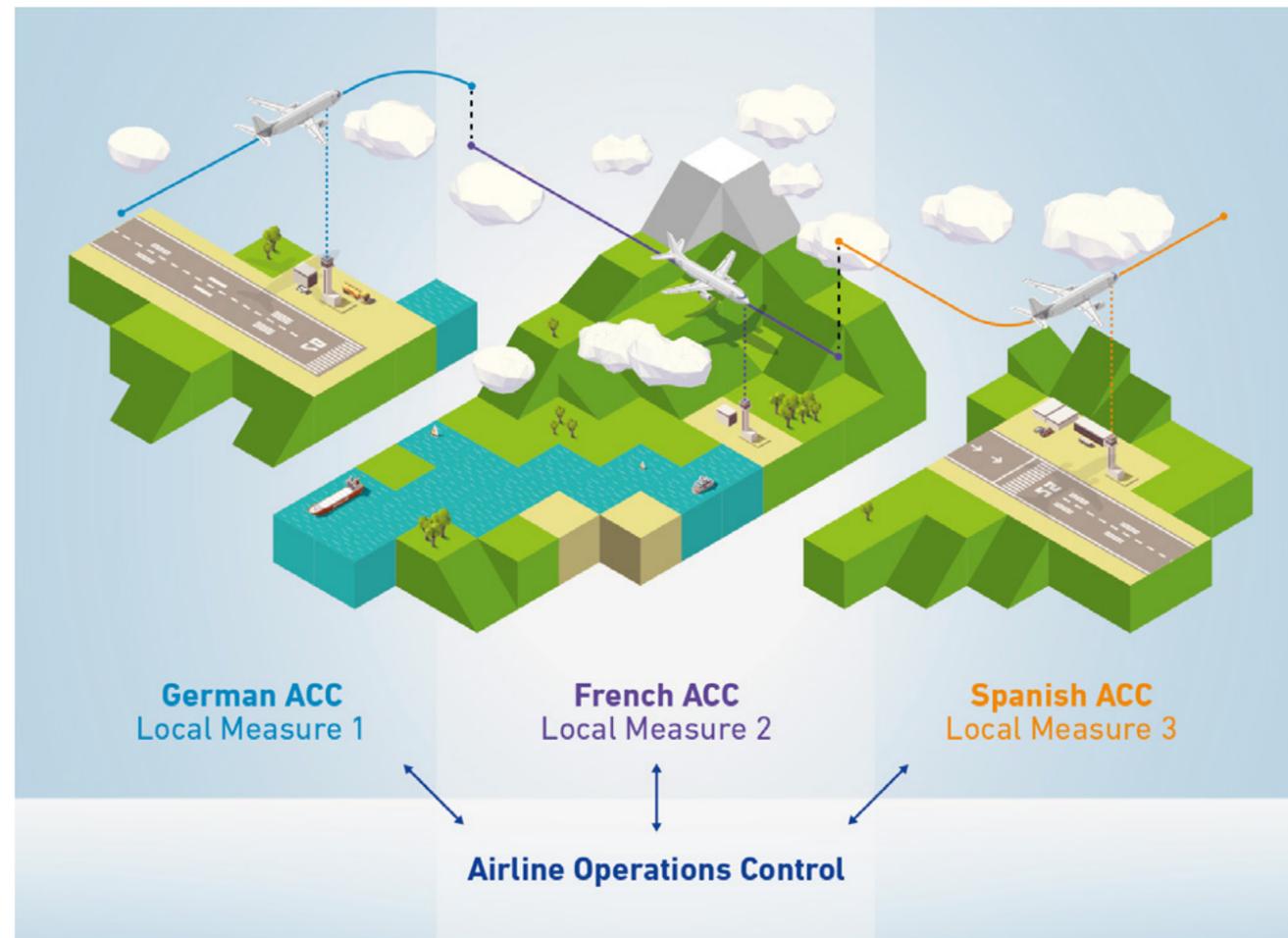


↑ FMP Working Position at MUAC

STATUS QUO

The airspace over Europe is limited. With increasing air traffic, these limits create delays if the full airspace and airport capacity is not used wisely and in a coordinated manner. Today, mainly because there are many actors (airports, Area Control Centres [ACC]) in the network that are not connected, this leads to numerous local measures to balance demand and capacity. These measures are optimal from a local point of view, but might worsen the performance of the overall network. Consequently, many flights are affected by various restrictions that may result in delays.

↓ Today's local solutions



↑ NCM concept of linked solutions

There are, however, ways to reduce that impact. Supported by intelligent support and communication tools, sharing and linking available information and by working closer together, more targeted flight and flow measures for airspace and airport bottlenecks are possible.



THE EXERCISES

SIX EXERCISES, VARIOUS ITERATIONS, AND ONE GOAL: MAKING BETTER USE OF NETWORK RESOURCES WHILE TAKING INTO ACCOUNT THE COMPLEXITY AND DYNAMICITY OF THE ENTIRE AIR TRAFFIC SYSTEM.

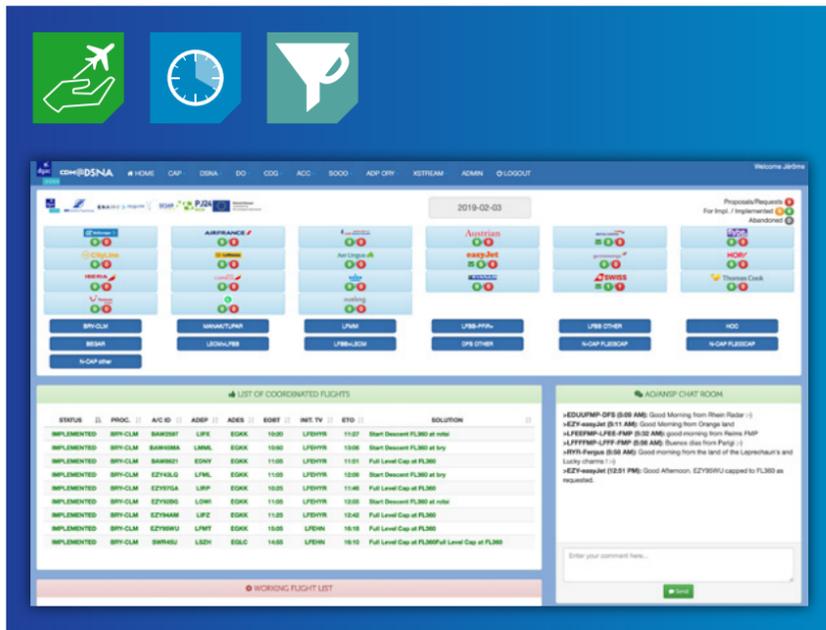
Working together in the European network requires intensive day-to-day planning and operational coordination. The NCM demonstrations ultimately aim to improve coordination between partners so that better flow and flight measures are agreed amongst all relevant operational actors. Some exercises focus on bilateral coordination improvements; others focus on improvements in connecting with the network. All will contribute to faster, more efficient communication, information sharing and cooperation between stakeholders, resulting in more predictability, higher efficiency and less delays.

Faster and more structured coordination using support tools will allow for more dynamicity and the fine-tuning of proposed measures compared to traditional coordination means such as telephone and email coordination. This also allows

for the implementation of additional surgical measures to individual flights. In addition, it will allow for much better control of situations where deviations to the original plan are required, e.g. in case of weather disturbances.

AIRLINE PARTICIPATION

Five major European airlines – Lufthansa Group Airlines, Air France including Hop! and Transavia France, Ryanair, British Airways, EasyJet – covering 80% of European air traffic, formed the ATEAM (Airline Team for the Enhancement of Air Traffic Management) consortium to contribute to SESAR activities such as the NCM project. Lead by Lufthansa, the airlines are working closely with the NCM project team to develop, test and implement tools and processes for the improvement of ATM in Europe. This includes simulations as well as flight trials in all regions of the network.



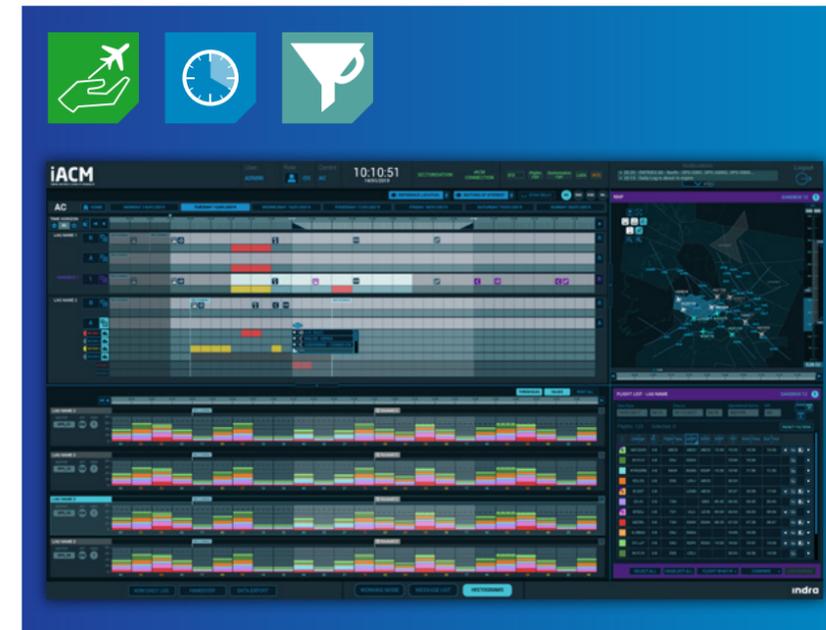
AVOIDING REGULATIONS WITH COORDINATED RE-ROUTES

DSNA developed the Collaborate Advanced Planning tool (CAP), used to coordinate options to avoid busy French sectors, in direct coordination with airlines. In NCM, DSNA will demonstrate the benefits of CAP coordination and measures to airlines by extending the use of the CAP tool to cross-border operations and other ANSPs, such as DFS in their busy Karlsruhe sectors. DSNA supports the connection of CAP with the Network Manager's systems to provide transparency and improvement of CAP measures to operational actors and airlines. A wide range of flight trials (CAP) as well as shadow mode trials (NCAP) with live data and simulations are performed.



SUB-REGIONAL COORDINATION BETWEEN ADJACENT CENTRES

Even with a perfect ATFCM daily plan and AO flight planning, ATC operation needs to deal with deviations for various reasons, especially when considering the unpredictability of certain weather phenomena. For example, the Balkan area can experience heavy thunderstorms in the summer. As a result, traffic planning may need to be changed at the very last moment. For these reasons, fast and simple tactical coordination is vital. Supported by new tools, the ANSPs of Austria, Croatia and Serbia/Montenegro will demonstrate the benefits of a highly interactive tool (ECOSYSTEM by Thales) that has the ability to coordinate and implement pre-agreed targeted measures to specific flights.



OPTIMIZATION OF ATFCM MEASURES WORKFLOW

ENAIRE of Spain will demonstrate that the support of their new tool iACM (by Indra) will contribute to efficient identification and implementation of ATFCM measures. ENAIRE will test a number of coordinated ATFCM measures in the NCM demonstrations such as:

- ground delay measures for flows and flights
- cross-border level capping measures in coordination with France using the CAP tool
- targeted flow measures using the PLANTA tool, developed by Eurocontrol

The results of the demonstrations will contribute to the further implementation of iACM.



NETWORK AWARENESS

CONNECTING AIRSPACE AND AIRLINE
OPERATORS WITH TRANSPARENT
MEASURES IN THE NETWORK



- More than 200 A/C
- 100 to 200 A/C
- 50 to 100 A/C
- 20 to 50 A/C
- 10 to 20 A/C

↓ **Busiest traffic**
07/09/2018
Daily figures

Aircraft operators in the European network deal with 68 control centres in 43 countries that all aim to balance demand and capacity in their area. Local tools to reduce delays will be connected to the network systems to ensure local measures are validated against the European operational environment and then shared amongst all partners.



↑ **OPS room Karlsruhe UAC**

Karlsruhe UAC aims to connect local re-route proposals (RRP) to solve their capacity problems and provide transparency to the network and airspace users. As a result, Karlsruhe can check measures against network constraints and airspace users will receive fully validated RRP's via the network system. This allows airlines to plan better, optimize their flights, and reduce the impact of capacity constraints.



BETTER FLIGHT AND FLOW MEASURES



USING AVAILABLE CAPACITY THROUGH FINE-TUNED AND TARGETED FLIGHT AND FLOW ADJUSTMENTS

Coordination between network and local tactical capacity managers currently takes place through ad-hoc and inefficient telephone communication. Linking local support tools with network tools via B2B messages will enable standardized, time-efficient and dynamic coordination processes. This will provide the possibility to test and coordinate targeted flight and flow measures that create less disturbance to traffic and have less or even no impact on certain flights.

The Maastricht Upper Area Control Centre (MUAC) simulates the impact and coordinates proposed measures with the network using B2B connection before applying them. This enables a wider application of targeted flight measures such as delay exclusions and improvements. In addition, airspace users are in close coordination with MUAC and NMOC to optimize the allocation of targeted measures to flights that are critical in respect to night curfew, passenger connections or crew duty times.



← Better traffic distribution by optimizing level assignments

In the United Kingdom, UK ANSP NATS will test the performance of several ATFCM measures via B2B connection with the network to improve daily planning. In addition, NATS will simulate the impact of targeted flow measures in comparison to common delay measures in the London TMA. The demonstrations will provide early experiences on the use of intelligent information provided by local tools to harmonize local and network procedures.

In Germany, Munich ACC, which operates in close proximity to several adjacent ACCs, has a strong interest in better simulating the effect of re-route measures on off-load areas. Munich flow managers will test whether improved simulation results will benefit the creation of the daily airspace use plan and therefore the cooperation and coordination with adjacent centres. In addition, Munich, like London ACC, will simulate the effect of targeted flow measures supported by network simulations on the Prototype Local and Network Tool for ATFCM (PLANTA by EUROCONTROL).

SIGNIFICANT BENEFITS





MULTI-AIRPORT NETWORK COORDINATION



↑ Hub and OPS Control Centre Lufthansa Munich



AIRPORT ARRIVALS AND DEPARTURES CONNECTED WITH THE NETWORK TO IMPROVE AIRPORT PERFORMANCE

The complexity of airport operations provides challenges to overall network planning. Logically, both airport capacity and airspace capacity need to be used to the maximum. However, many factors contribute to deviations that deteriorate one or the other, and the coordination required to find an acceptable balance is currently missing.

Spanish airports and London Heathrow will demonstrate that AOP-NOP integration will improve network performance by sharing airport planning information with the network. Harmonization of both plans will make intelligent use of the available capacity by better coordinating arrivals and departures with available enroute airspace.

Participating airlines will share their flight planning earlier than done previously to enable the airports of Alicante, Barcelona, London Heathrow and Palma de Mallorca to optimize multi-airport planning and arrivals into these airports.

Airports are important partners of the network. Their seamless integration is essential for a common situational awareness. This integration consists of a rolling exchange of data between the Airport Operations Plan (AOP) and the Network Operations Plan (NOP), leading to better planning and better aircraft delivery into airports. NCM exercises address airport integration into the network and bring it closer to reality.

NCM includes trials at Barcelona, Palma and Alicante Airports as well as at Heathrow Airport, using AOP by INDRA. The trials at the Spanish airports address the planning phase, while the trials at Heathrow go a step further and include the execution phase as well.

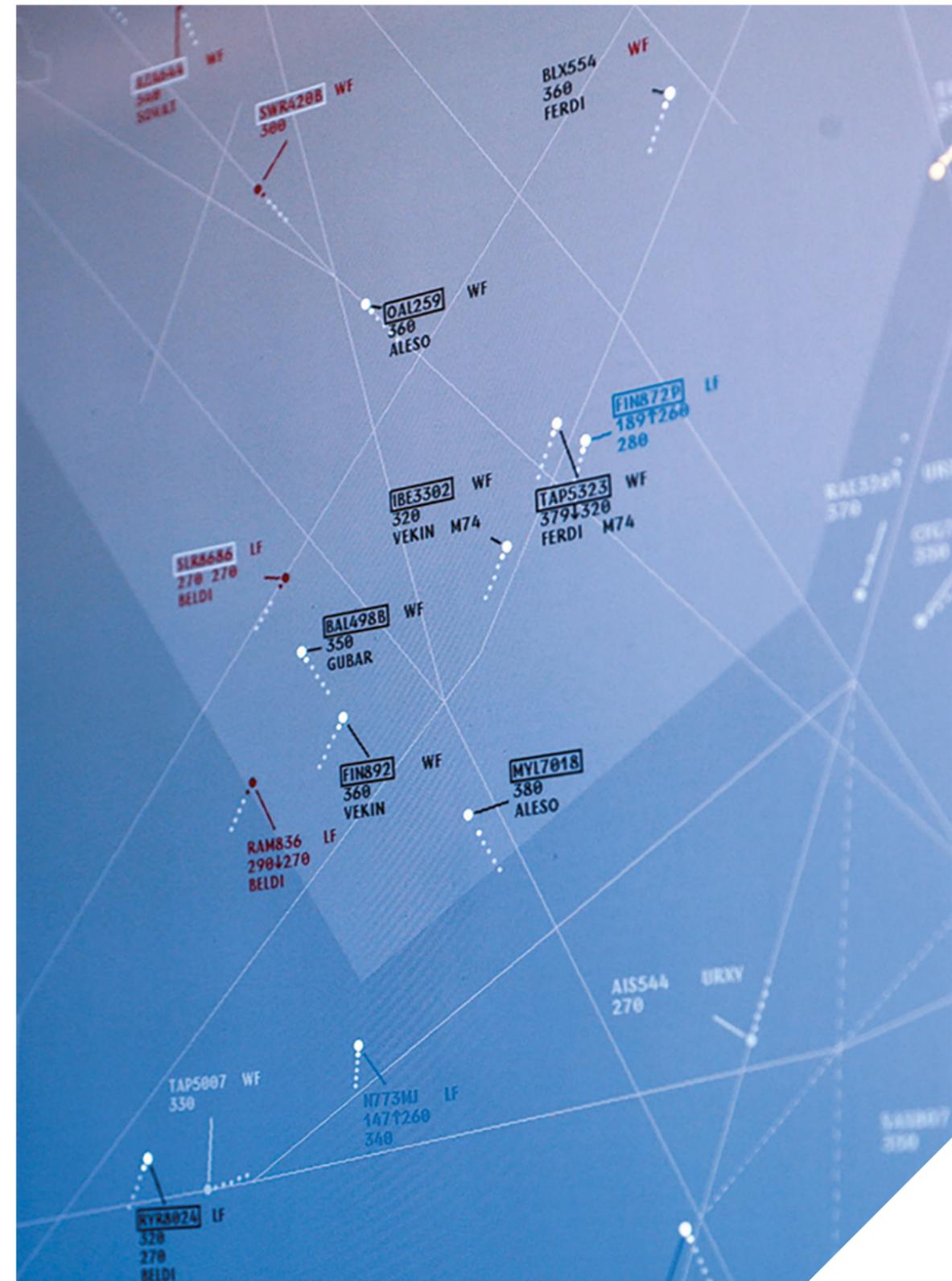
The project aims to demonstrate an improvement in planning and increase in predictability by sharing early Departure Planning Information (DPI) that provides the most up-to-date take-off times according to the traffic situation. In addition, this exercise will define and request Target Times (TTs) for arriving flights in the planning phase to solve demand-capacity imbalances, thus minimizing reactionary delays.

The TTs are defined at local level in close cooperation between airports and airlines and shared with the Network Manager (NM) through the AOP. NM will manage the delivery of arriving flights by assigning and refining Calculated Take-Off Times (CTOTs) according to the requested TTs.

Similar to the Spanish airport trials, Heathrow Airport will demonstrate the benefits of sharing early DPI information at airport and network level. TTs will be defined and shared with the NM for arriving flights at Heathrow to solve capacity-demand imbalances and avoid congestion and delays in the terminal area.

In order to demonstrate the benefits from a network point of view, the airport exercises will run in parallel and share early DPI information among all the airports in the exercise to identify the benefits for flights to and from the involved airports.

NCM will demonstrate the benefit of information sharing and target time setting for improved planning and more punctual airport arrivals and departures.





EXPECTED RESULTS

FASTER COORDINATION, BETTER USE OF AVAILABLE AIRSPACE AND AIRPORT CAPACITY

NCM demonstrations are expected to improve the connectivity between operational stakeholders by sharing operational information and by using improved coordination processes. Supported by local tools that are connected with network tools, it is expected that this will result in significant time savings and will create

more time to find fine-tuned and targeted measures for specific flights or flows. These smarter measures are expected to facilitate better use of available or unused capacities and therefore contribute to reducing the impact of ATFM measures on airlines and their passengers.

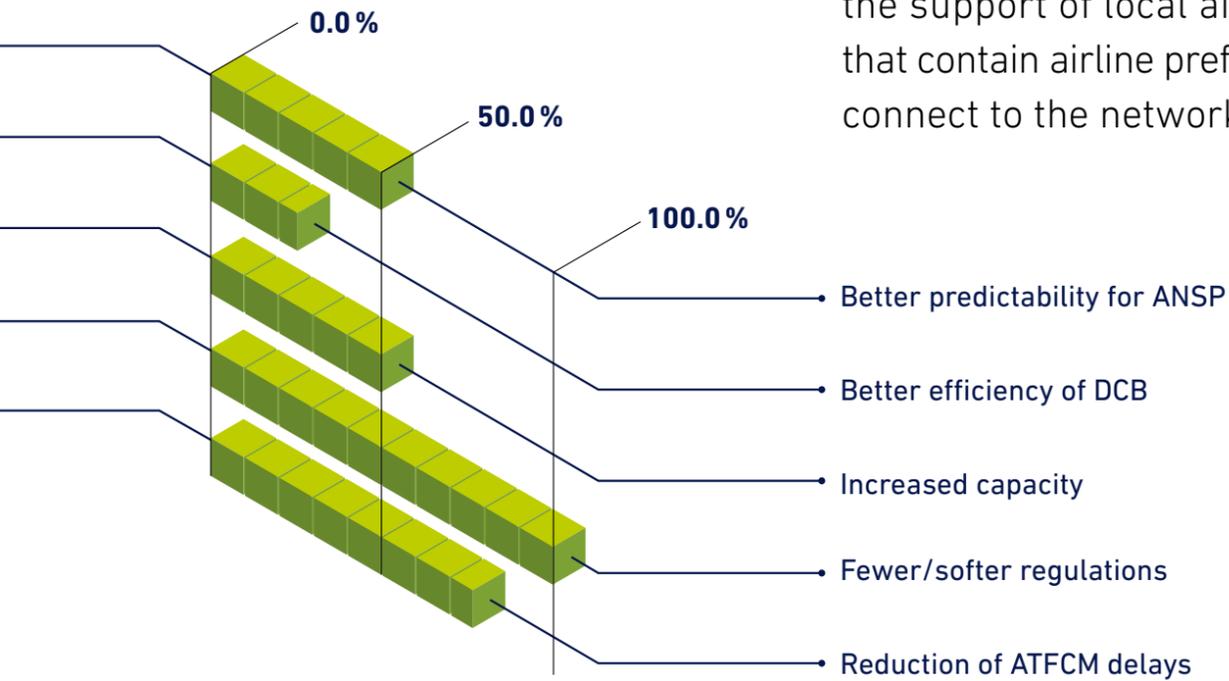


BETTER PREDICTABILITY

Cooperation between operational stakeholders will also contribute to developing agreeable and acceptable concepts and raising awareness of other operational interests. This may have a positive influence on predictability within the network and allow all stakeholders to optimally plan scarce resources.

BETTER FLEET MANAGEMENT FOR AIRSPACE USERS

With improved awareness and coordination possibilities for capacity issues within the network, airspace users will be in a better position to analyze the impact on airline operations and dynamically use the available options to reduce the negative impact on airline performance with respect to punctuality, efficiency and passenger comfort. Much of the coordination and analysis of options is expected to be automated with the support of local airline tools that contain airline preferences and connect to the network systems.



12 OUT OF 15

POTENTIAL "LIMITED" REGULATIONS COULD BE AVOIDED BY APPLYING THE CAP MEASURE

4111

MINUTES OF REGULATION DELAYS WERE AVOIDED THANKS TO APPLYING THE CAP PROCESS IN A 14 DAY TRIAL

IMPROVED AWARENESS AND COORDINATION



OUTLOOK FOR THE FUTURE

The participants in the NCM demonstrations appreciate the platform provided by SESAR. Preparations of the exercises have already resulted in an increased mutual understanding of the different operators. This cooperation will contribute significantly to more efficient operational implementation which is expected to take place after the finalization of the NCM demonstrations.

DEVELOPING, TESTING, DEMONSTRATING AND IMPLEMENTING: THE SESAR VISION BECOMES REALITY

The findings of the NCM demonstrations will also provide the basis for operational implementation guidelines to support the deployment of NCM functionalities at European airlines, air navigation service providers and airports, with benefits for all actors. This will enhance overall air traffic efficiency in Europe, with additional positive effects for European citizens, the environment and the economy.

CONTACTS & PARTNERS



Founding members



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Logos are sorted in alphabetical order.



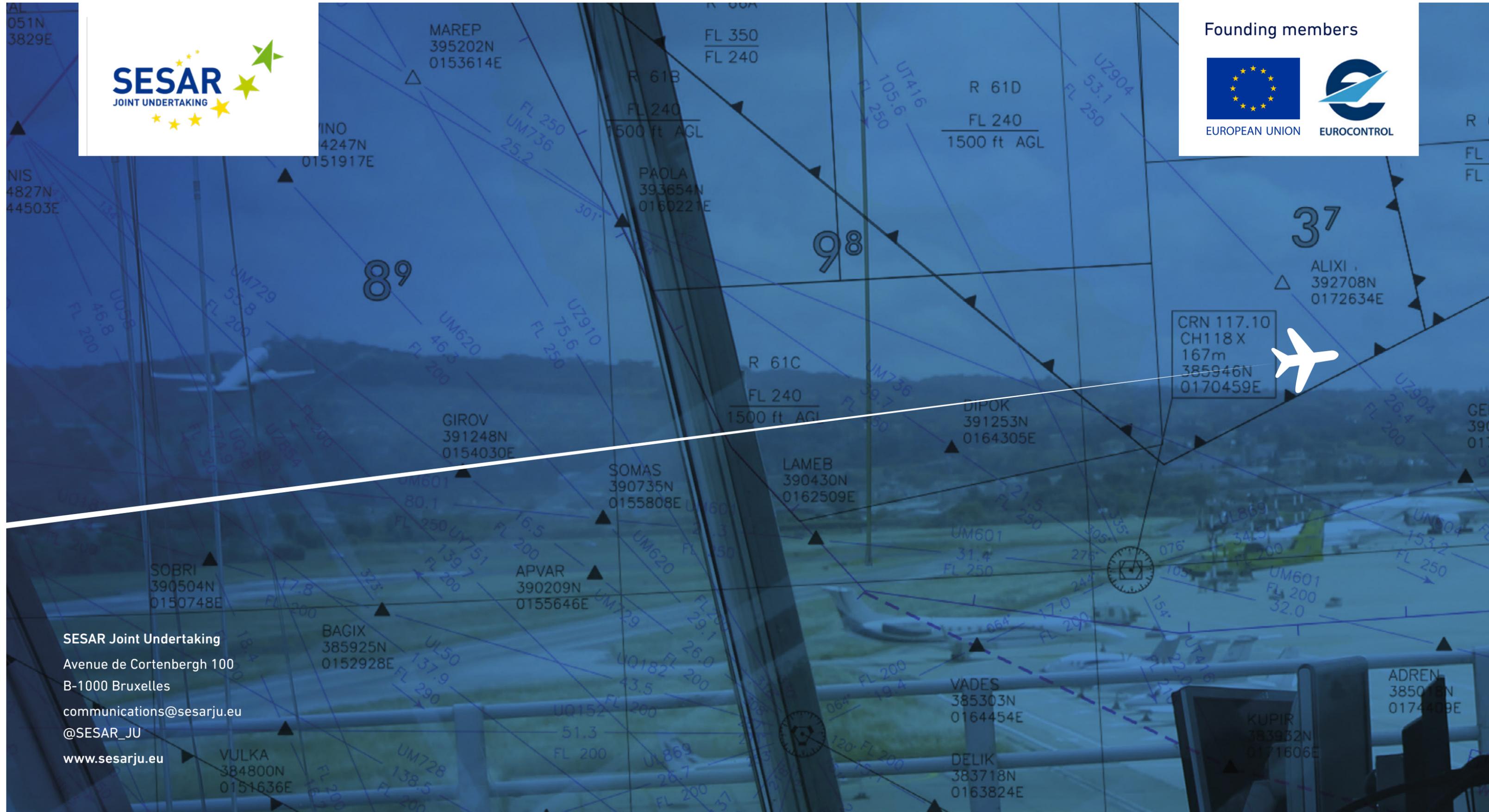
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APVAR
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FL 350
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