ANNUAL REPORT

DSNA
The French Air Navigation Service Provider

2019

Ministry for an Ecological and Solidary Transition

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTÈRE
DE LA TRANSITION
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DSNA

TABLE OF CONTENTS

DSNA **RAPPORT D'ACTIVITÉ 2019**

3

This spring 2020, at the time of publication of our 2019 activity report, air transport is in the midst of a global crisis as a result of the coronavirus. In Europe, while 2019 posted record air traffic — the French air navigation services recorded a new daily record for Europe with 11,311 controlled flights —, the outlook for a recovery in its growth is uncertain.

This crisis is putting our collective resilience and forecasting capacity to the test, but has not changed the DSNA's values: safety and security, the environment, human resources, the continuity of the public air navigation service, preparation for our future. Our professionalism and our commitment will be essential to adapt, with our partners, our ATM modernisation strategy in the framework of the Single European Sky. The DSNA will keep a keen ear open to airspace users,who have been especially hard hit by the economic crisis.

Once air transport has returned to stable activity, the DSNA will be able to offer its customers an even better service, fully meeting their operational needs and in line with the environmental requirements that condition the development of our activity.

Maurice GEORGES – *Director of Air Navigation Services*

USERS & CUSTOMERS, EUROPE, PARTNERS, TERRITORIES

CUSTOMER-ORIENTED
SAFETY SERVICE

THE SINGLE EUROPEAN SKY
AND INTERNATIONAL ACTION

SERVICE TO AIRPORTS
AND TERRITORIES

OUR CHALLENGES

Optimised ATM
network services

Advanced
air traffic services

High-performing
airport operations

Enabling aviation
infrastructure

THE SINGLE EUROPEAN SKY

1 INTEGRATED
SAFETY INITIATIVE

2 TECHNICAL
MODERNIZATION

3 OPERATIONAL
TRAINING

4 ORGANIZATION
OF SERVICES

5 MANAGEMENT

6 PARTNERSHIP

OUR PILLARS

AIR NAVIGATION SAFETY & PUBLIC SERVICE   HUMAN & COLLECTIVE

INNOVATION & THE SINGLE EUROPEAN SKY

OUR VALUES

DSNA's strategic plan

HIGHLIGHTS
OF 2019

EVERYDAY ACTIONS TO BUILD A DSNA
THAT MEETS THE REQUIREMENTS OF TODAY'S AND TOMORROW'S PERFORMANCE
IN TERMS OF SAFETY, ENVIRONMENT, CAPACITY AND COST EFFICIENCY

AIR TRAFFIC
11,311 flights controlled on Friday
12 July 2019, a daily record in Europe.

JULY

**A NEW CONTROL TOWER
IN BEAUVAIS**
Commissioned
on 22 March 2019.

**A NEW WEATHER SERVICE
FOR ACCs**
The weather data and situations
presented in a functional way
to the en-route controller and
shared by the flow management
position (FMP) to improve
foresight of the impacts
degraded situations will have
on traffic.

JANUARY

XSTREAM (SESAR)
Operational tests by Paris ACC
on the pre-sequencing of flights
at peak times up to 300 NM
before their arrival at Paris-CDG,
demonstrating significant gains
in terms of CO_2 reduction. An
environmental project that has
been rewarded with the ATM's
highest trophee.

**BIGSKY, AN INNOVATIVE
MULTISERVICE INTERFACE
AT PARIS-CDG**
All useful information provided
to the control room manager
on a single screen for decision-
making.

APRIL

JUNE

MARCH

**DATA LINK: OPERATIONAL CAPACITY EXTENDED
TO THE WEST FRONTAGE**
The air traffic controllers of Bordeaux ACC and Brest
ACC communicate via Data Link, apart from the
frequent transfers between control sectors, the control
instructions (direct route, flight level, speed, course)
to equipped and connected aircraft.

MAY

**ON-LINE TRAINING OF AERONAUTICAL
DATA PROVIDERS**
A SIA initiative to assist our partners with
the new regulation and familiarise them
with the data transmission methods.

DATA LINK: UPGRADED SURVEILLANCE AT PARIS-CDG

A new functionality successfully tested allowing the controller to dispose of real-time flight parameters.

CALL FOR PARTNERSHIP FOR THE FRENCH U-SPACE

A groundbreaking procedure organised by the DSNA and Defence to build this new environment of tomorrow.

WORLD RADIOCOMMUNICATIONS CONFERENCE

A meeting every 4 years in which the DSNA participates as part of the French delegation, to defend current and future French aeronautics systems interests.

DECEMBER

4-FLIGHT : MODERNISATION OF THE ATM SYSTEM FOR ACCs

Preparation of the first large-scale training courses on the pilot sites of Reims and Marseille ACCs for its deployment phase.

SYSAT: MODERNISATION OF THE ATM FOR MAINLAND FRANCE APPROACHES & AND TOWERS

A new scenario based on groundbreaking technologies to modernise the 69 airfields outside Paris region.

NOVEMBER

SEPTEMBER

BREST ACC, REFIT OF THE CONTROL AND SIMULATION ROOMS

A project started in July that makes this en-route control centre one of France's most advanced.

SALTO, A HIGH-PERFORMANCE ATFCM TOOL

New, even more efficient collaborative methods for managing traffic flows and capacity in each ACC.

REIMS ACC, NEW 4-FLIGHT TEST

Sixty flights controlled at night with 4-FLIGHT in secure mode, testing the automatic coordination with adjacent centres and the position groupings.

RECONSTRUCTION OF RUNWAY 3 AT PARIS-ORLY

A complex 4-month project which required more than 6,000 flights to be cancelled or rescheduled, with a big impact on the control of air traffic on a single runway.

AUGUST

OCTOBER

WEST INDIES-GUYANA SEAFLIGHT MODERNISATION OF THE GROUND ATM IN THE OCEANIC AIRSPACE

Preparation of the training of operational staff and the first tests of real traffic in secure mode at the pilot site at Pointe-à-Pitre (Guadeloupe).

NEW-GENERATION SATELLITE APPROACH PROCEDURES

Publication of the first PBN landing procedure with turns at Saint-Denis La Réunion for commissioning on 2 January 2020.

ORGANISATION OF THE **AIRSPACE**

With 1,000,000 km², the French air navigation services manage one of the largest airspaces in Europe.

The DSNA numbers **five en-route control centers (ACC)** located at Brest, Paris, Reims, Marseille (Aix-en-Provence) and Bordeaux, **nine mainland regional services in charge of approach control and aerodrome control (SNA)** with headquarters located at Nantes, Lille, Paris, Strasbourg, Lyon, Nice, Marseille, Toulouse

and Bordeaux along with **three overseas services** in the French West Indies-Guyana, in the Indian Ocean and in Saint Pierre and Miquelon. It provides support to the civil aviation services of the overseas collectivities of the Pacific (French Polynesia, New Caledonia, Wallis and Futuna).

On 31 December 2019, the DSNA carries out its air traffic control mission across 74 airfields on the French mainland and 12 overseas airfields.

UPPER AIRSPACE > ACC SKILLS AREAS
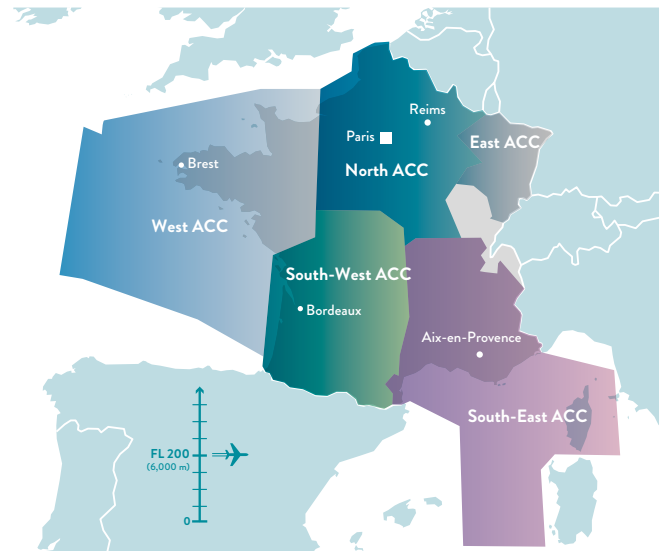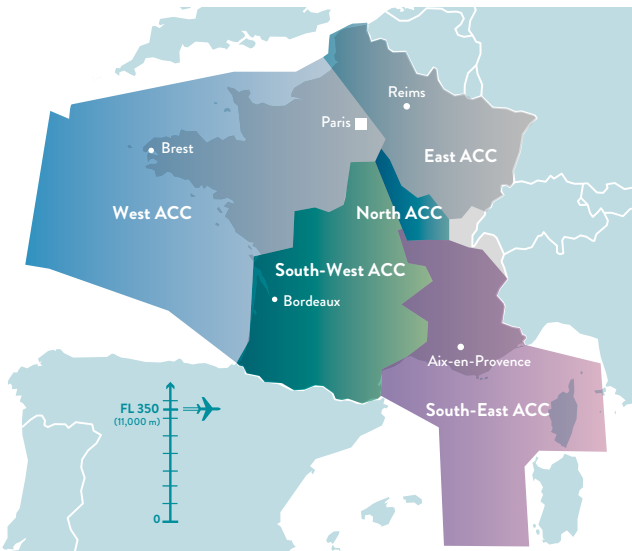
LOWER AIRSPACE > SNA SKILLS AREAS

TMA and Flight Information Sectors (FIS)

Airfields managed by the SNAs
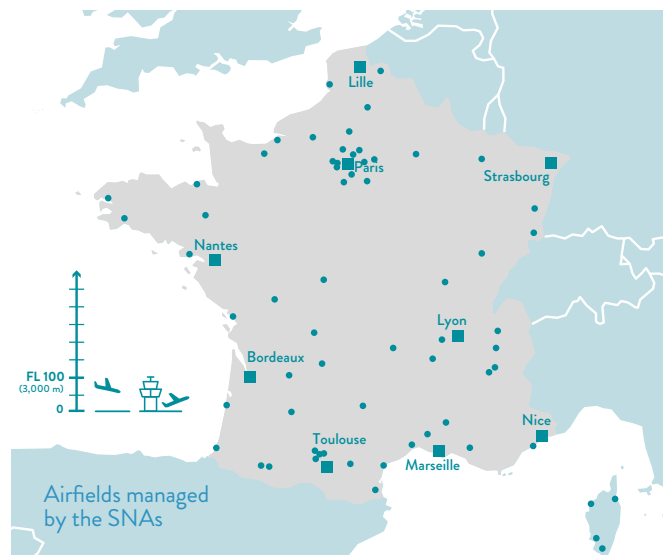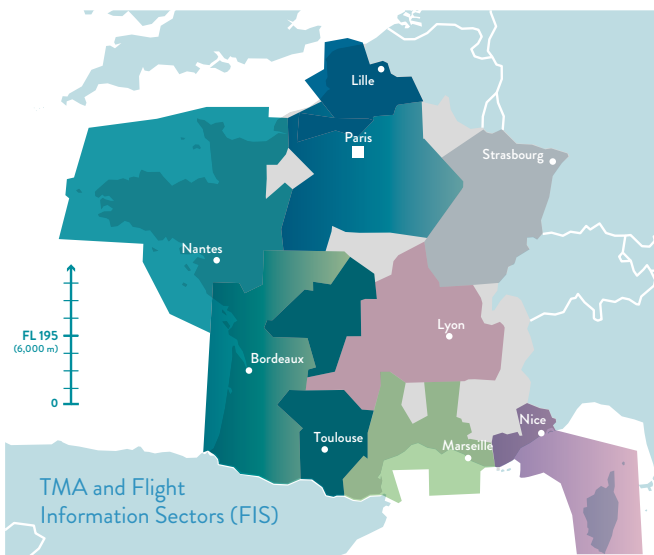
01

AIR
TRAFFIC

RECORD AIR TRAFFIC,
BUT A DIP IN GROWTH FROM SEPTEMBER 2019

The French air navigation services controlled 3,273,964 flights in 2019, i.e. an increase of 1.5% on 2018 mainly accounted for by overflights. With 8,970 flights controlled on average per day, 2019 is a new record! For 2019 this is the equivalent of an additional 2015 summer month of traffic.

2019 was marked by a 3.1% rise in traffic between January and August compared to the same period in 2018, then a reversal of the trend as of September, with a significant fall at Christmas time (-3.5% in December 2019).

High season: increasingly dense traffic. From April to October, French air traffic control services controlled 25,000 flights more than 10 years ago.

Low season: average traffic of 7,700,300 flights per day.

New weekly traffic peak in July with 77,026 flights, or on average 11,004 flights per day.

6 weeks, from Monday 17 July to Sunday 28 September 2019, are part of the Top 10 busiest weeks.

New daily traffic peak with 11,311 flights: a European record!

8 days, from 21 June to 19 July 2019, are in the Top 10 busiest days.

The traffic controlled in France is composed of 51% overflights, 36% international flights (arrivals in France or departures from France) and 13% of domestic flights.

In 2019, **overflights** increased by 2% on 2018, particularly due to traffic flows with Italy: United Kingdom / Italy (+3%), Spain / Italy (+5%). For the French airspace, the Spain/United Kingdom flow (+2%) remains by far the greatest flow of overflights. Overflights were particularly affected at Christmas time, generating a significant fall in traffic for Brest ACC (-6%) and Reims ACC (-4%).

Similarly, **international flights** rose by 2% on 2018 owing to traffic with Italy, Spain and Africa (+3%). With the uncertainties relating to Brexit, traffic with the United Kingdom started to fall (-2%).

In 2019, 201 million passengers travelled on international and internal flights serving French mainland airports, i.e. an increase of 4% on 2018. This growth, greater than movement growth, is explained by an optimization of the number of passengers carried and the use of higher-capacity aircraft, of 150 to 200 seats. In September 2019, several airlines were declared bankrupt, including Aigle Azur, XL Airways and Thomas Cook Airlines.

The ten leading French mainland airports in terms of FIS movements (arrivals and departures)

	2019		Variation
1. Paris-CDG	505,380	↗	+3.4%
2. Paris-Orly *	221,132	↘	-4.6%
3. Nice-Côte d'Azur	145,991	↗	+1.1%
4. Lyons-Saint Exupéry	116,639	↗	+2.7%
5. Marseille-Provence	102,617	↗	+4.3%
6. Toulouse-Blagnac	100,116	↘	-1.5%
7. Bâle-Mulhouse	85,382	↗	+3.3%
8. Bordeaux-Mérignac:	70,182	→	+0.0%
9. Nantes-Atlantique	65,743	↗	+7.2%
10. Paris-Le Bourget	53,685	↘	-5.6%

Limitation of airport capacity (page 15).

Despite two difficult months in November and December (-4%), **internal traffic remained stable in 2019 in terms of movements.**

The main regional and Overseas airports recorded a rise in their movements thanks to the opening of new lines and an ever-increasing proportion of Low-cost airlines. Nevertheless, competition with the *Low-cost TGV remains fierce, especially for Toulouse and Bordeaux.*

In European terms, France remains the country controlling the most flights. In Western Europe, traffic remained almost stable in 2019 due to this difficult Christmas period.

Annual variation in FIS traffic controlled in France — Source: DSNA

+1,5%

3,400,000
3,200,000
3,000,000
2,800,000
2,600,000
2,400,000

2000   2005   2010   2015   2019
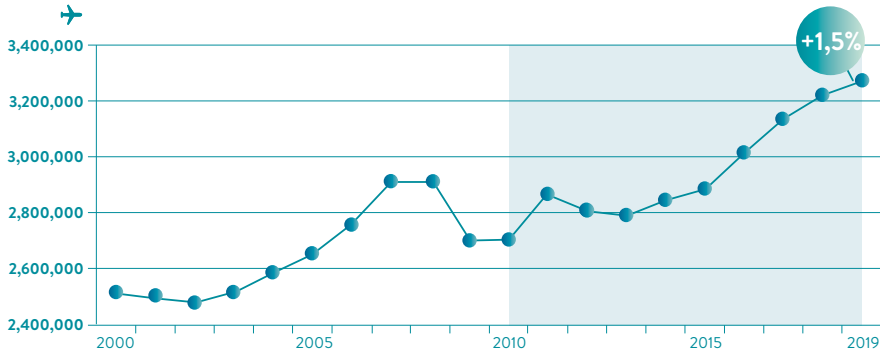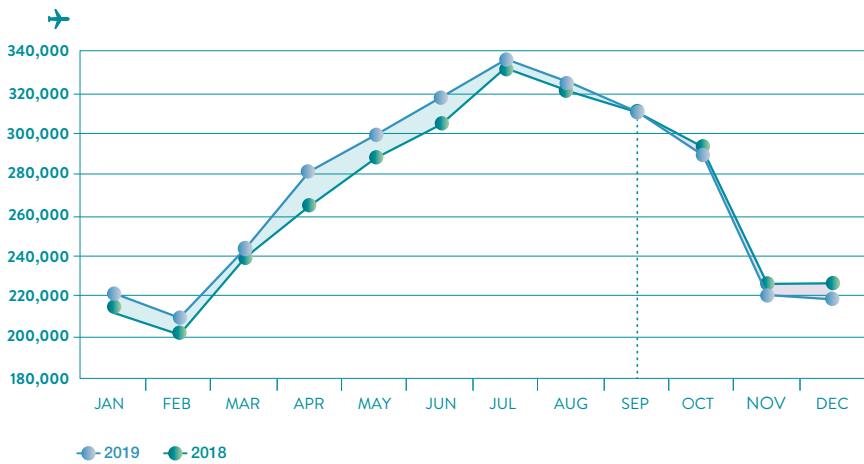

Nice Côte D'Azur Airport

Monthly distribution of controlled IFR traffic in France — Source: DSNA

340,000
320,000
300,000
280,000
260,000
240,000
220,000
200,000
180,000

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

— 2019   — 2018

Pointe-à-Pitre airport, Le Raizet.

Variation in the main traffic flows in France
Average number of flights per day and 2019/2018 variation — Source: DSNA

NETHERLANDS
BELGIUM

UNITED
KINGDOM

GERMANY

437 -2%

334 +1%

799 +2%

290 0%

528 -5%

299 +3%

338 +3%

313 +3%

421 +3%

309 +5%

SPAIN

ITALY

AFRICA

TRAFFIC BREAKDOWN

Domestic flights 13%
Overflights 51%
International flights 36%

— European overflights
— International departures and arrivals
— French airspace
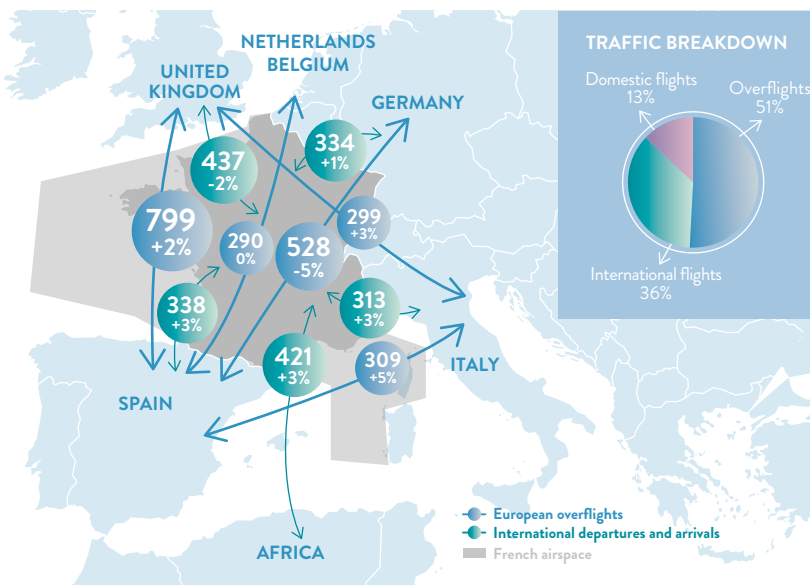
02

AIR NAVIGATION SAFETY
& PUBLIC SERVICE

FLIGHT **SAFETY**

CANSO Global ATM Safety Conference 2019 "Delivering safe skies in a rapidly changing global airspace system": from 4 to 7 November 2019, the DSNA hosted the annual meeting of air traffic controllers in Paris, on air traffic safety. 130 people took part from all over the world.

Flight safety is the primary mission of DSNA. Far from being a restriction, it is a driver of development. The DSNA is committed to integrated security management for an even greater mastery of our professional practices.

For this purpose, the French air navigation services are taking all the preventive and corrective actions necessary for its continuous improvement, based on a "just" culture promoting experience feedback, and applying the severity classification method required by European performance regulations.

SAFETY INDICATORS

In 2019, air traffic safety indicators (en-route loss of separation, number of incidents between civil and military aircraft, intrusions of VFRs into controlled airspace, runway incursions) improved (page 12).

However, the increase in air traffic and the requirements of technical modernization and systems automation, which have become increasingly interoperable, make it necessary to renew and strengthen our risk management model.

A NEW BARRIER SAFETY MODEL

To derive greater benefit from operations in matters of safety event analysis and change safety studies, the DSNA embarked on a new risk management approach compliant with the new European regulation applicable on 2 January 2020.

This approach is based on the use of a barrier safety model representing the contributions of each stakeholder of the safety chain. It is used to better identify weak signals, from real time to the most organizational actions and to better understand resilience mechanisms for a system as complex and interconnected as that of air navigation.

SECURITY PLANS

The DSNA has developed operational security plans for airfield and approach control, air traffic control in the Paris region and en-route control. In particular, it played an active part in developing the new European plan for prevention of runway incursions, putting the emphasis on better synergy between the concerned stakeholders: airfield operators, vehicles, air navigation ser-

vices providers, airlines,and monitoring authorities. This plan is monitored as part of the State Safety Program.

Within the framework of the European SESAR programme, the DSNA also invested significantly in SAFE and IAO projects (page 42) aimed at developing new operational concepts for safety on the ground.

TREATMENT OF SAFETY EVENTS

The "just" culture is aiming to guarantee a constructive and trust-based work environment, which focuses on continuous improvement in safety. The DSNA has an internal charter that formalises its commitment to applying the principles of this procedure in accordance with the European regulation.

Safety events deemed important are always the subject of an analysis to define areas of improvement.

As far as the examination of civil/military incidents is concerned, the DSNA takes part in the Permanent Group of the Airspace Directorate for Air Traffic Management Safety (GPSA).

Number of en-route air misses

Number of airproxes per 100,000 flights

In million

The standard minimum en-route radarseparation between two aircraft is 5 Nm in the horizontal plane and 1,000 ft in the vertical plane. The safety net alerts the controller to an exceptional collision risk.
Two indicators are monitored: the "HN 70" when the separation between two aircraft is less than 70% of the standard and the "HN 50" which corresponds to 50% of the standard.
In 2019, the frequency of occurrence of a loss of separation of < 70% was 0.37 flights out of 100,000 controlled flights and that of a loss of separation of < 50% was 0.09 flights out of 100,000 controlled flights.
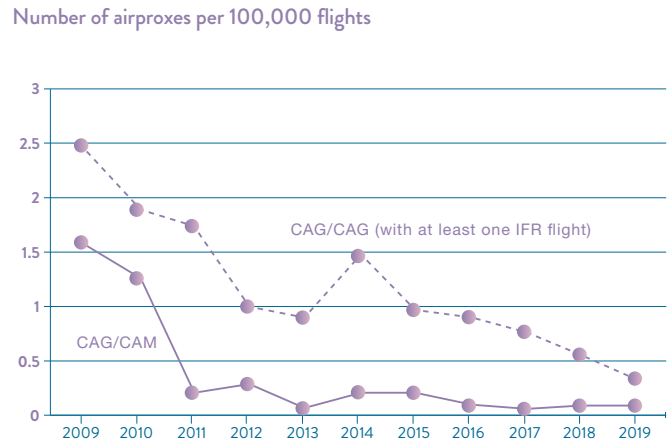
In France, two types of air traffic co-exist: general air traffic (CAG) and military air traffic (CAM).

An airprox is an incident without consequences during which two aircraft met in a hazardous situation of proximity. In 2019, pilots filed 0.34 "CAG/CAG" airproxes implying at least one IFS flight every 100,000 flights and 0.09 "CAG/CAM" airproxes every 100,000 flights.

CIVIL-MILITARY COORDINATION

Any airspace reorganization is the result of a long and rigorous work, based on mutual trust between the various partners.

The French Air Force, equipped with state-of-the-art combat aircraft and weapon systems, as well as NATO for its major joint military exercises, require more airspace for their training. In 2019, two zones for training in new weapons (ZENA) were defined in agreement with the DSNA and are being experimented: ZENA Atlantic and ZENA Gascogny.

Developments in military matters was the subject of numerous negotiations between the various operational agents at the CDM@ DSNA seminar in November 2019 (page 30).
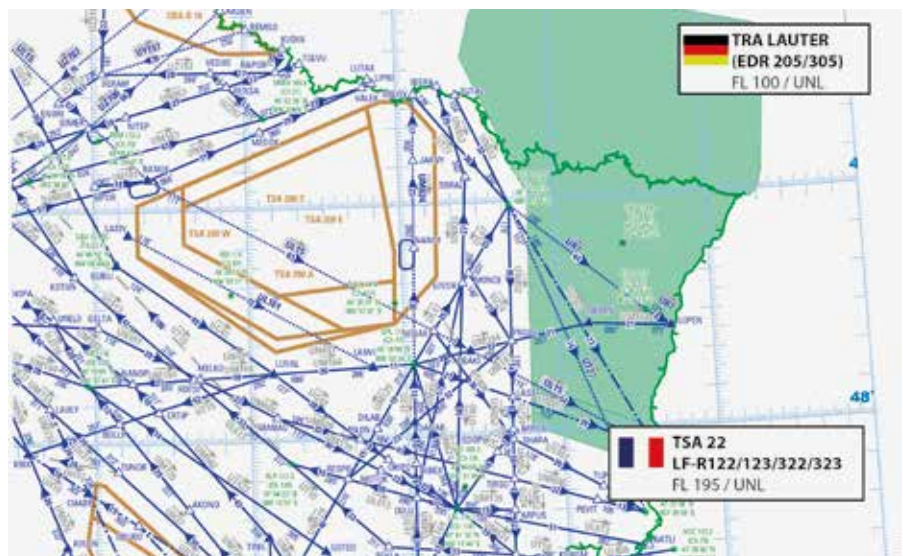
ZENA Northeast will be built based on existing zones, TSA 22 (France) and TRA LAUTER (Germany), located in the Core Area.

ZENA Northeast is an ambitious, groundbreaking project in terms of military aircraft operations, as they would be cross-border between France and Germany, which is a first in Europe.

In 2019, an in-depth analysis was conducted with the French and German civil and military authorities. In order not to penalise the dense and complex traffic in this part of the airspace, the aim would be for each force to be able to use all of these two military zones, at mid and high altitude, favouring a pioneering management of its use between the two forces *(Advanced Flexible Use of Air-space)*. To do so, exchanges of data and coordination in the planning of military activities must be set up. These discussions are continuing in 2020 at the FABEC (page 43).

PRACTICAL SAFETY-RELATED ACTIONS IN 2019

Both the operational events set out below demonstrate how critical our air traffic control system is, if the service becomes unavailable, but also its level of resilience. For these safety events considered significant we sought feedback from all the agents concerned.

CESNAC operators (Bordeaux).

COMPUTER FAULT IN AERONAUTICAL MESSAGING

1 September 2019 - 2:30 am: the MÉSANGE system suddenly stops working, rendering inaccessible the aeronautical messaging system, which automatically serves all en-route control towers and centres in France via the specialised air navigation network. This messaging system usually carries the flight plans from EUROCONTROL.

The return to a nominal software configuration required seven hours work by the CESNAC's (IESSA) maintenance staff to rebuild a fully operational system. A very effective operation, tackling an unprecedented, particularly complex fault!

On the operational side, the flight plans submitted during the fault had to be manually entered and processed by controllers and CESNAC operators. Therefore, strict regulations had to be setup during the early hours of the

morning, causing significant disruption to air traffic in Europe. In this deteriorated context, flights continued to be controlled in absolute safety.

SEVERE DISRUPTION TO OPERATIONAL COMMUNICATIONS

23 and 24 November 2019: huge storms hit Southwest France, leading to failures in the national electricity supply and therefore to losses in operational connections with the radar and radio antennas of isolated sites, and certain equipment.

This situation was aggravated by storms near to Marseille ACC, causing inter-ference with the radio links and leading to the loss of most of this centre's radio links for a quarter of an hour. To ensure air traffic safety, Marseille ACC immediately took appropriate action in the form of redundant links and generators for isolated sites. DSNA air traffic controllers and maintenance teams, in coordination with the operators of the electricity and telephone network, have been fully initiated in the operational and technical management of this exceptional degraded situation.
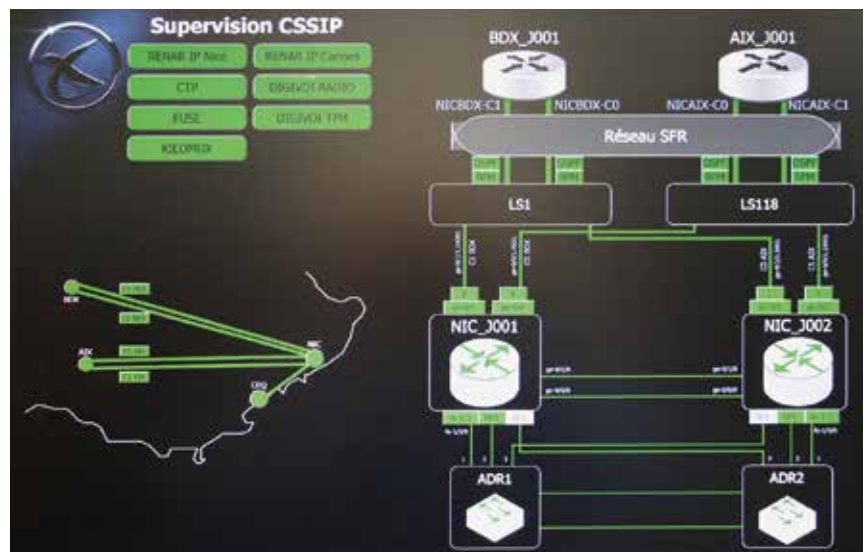
Supervision of the specialised air navigation network (RENAR IP).

STORMS, SNOW, FROST, THUNDERSTORMS: FORESEE THE IMPACT ON TRAFFIC TO KEEP FLIGHTS SAFE

The DSNA is a pioneer in bringing in the first SWIM weather services in Europe.

With the SWIMET project providing more precise and more elaborate information, the en-route controller follows the pilot's operations even more closely on their 4Me tool. Accordingly, they can better inform the pilot of the overall situation, providing welcome aid to the pilot, who can use this information to take the decision to avoid the dangerous zone. Futhermore, control room manager, flow

manager (FMP) and controller view the same enhanced weather information.

Based on an SESAR 1 solution, the SWIMET project has been developed together with the start-up METSAFE. This company manages a digital services platform that processes the data of Méteo France and METEORAGE, and makes them available to DSNA's appli-cations to facilitate their use by air traffic controllers.

Cannes airport under water.

MORE ENVIRONMENTALLY-FRIENDLY
FLIGHTS

Scientists agree in saying that the environmental impact of air transport on CO_2 emissions is around 3% and that in 20 years, gas emissions per passenger transported have fallen significantly.

The measures implemented deserve mention, as reducing aviation's impact on air quality and noise disturbance for overflown populations is a priority requirement for air transport to develop sustainably. With the support of groundbreaking technologies, each operational agent, in its field, is called upon to see that this environmental transition takes place and to promote greener aviation on a daily basis.

The DSNA has made the reduction of the environmental impact of air traffic its second strategic priority.

LIMITING THE IMPACT OF NOISE

An air traffic impact study (EICA) measures and appraises the environmental impacts of creating or modifying an air traffic mechanism. The study is then presented to the Consultative Commission for the Environment (CCE) for the airport in question and to the ACNUSA, an independent authority, when the airport falls within its remit.

In 2019, the DSNA executed several impact studies, mostly oriented towards satellite procedures:

▎ study for Marseilles airport, which does not require acoustic calculations;

▎ studies for Ajaccio, Bastia, Figari, Montpellier, Perpignan and Saint-Denis de La Réunion airports, which require environmental impact calculations (noise, gas emissions, population count);

▎ studies for Bordeaux and Toulouse airports, using more complex noise, overflight and gas emission indicators.

COOPERATION WITH SKYGUIDE

Following the repositioning of the ILS interception chevron for flights arriving in Geneva in order to limit the overflying of Lake Geneva's local residents (Skyguide's PETAL project), the DSNA finished its measuring campaign in 2019 at Chens-sur-Léman and Thonon-les-Bains in Haute-Savoie. The round-up of these measures was presented to local politicians and the Geneva airport CCE, evidencing the device's efficacy in reducing the number of overflights of the Lake Geneva peninsula.

REDUCING CO_2 EMISSIONS

Managing flights more efficiently by optimising trajectories, using the best PBN trajectories and continuous descents for arrivals are the DSNA's constant concern.

In 2019, the attribution of direct routes for aircraft wherever possible and tactical flight management by air traffic controllers reduced the distances travelled and saved around 128,000 tons of fuel, representing a reduction of CO_2 emissions of around 400,000 tonnes.

At European level, the FABEC environment committee took action in response to *The Green Deal* initiative launched by the European Commission in December 2019. Specifically, FABEC is at the core of the *Free Route* concept (page 43).

Paris-Orly: closure of the South runway for four months for rebuilding with a big impact on air traffic management.

CONSULTATION AND COMMUNICATION

FLIGHTS DEPARTING FROM PARIS-ORLY

In 2019, studies continued to reduce the noise impact of flights leaving from Orly. A working group, called Optibruit, was set up within the Orly CCE, bringing together the representatives of each CCE college and of the PRISALT association's technical committee. Its mandate is to explore new methods of piloting aircraft, maintaining aircraft noise reduction procedures up to 3,000 feet (900 metres), followed by a "soft" acceleration phase helping to reduce noise pollution.

The proposals selected will be subject to the appraisal of Airbus and Boeing who will examine the environmental impacts.

CEM PLATFORM

To facilitate exchanges between aviation industry professionals and national representatives of local residents' associations on aviation-related environmental issues, most European air traffic controllers have set up a national *Collaborative Environmental Management (CEM) platform.* This approach makes it possible to involve associations in a participative manner and to better highlight the environmental issues and achievements.

In 2019, the national CEM platform met to discuss air traffic management operations and airport and air activities in general and their environmental impacts in France. Two additional members, representing French-based foreign airlines and European-wide airport area residents will join this initiative in 2020, thus enlarging the scope of the discussions.

REPLACEMENT OF THE ILS AT PARIS-LE BOURGET

From 8 July to 26 November 2019, the technical services of the DSNA replaced the category I ILS for precision landing on runway 27.

To carry out this work properly, the airport's operating conditions had to be changed and local residents informed.

RECONSTRUCTION OF RUNWAY 3 AT PARIS-ORLY

From 29 July to 1 December 2019, up to 1,000 persons worked 24/7 on the rebuilding of Orly's South runway, of 3,320 metres in length. A project of this kind is very complex to manage and requires great professionalism of the teams on the ground. On this occasion, the DSNA installed a new category III ILS in an East-facing configuration in order to improve flight safety in the event of poor weather conditions.

In Orly, the closure of runway 3, which normally enables specialised-runway operation with runway 4, had a big impact on air traffic, both on the environmental side and on the performance side. Aircraft take-offs and landings were basically performed on a single runway (North runway). Also, a dialogue was held beforehand with all the parties concerned: airport manager, airline companies, local politicians and residents.

To facilitate arrivals management, air traffic controllers successfully tested a highly-innovative ergonomic MMI interface (IODA page 35). In this type of degraded situation, the CDM process between operational agents has proved very useful and contributes effectively to adherence to the curfew.

AN EXCEPTIONAL PROJECT

150
machines for demolition and landscaping

175,000
tons of asphalt

15 km
of multi-tube conduit

200,000
tons of concrete

2,000
runway lights

PRACTICAL ACTIONS FOR THE ENVIRONMENT IN 2019

LIMITING THE IMPACT OF NOISE

Bordeaux: South-bound departure procedure modified

At the request of the Prefect and of local residents, in 2019 DSNA studied the modification of the procedure for south-bound departures from runway 23 at Bordeaux airport in order to avoid over-flying the populations of Pessac and Pierroton districts. The project aims to reduce flight dispersal.

Having won the approval of the airport's CCE and the ACNUSA, this project is scheduled to start in autumn 2020.

First PBN landing procedures with turns

AR RNP approaches provide optimum and safe accessibility to an airport surrounded by obstacles or highly developed areas, combining a very precise series of laterally and vertically guided turns. On this type of complex trajectory, the aircraft has precise final approach guidance, even in a constant radius turn, which enables it to automatically align with the approach track. For the company, the benefit of this new procedure is that it avoids diversions on arrival due to poor weather conditions, but the use of these trajectories requires the airline to have certified avionics systems and specific operational approval.

After receiving the approval of the National Supervisory Body, the first AR RNP procedure was published in 2019 at Saint-Denis de La Réunion and commissioned on 2 January 2020. The next one is scheduled in 2020 for Ajaccio.

Saint-Denis de La Réunion: the DSNA in collaboration with Air Austral designed an AR RNP procedure on runway 12 that, in bad weather, provides a precision approach on the longest runway, used for take-offs and with no ILS. An important asset for flight operation and safety!

OUR PARTNERS TALK
ABOUT THE DSNA

skeyes nice to guide you

In a dense and complex airspace, Skeyes, a Belgian air traffic controller and member of the FABEC (page 43), controls more than a million flights per year. Skeyes provides air traffic control services for Brussels, Anvers, Charleroi, Courtrai, Liège and Ostend airports, and has a control centre that manages traffic up to FL 250 (7,500 metres).

"To improve our environmental performance, we use tools developed by the DSNA, such as ELVIRA (automatic detection of deviation from trajectory, non-stabilised approaches and continuous descents) and CARPEDIEM (measuring the horizontal and vertical inefficiency of flights) enabling us to optimise flight routes and profiles. Thanks to the development of new functionalities in these tools and improved data availability, we hope to further contribute to the global effort to reduce aviation-related CO_2 emissions."

Marilyn Bastin, Head of Environment and Procedure Design

PRACTICAL ACTIONS FOR THE ENVIRONMENT IN 2019

REDUCING CO_2 EMISSIONS

Improving the environmental efficiency of flights and their arrival capacity

The xStream (SESAR) project, coordinated by the DSNA, involved 16 associates. By means of several types of exercise carried out in summer 2017 and autumn 2019, the aim was to assess how to best manage peak-time arrivals at very busy airports: Paris, Zurich, Frankfurt and London, all located in the most dense part of Western Europe's airspace *(Core Area).*

Paris ACC tested two additional concepts to speed up arrival sequences at Paris-CDG and Paris-Orly by targeting flights to be slowed: both on the ground by generating a target arrival time (TTA) to be met by the pilot, and en-route, up to 300 NM (550 km) upstream of the destination airport, by sending an early speed reduction request. In the latter case, the controller of the en-route sector asked the pilot to reduce the aircraft's speed up to 1 hour prior to arrival, which levelled out traffic peaks. This management procedure reduced, for flights arriving at peak times, their fuel consumption by up to 30 kg per flight, representing a CO_2 reduction of up to 90 kg per flight. Furthermore, with this new management procedure, low-altitude wait loops have been much less used.

Very encouraging results in terms of environmental performance, which earned this project the ATM's top accolade en 2019!

> With xStream, the DSNA and its associates received the ATM Award 2019 in the "Environment" category, then the "Overall Excellence in ATM" award. This prize is awarded by an international jury of industry professionals.

Pre-departure Target Time of Arrival (TTA)
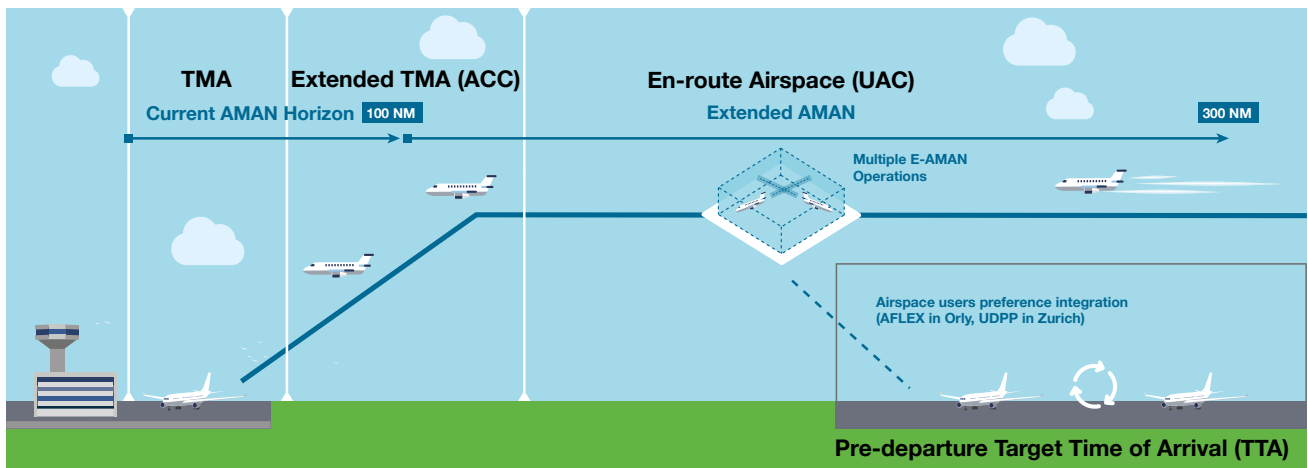
H24 continuous descents at Paris-CDG

This very ambitious project for an airport with four runways and one as busy as Paris-CDG aims, by 2023, to significantly limit environmental impacts (noise and CO_2) emissions by improving vertical profiles.

Since 2016, these continuous descent procedures known as "soft" descents have only been used for night flights, in low traffic periods.

The general application of these daytime and nighttime periods must take into account the complexity of simultaneous approaches on both runway pairs. For this purpose, following Assises du Transport

Aérien (Air Transport Roundtables), the DSNA worked on implementing satellite guidance of aircraft up to the interception of the approach track (PBN procedure), then an approach phase by guidance on the ILS (instrument landing system) for the final phase. With this PBN to ILS concept, the approaches of both runway pairs will be used independently, which is a prerequisite.

This project is also a chance to study a better feeding of the regulation area by a North/South segregation of the flows, using new crossing point trajectories for tailwinds. Here again, a heavy limitation of

low-altitude inter-axis crossing points at low altitude would be a significant environmental benefit.
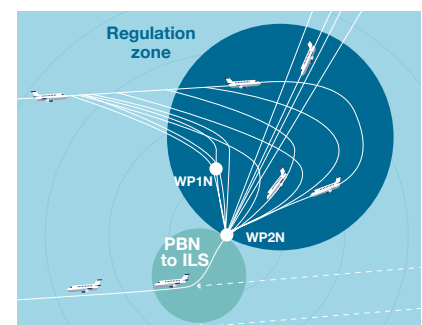
FLIGHT **REGULARITY**

New position of the control room manager at Brest ACC.

Breakdown of delay causes related to air traffic regulations — Source: DSNA

78%

22%

■ *Delays directly linked to air traffic*
■ *Delays linked to other factors*

2%
Miscellaneous

5%
Technical malfunctions

2%
Other external factors

Poor weather conditions
19%

Lack of operational staff
36%

18%

Capacity limitations in the control sectors

18%

Social movements
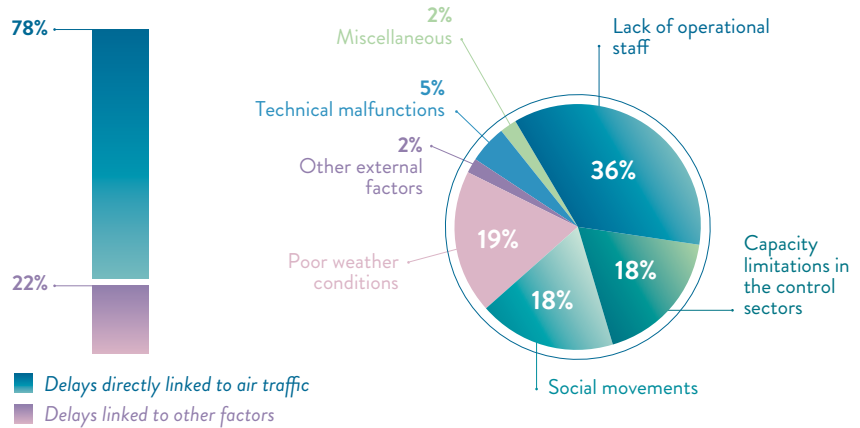
INCREASINGLY COLLABORATIVE TOOLS AND WORKING METHODS

When certain air control sectors are saturated due to an excessively high traffic demand, the flights are regulated for safety reasons.

In 2019, air traffic control services generated 4,370,551 minutes of delay, nearly a third less than in 2018, 87% of it related to en-route traffic control. Taking the number of controlled flights into account, this represented an average of **1.33 minutes of delay per flight** (1.95 min/flight in 2018), the overall European objective for en-route traffic control being set at 0.5 min/flight.

In 2019, the lack of qualified operational staff and the structural limitation of the capacity of certain control sectors represented more than half of the causes, along with difficult weather conditions. Summer 2019 worked out better than summer 2018 thanks to the operational measures implemented (page 18) and to the less stormy weather, but the performances deteriorated at the end of 2019, with difficult weather conditions and repeated national strikes in December related to the pension reform.

All causes combined, 27% of flights were delayed by over 15 minutes upon departure from French mainland airports in 2019. The breakdown of causes was as follows: rotations in series (10%), airlines (7%), passengers (3%), air navigation (3%), airports & security (3%), and bad weather conditions (1%).

Since late 2019, the 5 ACCs have been using a new SALTO tool providing advanced functionalities to optimise the management of the traffic flows. This modern tool provides traffic forecasts, enables early detection and analysis of imbalances between demand and the ability to decide on the appropriate measures to be taken.

Connected to the *Network Manager* (EUROCONTROL), SALTO electronically sends the planned changes of configuration and capacity of the control centres and any implementation of regulation measures when a traffic overload in a sector is forecast.

With this new-generation tool, the control room manager or the flow manager (FMP) can evaluate strategies before they are implemented and detect unplanned flights. Collaborative methods for managing traffic flows and capacity are becoming even more efficient!

PRACTICAL ACTIONS IN 2019 TO IMPROVE PUNCTUALITY

At strategic level, in 2019 the DSNA and IATA signed an agreement to cooperate in the drafting of the French strategy for modernising the airspace in France and for air traffic management, and to implement it (page 30).

On the pre-tactical level, in a context of sustained traffic, the DSNA has been working with airlines, Météo France, airport managers and the Network Manager (EUROCONTROL) to develop collaborative decision-making (CDM) processes even further as performance tools for optimizing operations and the exploitation of the route network, in nominal and degraded conditions alike:

I rework certain sectorisations of the airspace to facilitate traffic fluidity;

I implement rerouting scenarios at European level to optimise the network as a whole and ensure the most effective possible management to minimise the impact on the environment;

I to extend the CDM beyond airport operations. Advanced collaborative management makes it possible to avoid saturated en-route control centers and, when deteriorations occur, to improve resilience to return to a nominal situation more quickly;

I to dispose of a shared view of the weather forecasts over all sectors and ensure consistent and optimized management of regulations and scenarios;

I to make the CDM tools even more efficient while expanding their scope and making them more interoperable.

This undertaking reflects the common desire of the Network Manager, our partners and our customers to share a number of operational data items via the "B2B@NM" collaborative service.

To develop post-operation analyses to improve our performance

The DSNA has a sophisticated tool (ATFCM PostOps portal) to precisely analyse operating scenarios: delays per control sector, flight trajectory on the horizontal or vertical plane…

A posteriori, these analyses will provide operators with a deep understanding of the impact of their actions. And at pre-tactical level, they enable different scenarios to be simulated and help in decision-making.

Biarritz airport.

The G7 summit in Biarritz

France welcomes 24 foreign delegations participating in the international summit from 24 to 26 August 2019. This event with complex organisational requirements required the involvement of many DSNA staff, both in the preparation stage and in its running over the three days.

On the tactical side, SNA Southwest set up a local coordination unit closely linked to Operations management, the EUROCONTROL Network Manager and the embassies. It thus facilitated operations with Defence and and the very specific management of government flights. As for the parking, due to the limited number of parking spaces at Biarritz airport, the delegations' aircraft were spread over Bordeaux, Le Bourget, Marseilles and Nice airports.

By only generating 2,300 minutes of delays for Bordeaux airport, this effective organisation minimised the operational impact of this event on air traffic, which was still substantial at that time.

03

HUMAN &
COLLECTIVE

HUMAN RESOURCES

On 31 December 2019, the workforce of DSNA personnel working on the French mainland and Overseas (West Indies-Guyana, Indian Ocean, Saint Pierre and Miquelon and Pacific Collectivities: French Polynesia, New Caledonia, Wallis and Futuna) amounted to 7,354 employees, with a male-female distribution of 72% – 28%. This number is down by 0.7% on 2018.

93% of agents (6,814) operated on the French mainland and 7% (540) Overseas.

For the air navigation services of the Pacific, the DSNA provides functional and technical support within the framework of conventions.

MANAGEMENT AND TRAINING OF TECHNICAL PERSONNEL

The DSNA manages for the DGAC the careers of the three technical corps ICNA, IESSA and TSEEAC. The provisional management of this personnel was the subject of careful monitoring given the time required for the technical and operating qualification process.

The DSNA participates in setting the criteria for their recruitment, assigned to the ENAC, the FABEC's primary training body (page 43). Together with the ENAC, the DSNA also determines the content of the initial training of its future technical personnel and adapts it to their career development.

The ICNA and IESSA courses are delivered between the ENAC and the air navigation centers. The diploma are recognized as Master grade (Baccalaureate + 5 years).

The DSNA also manages the assignments of its students studying at the ENAC and the professional mobility of its technical personnel through campaigns when positions become available, examined at joint administrative committees twice a year.

Initial training of student air traffic controllers at the ENAC on a simulator.

Distribution of staff by service

7%
DTI

28%
Mainland
SNA

20%
Paris Region SNA

1%
DO/Hq

7%
Overseas SNA

14%
SW Region SNA

21%
ACC

2%
DSNA/Hq

TOTAL
7,354 people
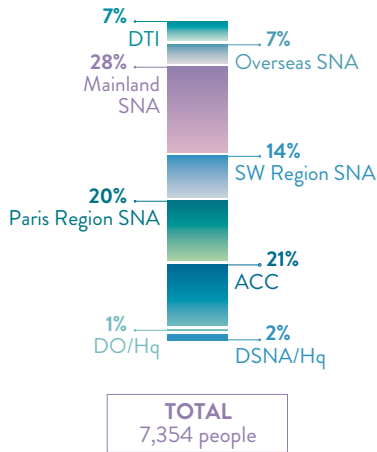
BREAKDOWN BY ORGANIZATION	
Paris region SNA	1,461
South-West region SNA	1,024
Marseille ACC	597
Reims ACC	493
Brest ACC	480
South-East SNA	353
South-South-East SNA	330
Center-East SNA	323
North-East SNA	282
West SNA	278
South SNA	251
West Indies-Guyana SNA	244
North SNA	192
French Pacific Collectivities (technical personnel)	186
Indian Ocean SNA	69
Saint Pierre and Miquelon DSNA	41

Control room at Brest ACC.

Distribution of controllers holding a valid license by organization type

46%
(1,602)

SNA*
(ICNA)

44%
(1,524)

ACC
(ICNA)

SNA*
(TSEEAC)

10%
(343)

TOTAL
3,469 people
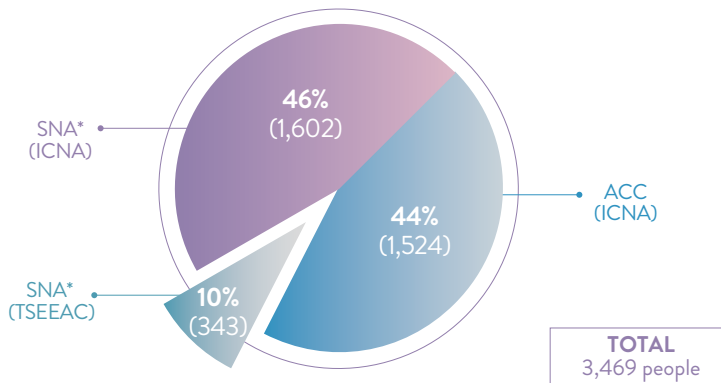
* This category includes mainland SNAs and overseas entities

Technical supervision room at Pointe-à-Pitre.

Distribution of maintenance personnel by service and organization type

CESNAC **4%**
(56)

DTI **13%**
(176)

OTHER ENTITIES* **3%**
(45)

DSNA/Hq
DO/Hq
SIA **2%**
(31)

28%
(369)

ACC

50%
(644)

SNA

TOTAL
1,321 people

* DSNA/SPM, French Polynesia, New Caledonia, Wallis and Futuna
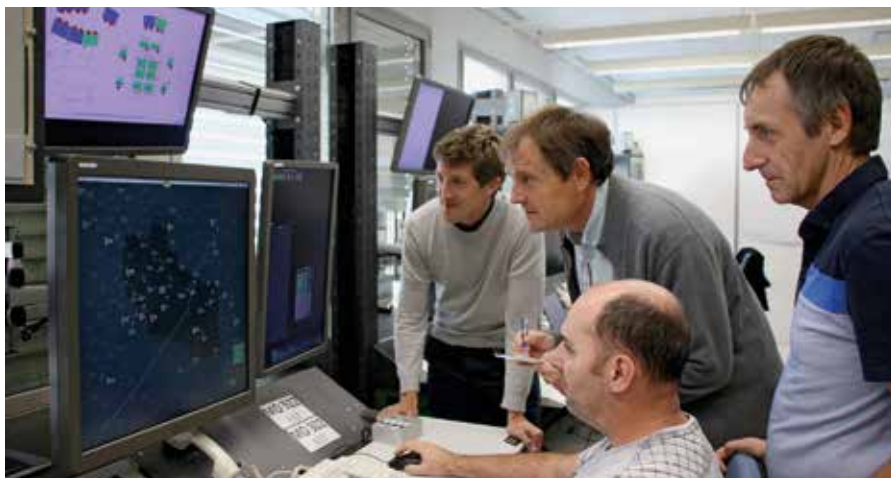
4-FLIGHT at Marseille AAC: team formed by the DO, DTI and Thales.

GUIDING MANAGERS IN BUSINESS TRANSFORMATION

In 2019, the DSNA continued its support of its managers involved in the technical modernisation according to seven transformation projects: safety/cybersecurity, program management, engineering and innovation, skills and Human Resources, trust, partnerships, and digital transformation.

PROJECT, PROGRAMME AND PORTFOLIO SUPPORT UNIT (UA3P)

Modernising our working methods is essential to integrate good project practices in terms of project, programme and portfolio management. In 2019, several training sessions were held and the support provided for the STIP/STPV, Free Route, OLDI, AMAN/DMAN, PostOps, Portail@CDM, PBN to ILS migrations was well received. New training dedicated to the Agile method will be given to the project teams concerned.

Nearly a hundred DSNA managers successfully followed the Managing Successful Programmes certified training course. Through this course, the DSNA aims to develop a common culture and create a labelling system and improve the awareness of its customers and associates.

REORGANISATION OF THE DTI

To better meet the new expectations, the DTI has embarked on a "service-oriented" transformation process, covering the entire life cycle of the systems, from their specification through to their implementation.

The expected benefits include: minimising the *Time to OPS*, optimising the DTI's added value for the operational services through use of the Agile methodology and a better understanding of the technical architecture accompanied by a simplification of the internal processes. In terms of innovation, an incubator will be responsible for producing and accelerating the developments, through both an innovative approach and the ability to provide a quick response to operating problems.

ADAPTING CONTROLLERS' WORK ORGANISATION

To improve its performance and the productivity of its operational services, the DSNA has negotiated with staff representatives a work organisation that optimises the management of the human resources in the ACCs and the big Approaches (Paris-CDG, Nice, Lyon). The tr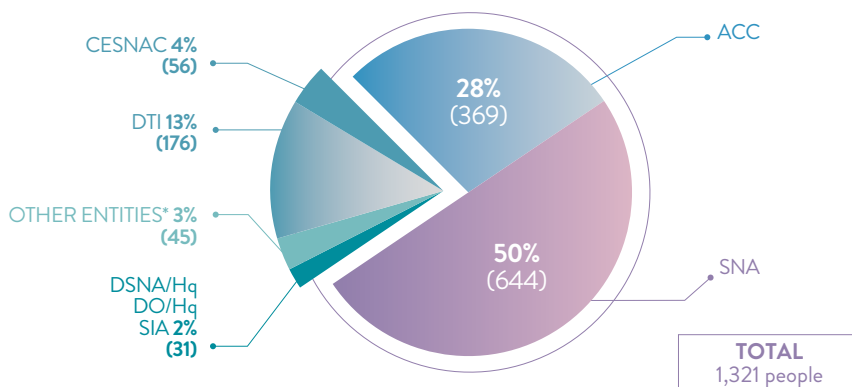ials carried out in the context of the DGAC 2016-2019 social protocol have demonstrated that these adaptations of control towers to traffic loads have led to gains in productivity and in reliability in a context in which the qualified workforce is being reduced. However, these increases have shown their limits in the face of major local variations in traffic.

Furthermore, after a decade of constant reduction of air traffic controller staff numbers, recruitment resumed with nearly 100 controllers per year (107 controllers recruited in 2019). But due to the curriculum of their training course, these personnel will only be in the operational centres from 2021 at the earliest.

The annual meeting of the overseas services at the DGAC head office in Paris.

Technical supervision at Nice- Côte d'Azur.

04

COMPETITIVENESS & **CUSTOMER** SERVICE

FINANCE

The management of finances and purchases contribute to the overall performance of the DSNA. The budget of the DSNA is established in a particular budgetary framework: the "Air traffic control and operation" appended budget (BACEA). The accounts are certified annually by an external service provider.

France has highly competitive air traffic control charges compared to Western Europe as a whole.

REVENUE AND EXPENDITURE

in 2019, the total income of the DSNA amounted to €1,659M or a fall of 1% on 2018.

This result is due to a continuous fall in fee unit rates. The route fee accounts for 81% of the DSNA's total budget. As for the fee in the terminal zone (RSTCA), the de-equalising measure introduced on 1 January 2017 reduced its rate by 24% for airports in zone 1 compared to 2016 and by 6% for zone 2.

INCOME		NUMBER OF UDS	UNIT RATE	AMOUNT
Mainland	Route charges	21,606,671	€60.81	€1,327 M ↘
	RSTCA	1,136,404	Zone 1: €172.30 Zone 2: €212.41	€215 M ↘
Overseas	Oceanic charges	419,229	€35.78	€15 M →
	RSTCA	2,811,667	€12.00	€34 M ↗
	Proceeds from air navigation charges (total)			€1,591 M
Income other than charges (sales of products and services)				€50 M ↗
Total				**€1,641 M** ↘

EXPENDITURE EXCLUDING PAYROLL	AMOUNT
Contribution to external organisations	€217 M ↘
Investments	€214 M ↘
Current operations	€194 M ↗
Total	**€625 M** ↗

Since 1 July 2019, the invoicing, collection and processing of the RSTCA's claims have been delegated to EUROCONTROL (as for the route fee). A one-stop-shop that simplifies procedures for airline companies.

For its budget outside payroll, the DSNA committed €625M. The contribution to external organisations (Météo France, EUROCONTROL, delegated airspaces, ADP group) accounts for 35% of these expenses..

To keep its services competitive, the DSNA committed €290M per year over the 2015-2019 period (RP 2). In 2019, 45% were devoted to the major technical programs preparing for the future, 46% to corrective and scalable maintenance (MCO) of existing installations and upgrades to systems and 10% to civil engineering.

Evolution of the unit rate for charges in France

Route charges:

RSTCA:
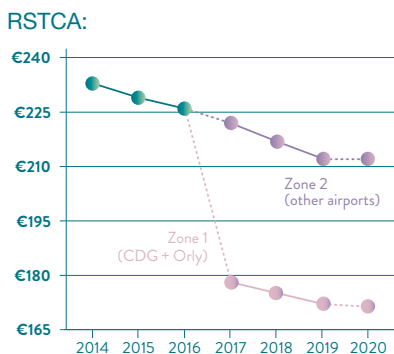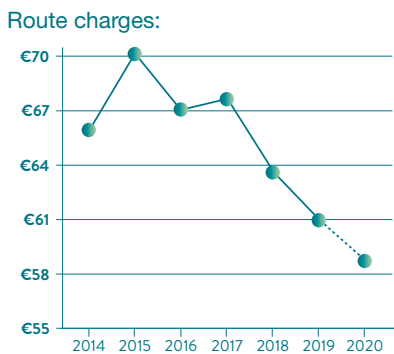
2015-2019 PERFORMANCE PLAN (RP 2)

Good governance requires transparency, effectiveness and consistency in our ability to be accountable to each of our contacts.

To continuously improve the effectiveness of our actions, the DSNA must meet performance objectives in terms of safety, capacity, environment and cost control. The DSNA's strategic plan gives a consistent overall view on the ways of achieving these objectives, by offering high-quality and competitive services to all of our users, customers and partners in a way that meets the expectations of each of them.

The DSNA steers its performance by objective and thus ensures the proper implementation of its strategy. In addition, it must meet a performance plan established at FABEC level (p. 43) with an economic section defined at national level for the reference period 2 known as RP 2.

Proceeds from air navigation charges — Revenue — Source: DSNA

€13 M
€213 M
€1 610 M
€33 M
€1,351 M

€15 M
€215 M
€1,591 M
€34 M
€1,327 M

2018
2019

MAINLAND
En-route control service fees   RSTCA

OVERSEAS
RSTCA   Oceanic charges

French flags 42%
Foreign flags 58%

French flags 14%
Foreign flags 86%

Development of the technical program of investment and corrective and scalable maintenance (MCO)

Investments and MCO (M€)

3,500,000	365
3,400,000	340
3,300,000	315
3,200,000	290
3,100,000	265
3,000,000	240
2,900,000	215
2,800,000	190
2,700,000	165
2,600,000	140

2010   2015   2019

Beauvais-Tillé airport control tower operational since 22 January 2019.
30 metres high, this new tower has an 85 m² watchtower that can house up to six control positions and one tower manager position. The investment, financed by the DSNA through charges paid by airlines, was €6M for the civil engineering and €2.5M for the technical equipment.

OUR PARTNERS TALK ABOUT THE DSNA...

The DGAC's National Airport Engineering Service (SNIA) devotes most of its resources to project studies, the building or renovation of buildings to be used by the DSNA, in mainland France and oversees. For most operations, the SNIA is the project manager of the civil engineering works .

"In 2019 the new technical blocks of Paris-Le Bourget (photo) and Avignon, and the 4-FLIGHT space at Paris ACC were delivered. 2019 was also marked by the launch of the extension of the technical blocks at Orly, Marseilles and Lille, the modernisation of the South tower of Paris-CDG, a new radar for Nice and a new AFIS tower for Wallis.

In Cayenne, the first homes were built in the renovation of the DSNA staff accommodation. In Saint-Pierre and Miquelon, the SNIA is in the design stage of the installation of an EGNOS station.

The high-level skills of the SNIA's agents perfectly meet the DSNA's highly specific needs. As the future projects will be open to teleworking organisations (*Digital Advanced Tower*), this will be a new challenge for this partnership, which began 12 years ago."

MAJOR TECHNICAL AND OPERATIONAL
ACHIEVEMENTS

Bordeaux ACC: modern and ergonomic control positions with latest-generation tools.

Brest ACC: *flight clearance given to the pilot by Data Link.*

Enhanced surveillance at Paris-CDG. *Since 9 January 2020, the controller has been able to view three key parameters of the aircraft in real time: altitude selected by crew, speed and course. This functionality has been in service in the 5 ACCs since 2018.*

GROUND-AIR DATA LINKS

"Ground-aircraft" data exchanges by digital links (CPDLC) have been available in our upper airspace since 2016, for frequency transfers between control sectors. Used increasingly frequently, they are made in the form of written messages. They automate a simple task and free up frequency time for control instructions known as "clearances". Furthermore, pilot and controller control the most appropriate moment to communicate in their task sequence, the message no longer arrives by surprise. Today, the operational improvement made by this new technology is well known.

In spring 2019, Bordeaux ACC and Brest ACC controllers passed a new milestone, being able to send direct route, flight level, course and speed clearances by Data Link. These Data Link clearances account for around one third of the Data Link messages initiated by controllers. This fourth service provides priceless support to the controller in terms of safety in the event of a crossover, wait or stormy conditions as the course of the aircraft in avoidance procedure is known. For the Reims, Paris and Marseille ACCs, the Data Link will be fully operational on the arrival of 4-FLIGHT (page 33).

For airline companies, the European regulation provides for mandatory on-board equipment as of February 2020.

Furthermore, the DSNA has confirmed its participation in the IRIS programme coordinated by INMARSAT, satellite communication operator, in cooperation with the ESSP, responsible for the operation and maintenance of the European satellite navigation system EGNOS. This programme aims to demonstrate the ability of a satellite system to provide air-ground communication services in addition to the VHF antenna (VDL mode 2) infrastructure on the ground, whose output must be sufficient to meet the needs of the air traffic of tomorrow.
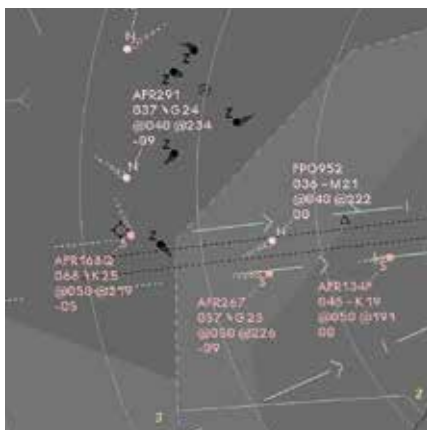
Brest ACC: *the redevelopment works on the control tower (incorporating our partners from the Ministry of the Armed Forces) and on the simulator training room with new equipment were completed in 2019. This project started in 2016 involved 200 people. It required the acquisition of 102 furniture units for the control positions, 100 x 43" control screens and the placement of 180 km of cable.*

4ME, SWIM SERVICES MULTI-APPLICATIONS PORTAL

The 4Me tool is deployed in the 5 ACCs. Originating from a SESAR Solution, it promises better integration between the pre-tactical (ATFCM) and control (ATC) phases, by offering dynamic information.

The controller can for example view arrival sequences in the big airports to apply the XMAN *(Extended AMAN) procedure,* access the *Network Manager's* data via B2B@NM and, since 2019, SWIMET services based on the data from METEO France and METEORAGE.

The 4Me services enable the information to be shared in real time, a key asset for the controller so they can get a good knowledge of their own operating environment. These services are regularly upgraded.

CDM@NCE

CDM *(Collaborative Decision Making)* is a collaborative decision-making process between all the platform's partners to enhance its performance, with advanced tools sharing operational data in real time.

After Paris-CDG and Paris-Orly, the DSNA is continuing its studies to extend the CDM to the regional airports. In 2017, Lyon-Saint Exupéry airport was labelled A-CDM.

Since 25 November 2019, Nice air traffic controllers have had a new tool (DMAN) connected to the *Network Manager* and new procedures for sequencing departing flights. A first specific implementation proved very useful in the very bad weather that hit South-east France in late 2019.

4Me: viewing of convection zones.

DMAN tool at the Nice-Côte d'Azur control tower.

Pointe-à-Pitre control tower, Le Raizet.

SATELLITE NAVIGATION

In Europe, more than 600 approach procedures (including 150 in France) based on the European satellite navigation system EGNOS are available in more than 300 airports. In early 2020, France implemented the first PBN landing procedures with turns (page 16).

PBN TRANSITION PLAN

A new European regulation on PBN *(Performance Based Navigation)* introduces a broad deployment of approach procedures in Europe by 2024 for all flight phases, in order to provide PBN operations only by 2030, with the exception of category II and III approaches. The EGNOS satellite system will be key in implementing the provisions of this regulation.

In this context, the DSNA has been working on a transition plan detailing its actions for the 2020, 2024 and 2030 deadlines. This plan explains how conventional ground navigation equipment (ILS, VOR, NDB) will be gradually rationalised to form a minimum network suitable for managing critical situations like the loss of PBN navigation on board an aircraft. In 2020, the DSNA will conduct a series of consultations with its partners, users and customers, to solidify its proposals.

THE DSNA OVERSEAS

Adaptation of the working systems and methods to the regional context, automated coordination with adjacent centres, technological development of air traffic control tools: several key challenges for the modernisation of the DSNA's ATM systems overseas.

In French Polynesia, since 21 November 2019, radar surveillance has been complemented and improved with ADS-B. This initial phase extends the service provided beyond the current coverage of the radar, while maintaining the small separations (5 NM) between aircraft.

In New Caledonia, the SNA tests the WAM *(Wide Area Multilateration)* system used for the monitoring and display of the situation in the air. The system is based on a network of 12 ADS-B beacons, installed in 2019, to enable positioning by triangulation.

In the West Indies and in Guyana, the SEAFLIGHT project, carried out by the SNA and the DTI in partnership with the Canadian manufacturer ADACEL, aims to implement an electronic stripping control system, with a groundbreaking architecture and MMI, common to the following three sites: Pointe-à-Pitre, Fort-de-France and Cayenne. With this system, airfield, approach and oceanic control services can be pro-

vided simultaneously with new-generation air traffic control support tools. The flight data posted on the controller's screen will also be more specific.

SEAFLIGHT will provide benefits in terms of the safety and fluidity of air traffic and also a better management of air traffic control charges. Its commissioning at Pointe-à-Pitre, the project's pilot site, is scheduled for the 1st half of 2021.

Assessment of a new version at the DTI with a leading air traffic controller from Pointe-à-Pitre.

OPERATIONAL-ORIENTED
CUSTOMER AND USER RELATIONS

BigSky, a multi-service MMI for flight management in TMA and at the airport. In June 2019, Paris-CDG air traffic control services designed and introduced this tool with its groundbreaking MMI, presenting a set of ATFCM and CDM services on a single screen. Connected to the B2B@NM and to the airport data, this tool facilitates decision-making for the management of arrival and departure flows, the balanced use of the four runways, operations during traffic peaks…

THE DSNA AND IATA MAKE COMMITMENTS

Affirming its commitments to its partners, the DSNA has developed with IATA, the International Air Transport Association, a collaborative decision-making process for the drafting and implementation of its air traffic control modernisation strategy in France for the benefit of the single European Sky.

▌ organisation and management of the lower airspace (upcoming environmental challenges in the Paris region, new digitalisation-related concepts);

▌ organisation and management of the upper airspace (implementation of the Free Route, optimisation of airspace management between military and civil sectors);

▌ modernisation of the systems, tools and infrastructures (transition towards the satellite system);

▌ integration of drones into air traffic.

In November 2019, the "French air traffic management strategy" was disseminated. Discussions are continuing to define an unprecedented governance responsible for managing these initiatives and coordinating any new deployments.

REGULAR MEETINGS WITH OUR CUSTOMERS

Every year, the DSNA organises national meetings at strategic (Strategy commission), operational (CDM@DSNA) and technical (Workshops on operational issues) levels covering nearly a hundred participants. These forums enable us to understand what our customers' and partners' expectations are. The potential offered by the collaborative tools was examined in depth. The companies specified their expectations such as the prioritising of certain flights.

In 2019, the agenda included the upcoming performance plan RP 3 (2020-2024), the summer results and flight management during the reconstruction of runway 3 in Orly, the impact on traffic of the 4-FLIGHT deployment phase, a standardised development of the CDM for regional airports, the new military needs in terms of airspace (ZENA project page 12).

THE DSNA@VOUS NEWSLETTER

This e-letter drawn up in English has nearly 1700 trade addressees: airline companies, general aviation users, airport operators, organisations and professional bodies.

The subject matter deals closely with our customers' operational needs. Among those tackled in 2019, some created more than 3,000 openings. We can mention the Full Data Link at Brest ACC and at Bordeaux ACC (page 27), the impact of the annual NATO "Tiger Meet" European interoperability exercises on France's Western frontage, safety (*Minimum fuel* situation and consequences for traffic, VFR/IFR cohabitation in class E), the closure of runway 3 in Orly and its consequences on operations.

Registration:
dsna-customer-bf@aviation-civile.gouv.fr

THE DSNA AND AIRPORT OPERATORS

2019 saw the signature procedure, for each of the airport's operators, and the aeronautical information protocol almost completed. For this purpose, in response to the expectation of a high number of users, the SIA trained the French and Overseas suppliers online. An extensive consultation process was also executed with the airport's operators on the future aeronautical information production system SEPIA, to which they will have access.

On the operational side, the exchanges of information concerned the improvement areas for the regional CDM and the sharing of the operating procedure in the event of massive diversions.

THE DSNA SERVING THE REGIONS

The 24-hour Le Mans car race is a world event that needs professional organisation.

To manage nearly 350 flights over four days, with a peak of departures on the Sunday after the race and a number of flights leaving towards the North to be coordinated with Paris ACC, the airport's manager called on the DSNA. Indeed, the airport flight information service (AFIS) could not absorb such a peak of activity and a traffic control service was needed. Ten or so DSNA staff were assigned. The airspace's organisation was adapted accordingly: creation of a temporary approach zone and specific arrivals and departures procedures, implementation of a flight viewing tool (IRMA), activation of SOL and LOC frequencies, opening of a runway office.

A very well-received initiative conducted by SNA West, which implements the DSNA's involvement in the economic development of the regions.
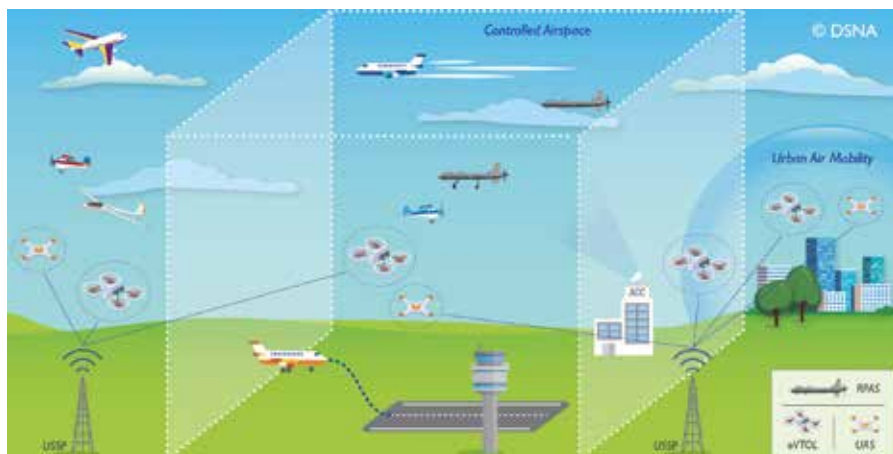
In France, 12 experimentation sites were identified to better define the operational concept of the integration of drones in controlled airspace: Bâle-Mulhouse, Clermont-Ferrand, Lille, Lorient, Lyon, Marseilles, Nice, Paris-CDG, Paris-Orly, Rennes, Strasbourg, Toulouse.

U-SPACE IN FRANCE: A COLLABORATIVE APPROACH

The DSNA is a major agent in Europe for the safe integration of drones in air traffic. On a daily basis, the DSNA accompanies drone operations by means of Géoportail and aeronautical data transmission managed by the SIA. It also carries out R&D projects with more than twenty European partners, and it has already deployed groundbreaking digital solutions in its operational bodies.

The DSNA and Defence have initiated an unprecedented request for association to build the French U-space. In November 2019, an innovation challenge was organised in Toulouse aimed at the sector's professionals. Eleven winners were selected to lead operational trials in 2020 of *Minimum Viable Product* solutions in nine airports, completing those already in progress on three sites. These trials will then be extended to new functionalities and larger airspaces. This iterative approach, also enables economically acceptable solutions to be gradually built, adapted to the real needs of this new entrant to the air traffic sector. The objective is to to define a target architecture, by 2023, aimed at a decentralised and structured solution throughout mainland France and overseas.

The DSNA actively participates in the building of the U-space operational concept within the framework of the SESAR program (page 40).

The DTI calibrates radionavigation resources on the ground with a Beech 250. In order to detect any signal emission and reliability problems of a beacon on the ground, the DTI tested the possibility of using drones to carry out in-flight controls. An initial trial measuring the Gaillac VOR was successfully held in October 2019. The DTI team trained in professional drone piloting was accompanied by an instructor from a private company.

05

INNOVATION
& TECHNOLOGY

INNOVATION & TECHNOLOGY ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||| | | | | | | | | | |

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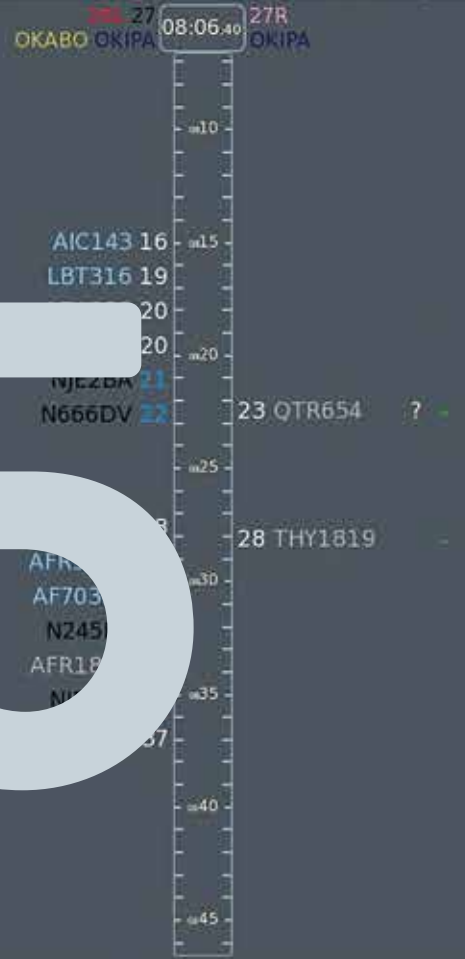
AN AMBITIOUS STRATEGY
FOR TECHNICAL MODERNISATION

THE MODERNISATION OF AIR TRAFFIC MANAGEMENT (ATM) SYSTEMS

Powered by

Coflight e**FDP**

enhanced-Flight Data Processing

THE FUTURE FLIGHT HANDLING SYSTEM

Developed by the DSNA, ENAV and Thales/Leonardo industrial consortium, the Coflight system of advanced flight data processing represents an operational and technological breakthrough. Forming the core of the DSNA's future air traffic management (ATM) system, it will allow the controller to optimise trajectories, thereby reducing fuel consumption and flight times.

At the same time, very advanced services based on the 4D Coflight trajectory have been developed: BOLT and Coflight Cloud Services (page 36).

4-FLIGHT
The Innovative ATM Solution

THE CRNA'S FUTURE AIR TRAFFIC CONTROL SYSTEM

The 4-FLIGHT program constitutes a major stake for air traffic control in France. Developed by the manufacturer Thales and the DSNA, co-financed by the European Union , it is the hub of the modernisation of the ACCs' ATM system. This stripless new-generation system incorporates the Coflight system, a sleek, user-friendly MMI, and modern flight management and safety tools.

4-FLIGHT under assessment in the control room at Marseille ACC / November 2019.

In late 2019, the program entered its operational implementation phase, scheduled for winter 2021/2022 with Reims ACC, at Marseille ACC and the CESNAC, then winter 2022/2023 at Lille ACC. The teams at Coflight closely accompany the development of the operational version of 4-FLIGHT.

Operational testing on real traffic in *shadow* mode to consolidate the tool, first large-scale training session for operational staff, assessment of the pre-operational version incorporating the management of the degraded modes, alerts and technical supervision of cybersecurity issues, continuation of the urbanisation of control room positions....All specific actions that represent a substantial investment for agents and constitute a real opportunity to get to appropriate the tool and the associated working methods.

Over 1,000 people are involved in this major program.

A transition phase complex to manage

For several years, the time it takes to deploy 4-FLIGHT in the 5 ACCs, air traffic management in France will be based on two systems: CAUTRA and 4-FLIGHT.

This coexistence requires the updating of the CAUTRA's existing hardware and software . For example, in order for the systems to dialogue with each other, the formats of the inter-centre data exchange messages must be standardised.

But managing and supervising the 4-FLIGHT and CAUTRA systems at the same time will generate a significant amount of work for our technical departments. That's why the DSNA is working to reduce the duration of this transition period to a minimum.

SYSAT
Approches et tours
technologie & performance

SYSAT, THE FUTURE AIR CONTROL SYSTEM FOR APPROACHES AND TOWERS

In addition to 4-FLIGHT, the SYSAT program, cofinanced by the European Union, aims to modernise the air traffic management systems of the mainland France approach control centres operated by the DSNA.

Big Parisian airports:

For the implementation of SYSAT on the big approaches of the Paris region (CDG/Le Bourget and Orly), a framework agreement was signed in November 2017, with the consortium SAAB/CS, SAAB supplying the control position and CS being responsible for the simulator and the installations. Three projects were launched:

▌**eTWR@ORY:** Orly Tower in electronic environment. The first works to adapt and contextualise the SAAB tool to the Orly environment have begun.
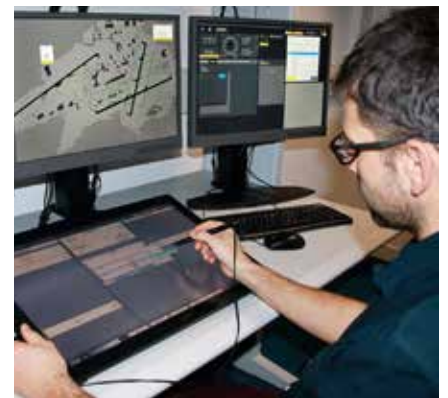
Testing of 4-FLIGHT on real traffic in *shadow* mode

Reims ACC - 18 December 2019: 22 hours local time at midnight, sixty flights were controlled with 4-FLIGHT, connected for the first time to the adjacent centres of Brest and Geneva. This test, conducted on three control positions, tested the automatic coordinations and position groupings. The operational tests (UOP), adhering to safety conditions enable progress to be made on the maturity of the system and validation of the working procedures. They require several months' preparation.

The success of the UOPs is a great source of motivation for the 4-FLIGHT teams.

Transforming controllers on the 4-FLIGHT simulator

Delivering quality training over two years, to nearly 350 controllers per centre and to a hundred or so maintenance engineers, while performing missions on a daily basis, is proving to be a crucial stage in the program. The lessons learned with ERATO at Brest ACC and at Bordeaux ACC are a precious asset.

The DSNA has shared the strategies it wishes to implement with its partners and customers to minimise the impact the periods of these training courses have on capacity. A cooperative process that must be continued until the system has been fully implemented!

4-FLIGHT simulator room at Paris ACC.

I **SOL@CDG:** renewal of the Ground monitoring system at CDG.

I **SIMU:** simulator development for controller transformation.

At the DTI in Toulouse, the SYSAT testing and trial platforms were installed in the new 600 m² building dedicated to this project. This modern working environment will enable effective progress to be made in analysing the technical maturity of the manufacturer's product and conducting the necessary tests.

Airports in regions:

Concerning the 69 airfields on the mainland, following a program review conducted between February and June 2019, a breakthrough scenario was recommended to take the technological developments into account.

This involves implementing a "service-oriented", open and modular architecture meeting SWIM *(System Wide Information Management)* standards enabling highly centralised data storage and processing. This scenario offers the best guarantees of durability, innovation capacity, flexibility of deployment and resource sustainability. It nevertheless entails a radical transformation of the DSNA, especially of the DTI and of the SNA's technical departments which it will be necessary to support.

The first portion of the program involves executing and delivering to the pilot sites the prototypes of the following ATMs: the new-generation ATIS (automatic terminal information service), the Generated Info MMI, the coordination of the Central Approaches/Towers, Coflight in Approach.

INCREASINGLY MATURE INNOVATIVE TECHNOLOGICAL DEVELOPMENTS

Digital Advanced Tower

The DSNA is fully committed to the digital transformation of the European ATM. It already uses these technological innovations as at Orly and is working on several concepts.

As part of the *Digital Advanced Tower* (DAT), it wishes to set up a first **Remote Tower Centre (RTC)** in France, by 2023, when the Tours military air traffic control tower is decommissioned and

thereby guarantee the continuity of the commercial activity of this regional airport. Based on an SESAR, this concept, already deployed by other European air traffic operators, aims to deliver the airport control service for several regional airports from a remote centre using high-technology digital cameras. The first trial stage is scheduled for 2022.

In 2020, the DSNA will also assess the introduction of a remote air traffic control of the "Quai du Large" urban heliport from the Cannes control body. The technological system will be supplied by the manufacturer Searidge.

Furthermore, studies are continuing for the placement of a DAT system at Saint-Pierre so that the Saint-Pierre controller, from its Tower, can control Miquelon airport. This project will further guarantee the territorial continuity of Miquelon.

IODA, an innovative interface for controlling arriving flights.

Its modern, tactile and user-friendly interface facilitates the mental representation of the situation for the user. It provides a set of innovative functionalities on the same display: forecasting of the airport's traffic load, posting of the flights on a map with the flight labels completed with the S mode, colouring of flights according to the associated time...

On the operational assessment in the second half of 2019, the flow manager (FMP) of Paris ACC and the Tower Manager at Orly had the same MMI, enabling them to better share the situation at French level. They were thus able to interact in order to effectively implement coordinated strategies for arriving flights in a degraded context (runway closed, poor weather, curfew). A new working

method that has proved highly beneficial in terms of safety, environment and capacity!

The DSNA is studying the integration of this innovation, which is the result

of several years of research, on a permanent basis as part of a global strategy to improve arrivals in the Paris region.
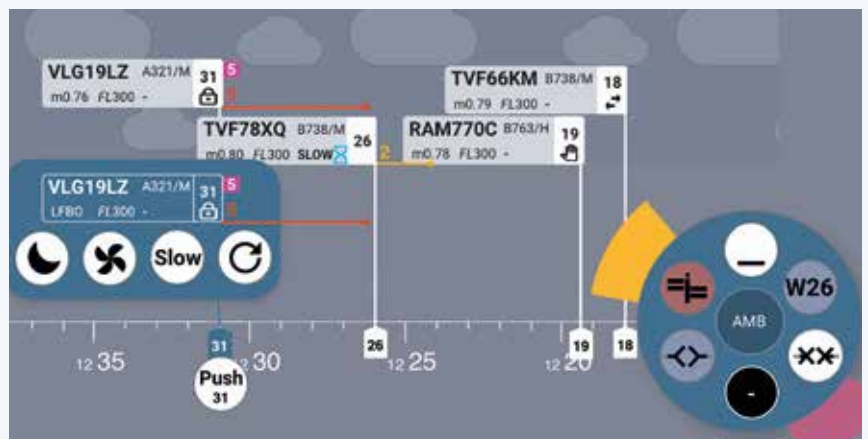
THE MODERNISATION OF COMMUNICATION, NAVIGATION AND SURVEILLANCE (CNS) SYSTEMS

The DSNA is pursuing its efforts to update its radio and telephony systems, which are critical for security, with the N-VCS project for the ACCs and Paris-CDG, the CATIA project for Approaches and the CLEOPATRE project for sites with lower levels of activity.

The N-VCS project developed in partnership with the Maastricht (MUAC) control centre continued in 2019 with a view to its deployment on the Brest ACC pilot site. The system, checked at the manufacturer Frequentis, was delivered and installed at the DTI. The back-up system, checked at the supplier CS, will be delivered and installed at the DTI in the 1st half of 2020. Alongside the technical confirmations carried out by the DTI, manufacturers are developing target software versions for the commissioning. Once all the systems have been installed at Brest ACC, the technical and operational tests will be able to start on site.

N-VCS project: DTI endurance tests on several operator positions.

The DSNA also offers air-ground communications means by Data Link and enhanced monitoring by S mode radars (page 27) and, in navigation terms, a dense network of satellite approach and departure procedures (page 29). As far as monitoring is concerned, the budget devoted to means alternative to radar (ADS-B et WAM) has been secured to support the vital upgrading of the DSNA's skills relating to these new technologies.

THE DSNA IN THE DIGITAL AGE

The European Commission has underscored the virtualisation of air traffic control technical systems as a major technological vehicle for the defragmentation of the single European Sky.

With the *Coflight Cloud Services* (CCS) project, the DSNA and skyguide are testing a pioneering initiative of the virtualised air traffic control services that are at the core of the European vision conveyed by the *Air-space Architecture Study* (page 39) and the SWIM concept: deliver, without considering the size of the air navigation operator, a high-performance remote *(cloud)* flight data service based on the Coflight product. In 2020, Paris ACC will assess, in the initial stage, the supply of services in the skyguide ATM environment for the Geneva control centre *(Virtual Center).*

CCS is a future solution for the operational needs of air navigation operators in terms of rationalisation of the infrastructure, delegation of air space and assistance.

> **ATM Awards 2019**
> The DSNA and its partners receive first prize in "Research & Innovation" for their works on the *Virtual Center*

In October 2019, the manufacturer Frequentis hosted at its registered office, in Vienna, around twenty air navigation operators and the *Network Manager* for a day's demonstration of the *Virtual Center* developed in the context of the SESAR program.

CCS successfully demonstrated the state of maturity of this concept by supplying plans of flight 3 MMI by data from remote (EUROCONTROL Brétigny, DFS Langen and skyguide Geneva). This exercise, a first at this scale, was carried out on a hundred or so flights, evidencing the feasibility of an interoperable European ATM system.

Coflight: flight trajectories in 4D

Landing at Toulouse airport.

INNOVATION & TECHNOLOGY |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||| | | | | | | | |

37

ARTIFICIAL INTELLIGENCE SERVING CAPACITY

The SINAPS *(SWIM Integrated Network management and extended ATC Planning Services)* project aims to develop a tool to aid decision-making for the room manager and the flow manager (FMP) in Paris to optimise the configuration of the centre's string of en-route control sectors, throughout the day. Indeed, this configuration must be dynamically adapted to the growth in traffic and to the resources available.

Developed by the DSNA in partnership with ONERA (French Aerospace Studies and Research Office) as part of the SESAR programme, SINAPS is a real example of the advanced use of artificial intelligence in air traffic management (ATM). It is fully commensurate with with the European *Architecture Airspace Study* vision and the recommendations of the "Fly Ai : demystifying and accelerating Artificial Intelligence (AI) in Aviation ATM" submitted to the European Commission in March 2020. SINAPS uses groundbreaking algorithms based on artificial intelligence methods, both symbolic and in automatic learning *(Machine Learning).*

This project, in the development phase, enables the DSNA to appropriate artificial intelligence techniques by adapting them to the operational requirements. A room test in *shadow* mode was successfully performed during the second half of 2019 at Bordeaux ACC to consolidate the tool and the concept, and better specify the operational benefits obtained in terms of time saved, contribution to decision-making and capacity optimization.

In 2020, the tests will continue at Bordeaux ACC and will be extended with the participation of Brest ACC.

Bordeaux ACC: optimisation throughout the day of the configuration of the control sectors according to traffic characteristics.

AN INTEGRATED DATA AND DIGITAL SERVICES STRATEGY

The **Information Management** challenges for the DSNA are various: digital management of aeronautical information (AIM), SWIM, emergence of the role of *ATM Data Services Provider,* virtual ATM *(Digital Advanced Tower, Coflight Cloud Services).* The DSNA also subscribes to the Government's digital transformation strategy, which plans to open up public data **(Open Data).** In this context, the DSNA is gradually building an integrated data and digital services strategy *(Information Management)* to take these challenges into account as a whole.

Digitalisation is thus allowing the DSNA to further enhance its information, whether it be documents, data or software source codes, which also contributes to improving the quality of its service. Thanks to the opportunities provided by mass data processing technologies **(Big Data),** this information is a reservoir for the improvement of our overall performance, providing better measuring, analysis and study capacity. This strategy is also especially important in the framework of our partnerships and in the context of Single European Sky projects, which are increasingly based on data exchange.

In terms of *Open Data,* a "Governance of the Intangible Assets of the DSNA" working group has been set up to specify our information governance strategy according to its degree of confidentiality, and in the same way our protection regarding safety, security and intellectual property issues.

Improving the environmental performance of flights by means of Big Data.
The FEAT (Flight Efficiency Analysis Tool) project aims to use the flight data and its context using Big Data technologies in order to improve the analysis and coordination of flights' environmental performance. The first application produced in the context of this project will enable on-line viewing of all air traffic controlled by the DSNA and follow-up of all French district overflight indicators, refreshed daily.

06

THE SINGLE
EUROPEAN SKY

THE **SESAR** PROGRAM

World ATM Congress 2019 / DSNA Stand: presentation of the xStream project, voted best ATM project of the year 2019.

The SESAR program, the technological pillar of the Single European Sky, aims to modernise Europe's air traffic management (ATM) system by developing new operational concepts in a new-generation technological environment with coordinated standards. As part of this, DSNA is pursuing seven key strategic objectives:

❶ **Safeguard its strategic, industrial choices.**

❷ **Define the measures needed to implement Free Route in a high-density airspace.**

❸ **Promote its operational concepts based on close integration between the pre-tactical phase (ATFCM) and control (ATC).**

❹ **Participate in the development of solutions for optimisation of flights arriving at saturated airports.**

❺ **Develop the Virtual Centre service offering as part of Coflight Cloud Services.**

❻ **Optimise trajectory management thanks to the interoperability of technical systems and data from aircraft.**

❼ **Incorporate drones in IFR traffic and develop management solutions for their operation in the airspace (U-Space).**

In March 2019, the SESAR JU submitted to the European Commission the study of a new airspace architecture in Europe, *Airspace Architecture Study (AAS)* to tackle the increase in air traffic delays. This study, basically oriented at en-route control, provides an insight into the organisation of the Single European Sky, taking modern technologies and SESAR solutions into account. It is divided into three steps: deployment of cross-border *Free Route* spaces in 2025, virtualisation of services in 2030, and *Trajectory Based Operations* in 2035.

In 2019, the DSNA participated in drawing up a plan for the transition towards this future Space architecture and making this coherent with the *European ATM Master Plan.* The 2020 version of this plan gives a route map with guidelines on Research & Innovation and Deployment.

RESEARCH & INNOVATION (SESAR 2020)

This second development phase, launched at the end of 2016, forms part of the "Horizon 2020" European programme, which groups together European Union funding for Research and Innovation (R&I). Provided with €585 million, it is able to keep work on the ATM going until 2024.

Following the first RFQ, the DSNA, along with the ENAC, the ONERA, Météo France and SAFRAN, was selected for 21 projets for an amount of €14 M over the period 2016-2020. The DSNA was involved in:

❙ approving 32 new SESAR solutions (DSNA leader for *SAFE* projects assessing various ground and boundary safety nets for security on the ground and around the airport, and ToBeFree on the cross-border *Free Route);*

❙ three cross-disciplinary projects;

❙ the assessment of four large-scale projects (DSNA leader for the *xStream* project)

This contribution revolves around the following areas: trajectory, air traffic flow and capacity management (ATFCM), Free Routing, air traffic control tools, optimised arrival management, airport security, Virtual Centre and traffic management with drones.

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40

RESEARCH & INNOVATION (SESAR 2020)
### THE MAIN PROJECTS THE DSNA WAS INVOLVED IN 2019

TO ENSURE HIGHLY EFFICIENT AIRPORT OPERATIONS

Increased Runway and Airport Throughput / Integrated Surface Management / Airport Safety Nets / Integrated Airport Operations (IAO)

These three projects propose groundbreaking improvements in terms of taxiing efficiency and safety on the ground with results serving the SYSAT programme.

Augmented Approaches to Land (AAL 2)

Demonstrations of landing procedures at Le Bourget using an augmented vision system with visibility on the runway of just 400 metres.
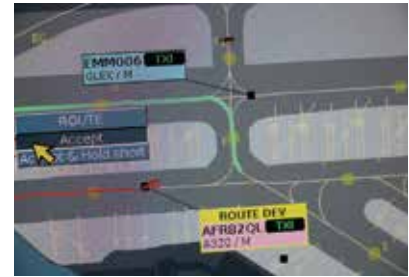
IAO project: the controller is warned that the flight has not taken the right taxiway (page 41).

TO OPTIMIZE THE SERVICES AND MANAGEMENT OF AIR TRAFFIC CONTROL

Network Collaborative Management

Demonstrations of the implementation of the CAP *(Collaborative Advanced Planning)* concept, extended with ENAIRE, DFS and the *Network Manager* (N-CAP), negotiation with the airline companies of proposals of flight plan modifications via the CDM@DSNA portal.

Optimised Airspace Users Operations

Improvement of the CDM process through the sharing of information between air navigation operators (FMP), *Network Manager* and airline companies.

Dynamic and Optimised Airspace Configurations

SINAPS project based on artificial intelligence (page 37).

Advanced Dynamic Capacity Balancing

SALTO 2020: an innovative tool to better assess the controller's load and facilitate the selection of traffic regulation measures (ATFCM).
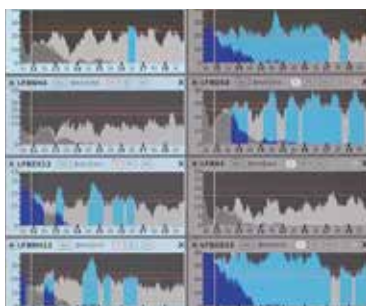
TO MODERNIZE AIR TRAFFIC SERVICES

Enhanced Arrival and Departure

Testing at EUROCONTROL Brétigny of "PBN to ILS" procedures at Paris-CDG, with the integration of aircraft on-board and 4D capacities, in the arrival sequencing (page 17).

ToBeFREE

Delivery of the SESAR for the cross-border *Free Route* in high-density traffic environments and in lower airspaces.

Separation Management / Enhanced Air Ground Safety Nets

Demonstrations of new separation and anti-collision management tools, with integration of drones in IFR traffic.

xStream (page 17)

From March to June 2019, Paris ACC conducted an operational assessment on the arrivals flows to Paris-CDG coming from the Northeast, in coordination with the Maastricht and Karlsruhe control centres.

TO INTRODUCE A BASE OF INNOVATIVE COMMUNICATIONS AND NAVIGATION TECHNOLOGIES

Interoperability (IOP)

Success of the first Interoperability of ground-ground systems" exercise 41).

Common Services and Virtual Center

Validation exercises demonstrating that this innovative architecture will enable optimum and flexible management of the airspace by distributing the traffic loads between control sectors, with better service continuity (page 36).

Global Satellite Navigation System

Defining of an operations concept compatible with both the current satellite system (GNSS) and the future GNSS, designed to improve the authentication of the signal, its performance and the robustness in the face of ionospheric disturbances and radio interferences through use of satellite or ground magnification systems.

U-Space

The DSNA has made a great contribution to the defining of the U-space operations concept in the CORUS project to define a system that manages the drones safely at very low altitude. It also participated in the PODIUM projects in Brétigny and Rodez, and USIS in Lille. The results are used to build the French U-space (page 31).

NEW OPERATIONAL CONCEPTS

MORE EFFICIENT AND SAFER OPERATIONS ON THE GROUND

With the steady increase in air traffic, the big platforms are key elements in terms of safety on the ground. **The IAO** *(Integrated Airport Operations)* project enabled comprehensive evaluation of the new functionalities for the controller at Budapest, Hamburg and Nice airports. Their deployment is required by the European PCP regulation in 24 airports, including Paris and Nice.

For Nice-Côte d'Azur airport, three functionalities were tested on site, in April 2019, on a demonstration platform after a preparation phase conducted by the DTI with real-time simulations:

❶ Optimise the planning of ground movements and taxiing, based on ground routes that can be modified by the controller and on the calculation of the associated taxiing times.

❷ Optimise the sequencing of the pre-departures, taking the dynamic (and not static) taxiing times into account using the DMAN tool, which make take-off times more predictable, enabling engines to be started up at the last moment.

❸ Use safety nets in addition to the A-SMGCS level 2 tool (now called *Runway Monitoring and Conflict Alerting)* tool, based on electronic instructions: detect any deviation of the aircraft from the controller's instructions, detect any conflicts in the controller's clearances.

Nice-Côte d'Azur air traffic control body: *15 controllers tested this new tool on real traffic in secure mode (shadow mode). This exercise enabled us to determine the benefits provided in terms of predictability, safety and environment and the requirements of adapting to a given environment and its specifics.*

IOP: "INTEROPERABILITY OF GROUND-GROUND SYSTEMS" VALIDATION EXERCISE

Key element of the European *Architecture Airspace Study vision*, the IOP is a key element for reducing discontinuities at borders relating to the fragmentation of the European sky. Within the context of SESAR 2020, in April 2019 the DSNA and its partners carried out the first interoperability exercise for technical air navigation systems in the European airspace.

Highly complex, this exercise required the implementation of several functionalities:

▌on the one hand, a *Shared Virtual Sky* to exchange radar tracks and transfer flights between the simulators of the DSNA (France), the ENAV (Italy), sky-guide (Switzerland), Maastricht and the DFS (Germany);

▌on the other hand, the sharing of *Flight Objects* to share the view of the 4D trajectory.

Managing this complexity has been a big challenge for the manufacturers concerned: Thales (France), Indra (Spain) and Leonardo (Italy) who develop different systems, with different trajectory management logics. For the DSNA, a new Coflight *dataset had to be built to cover all airspaces of Switzerland, Maastricht, Karlsruhe, Milan and Padova, as well as Reims.*

Considering the promising results of this trial, recognised by all partners, including EUROCONTROL and the European Commission, a second validation exercise is scheduled in 2020.

The deployment of the DSNA projects co-financed at European level is based on SESAR solutions. The decade 2010 – 2019 will have been one of major technological breakthrough for the aeronautical industry.

Furthermore, the DSNA participated in 3 U-Space projects (CORUS, PODIUM and USIS) and 1 project to demonstrate landing in low visibility with enhanced vision (AAL 2). 2019 was a year marked by the closure of 21 SESAR 2020 projects with significant results and a successful contribution from the DSNA.

A overview of the results is given on page 40.

In 2019, a second RFQ was launched. The DSNA, along with the ENAC, the ONERA, SAFRAN and the ESSP, was selected for 11 projects for an amount of €9M over the period 2019-2022. The DSNA was involved in:

▮ the validation of 14 new SESAR solutions;

▮ 2 cross-disciplinary projects;

▮ the operational evaluation of 1 large-scale project.

This contribution is based on the following issues: management of the on-board trajectory sent by Data Link, trajectory prediction service, traffic flow management and dynamic airspace configuration, airspace delegation and *Virtual Center,* integration of drones (RPAS) in the IFR traffic, collaborative airport management (A-CDM), optimised management of arrivals and departures, satellite navigation, demonstration of the performances of the on-board alert systems in the airport.

DEPLOYMENT

The operational implementation of SESAR projects is subject to financial support from the *Connecting Europe Facility (CEF),* with funds of €2.5 billion.

Several functionalities originating from SESAR 1 were identified in a European regulation in 2014 called *Pilot Common Project (PCP)* with deadlines ranging from 2018 to 2026. Projects directly associated with the PCP are managed via the *SESAR Deployment Manager (SDM).* Other projects linked to the Single European Sky are managed with the INEA directly.

In the context of the deployment of the SESAR, projects , the DSNA is the leader of the "SWIM Governance" project in which 23 partners are participating (air navigation operators, airports, airline companies, meteorological information providers, military-related). The SWIM is equivalent to a European navigation intranet in Europe. In 2019, Coflight Cloud Services (p 36) was the first service to be entered in the European SWIM register. Reference documents and a guide have been drawn up to facilitate the implementation of the SWIM, in the form of a code of conduct for use of information related to "Open Data" problems or applicable principles in terms of the supply of SWIM services.
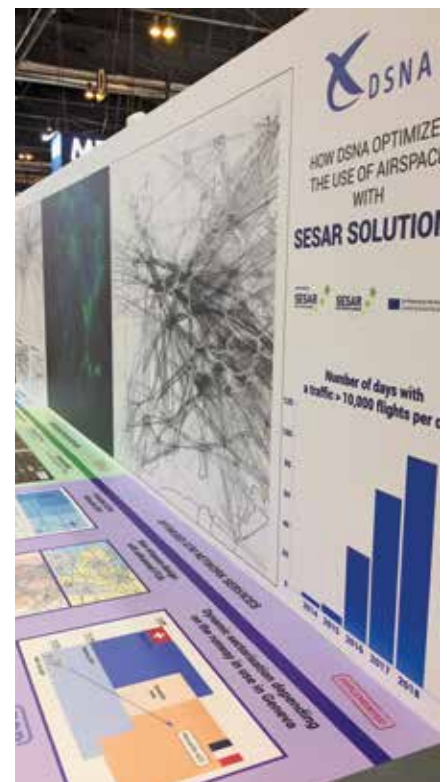
THE FAB **EUROPE CENTRAL**
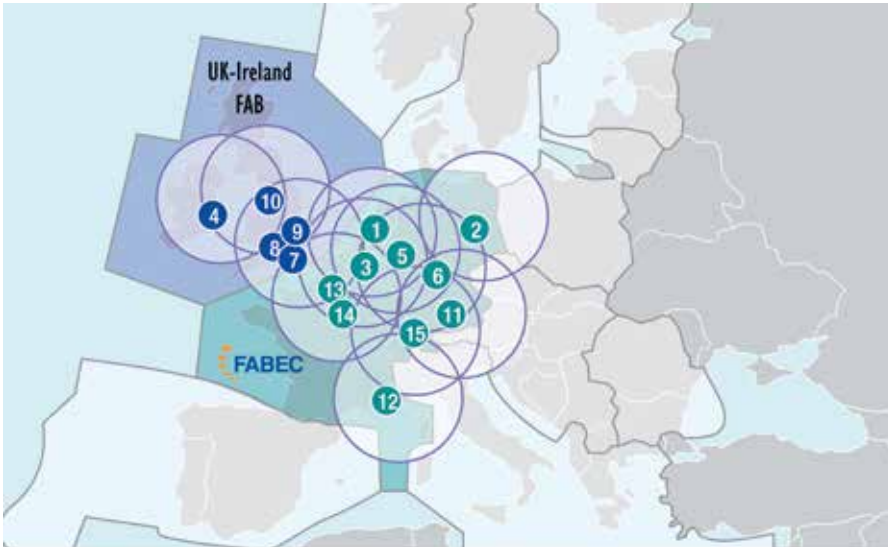
❶	Amsterdam	❺	Düsseldorf	❾	London-Stansted	⑬ Paris-CDG
❷	Berlin	❻	Frankfurt	⑩	Manchester	⑭ Paris-Orly
❸	Brussels	❼	London-Gatwick	⑪	Munich	⑮ Zurich
❹	Dublin	❽	London-Heathrow	⑫	Nice Côte-d'Azur	

ATM Excellence Award 2019 awarded to the FABEC and its partners, the NATS, Air France, Lufthansa and Swiss for the xStream (Extended AMAN) environmental project.

Extended AMAN: from here to 1 January 2024, flights destined for the 10 busiest FABEC airports and the 5 busiest FAB UK/Ireland airports, will benefit from optimised cruise management, approximately 200 NM upstream of their destination airport, thereby reducing their kerosene consumption. Certain en-route sectors in the *Core Area* may have to manage up to 10 different arrival flows!

France is involved with Germany, Switzerland, Belgium, the Netherlands and Luxembourg in the FAB Europe Central (FABEC), situated in the heart of Europe. The goal: to create a safer, more efficient airspace.

DSNA's main challenges in the FABEC are similar to those of its national strategy:

❶ **Airspace strategy: offer more direct routes in the upper airspace, promote the French model of civil-military coordination, and optimise the capacity for large European platforms such as Paris-CDG.**

❷ **Develop joint performance objectives.**

❸ **Technical systems strategy: coordinate to ensure geographical continuity and harmonisation of SESAR deployments.**

2019: PERFORMANCE OF THE FABEC AND DSNA	OBJECTIVE FABEC	COMPLETED FABEC	COMPLETED DSNA
Safety: EoSM[1] indicator			
"Safety" culture	Level C	Level C	Level D
Other objectives	Level C	Level D	Level D
Average ATFCM delay under all circumstances			
En-route	0.43 min. per flight	1.56 min. per flight	1.20 min. per flight
In terminal areas (Objective defined by the state)	0.60 min. per flight	0.92 min. per flight	0.42 min. per flight
Environment			
Horizontal Flight Efficiency (HFE)[2]	2.96%	3.33%	3.39%

1. *Efficiency of Safety Management: a compulsory Europe-wide indicator assessing the maturity of the safety management systems in air navigation service providers. Scale: level A (0%), level B (25%), level C (50%), level D (75%), level E (100%).*
2. *Horizontal Flight Efficiency: this indicator measures the difference between the length of the route actually taken and the shortest theoretical route.*

THE *FREE ROUTE*, A NEW APPROACH FOR FLYING IN THE UPPER EUROPEAN AIRSPACE

The European Single Sky PCP regulation provides for the entry into force of the *Free Route* in the airspace above FL 310 (9,500 metres) on 1 January 2022. In this controlled airspace, airline companies will be given an extensive choice in planning their routes and managing their operations, so as to meet their needs as fully as possible.

Various SESAR will support this project, such as the ToBeFree project, coordinated by the DSNA, which aims to specify and validate the implementation concept of the cross-border *Free Route Airspace (FRA)* in high-density traffic environments and in lower airspaces.

The *Free Route* airspace in the FABEC is being gradually introduced. A large number of military training flights take place in this very busy and complex airspace. Also, before implementing the *Free Route,* the FABEC's air navigation service providers have each opted for a gradual, tier-based approach, by assessing the concept in the off-peak period in areas with the least traffic. The airspace above FL 310 (9,500 metres) managed by the Maastricht control centre will be *Free Route* as of December 2019, the airspaces managed by the DFS and Skyguide will be *Free Route* by the end of 2021.

The *Free Route* airspace in Europe will become gradually cross-border as we approach 2025, according to the European airspace architecture study, published in 2019. This will imply a better management of flights' 4D trajectory, more representative than the real trajectory of the flight and of the information exchange capacities on these trajectories with the other control centres.

To meet these requirements, the DSNA will have Coflight, its latest-generation flight handling system. Through its architecture, Coflight will enable sharing of flight data and their real-time update by all the control positions concerned, whatever the centres may be.

The operational concept of **Free Route.**
In a Free Route airspace, *the pilots and companies are encouraged to plan their flight on the most direct routes. This means that the air traffic controller assigns a lot less unplanned direct routes. This traffic organisation makes traffic more fluent and improves the quality of conflict detection and resolution tools.*
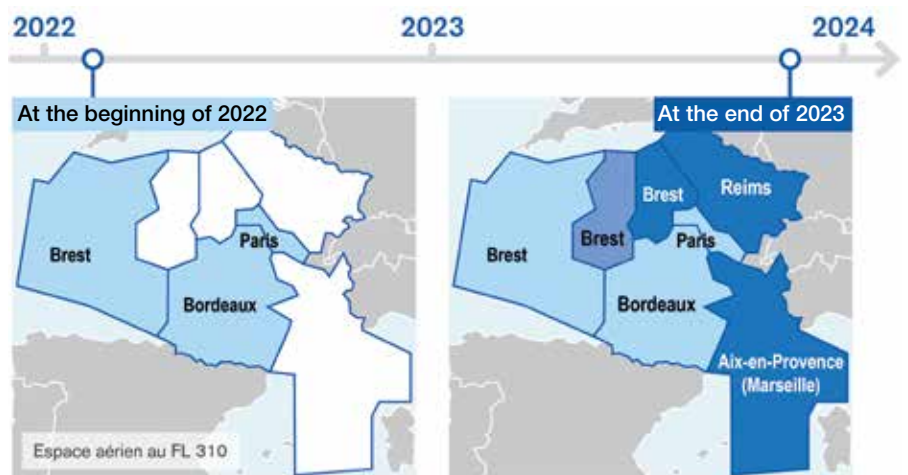
In France, the DSNA will initially offer several *Free Route* units above FL 195 (6,000 metres) with the Brest ACC, Bordeaux ACC and Paris ACC airspaces. The classic routes network in it will be withdrawn. On the civil-military coordination front, the FUA *(Flexible Use of Airspace)* concept must be deployed with the Navy and the Testing and Acceptance Traffic service (CER). *Free Route* will be widely used in France by the end of 2023.

WHAT ARE THE EXPECTED BENEFITS OF *FREE ROUTE*?

Airlines: operational efficiency *(User Preferred Route)*, improvement of the environmental impact. No need for specific on-board equipment.

Air traffic control: increase in security due to greater adherence of the route to the flight plan, improvement of the environmental impact of the route network, more stable traffic organisation. On the strategic front, the route network will also be quicker to modulate to changes in traffic flows. No need for re-sectorisations.

GLOSSARY

Pau-Pyrénées control tower in the early hours of the morning.

A

ACC
Area Control Centre

A-CDM
Airport-Collaborative Decision Making

ACNUSA
Airport Noise Control Authority

ADS
Automatic Dependent Surveillance

AIM
Aeronautical Information Management

A-SMGCS
Advanced-Surface Movement Guidance and Control System

ATCO (ICNA)
Air Traffic Control Officer

ATFCM
Air Traffic Flow and Capacity Management

ATIS
Automatic Terminal Information Service

ATM
Air Traffic Management

ATSEP (IESSA)
Air Traffic Safety Electronics Personnel

B

BOLT
Big data Operational Live Trajectory

C

CANSO
Civil Air Navigation Services Organisation

CAUTRA
Automatic air traffic coordination

CMCC
Military Coordination and Control Centre

CPDLC
Controller-Pilot Data Link Communications

D

DSAC
National Supervisory Authority

E

EGNOS
European Geostationary Navigation Overlay System

ENAC
National Academy for Civil Aviation

ERATO
En-Route Air Traffic Organiser

F

FABEC
Functional Airspace Block Europe Central

FEAT
Flight Efficiency Analysis Tool

FIS
Flight Information Sector

FL
Flight Level

FMP
Flow Management Position

I

IATA
International Air Transport Association

IFR
Instrument Flight Rules

ILS
Instrument Landing System

INEA
Innovation and Networks Executive Agency

L

LPV
Localiser Precision with Vertical guidance

N

N-VCS
New Voice Communication System

O

ONERA
The French Aerospace Lab

P

PBN
Performance Based Navigation

PCP
Pilot Common Project

R

RAT
Risk Analysis Tool

RECAT-EU
European wake vortex Recategorisation

RNAV
Area Navigation

RSTCA
Air Traffic Terminal Charge

S

SDM
SESAR Deployment Manager

SESAR
Single European Sky ATM Research

SKYGUIDE
Swiss Air Navigation Service Provider

SNA
Regional structure in charge of aerodrome and approach control

SWIM
System Wide Information Management

SYSAT
Program to modernise aerodrome and approach control systems in mainland

T

TMA
Terminal Manoeuvre Area

TSEEAC
Senior Civil Aviation Technician

V

VFR
Visual Flight Rules

W

WAC
World ATM Congress

FIND OUT **MORE**

AIR TRAFFIC

Air traffic in Europe in 2019 and variation between 2019/2018
Source: EUROCONTROL

	+1.4%	+0.2%	+0.8%	+2.5%	-0.5%	+4.5%	+0.5%
3,500,000							
3,000,000							
2,500,000							
2,000,000							
1,500,000							
1,000,000							
	FRANCE	GERMANY	UK	MAASTRICHT*	SPAIN	ITALY	SWITZERLAND
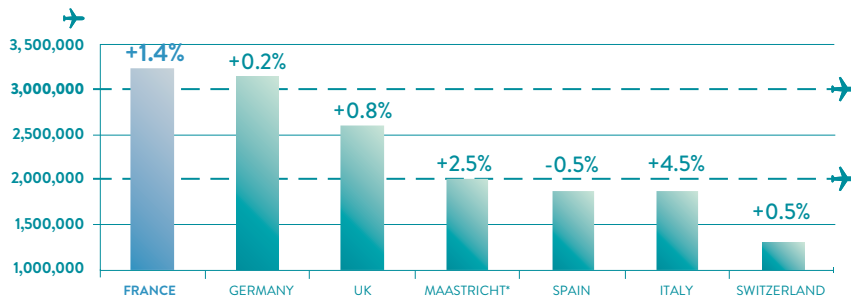
* Control centre managing the upper airspace over the Benelux and a part of Germany.

Traffic per organisation or entity in 2019 and variation between 2019/2018 —
Source : DSNA

PARIS REGION SNA	IFR			VFR		
Paris ACC	1,265,334	↗	+0.7%			
Roissy-Le Bourget	643,163	↗	+1.1%	4,077	↗	+13.9%
Orly* - General aviation	287,023	↘	-3.5%	551,517	↗	+5.5%

SOUTH-WEST REGION SNA	IFR			VFR		
Bordeaux ACC	987,491	↗	+0.3%			
SNA Southwest	167,663	↗	+2.6%	273,465	↗	+3.5%

ACC	IFR		
Marseille ACC	1,147,092	↗	+3.0%
Brest ACC	1,095,245	↗	+0.8%
Reims ACC	950,549	↘	-1.0%

MAINLAND SNA	IFR			VFR		
South-East SNA	255,549	↗	0.2%	214,165	↗	+1.0%
Centre-East SNA	215,321	↗	+1.5%	379,110	↘	-1.1%
South-South-East SNA	212,065	↗	+3.0%	391,373	↗	+2.9%
North-East SNA	180,924	↘	-1.0%	173,635	↘	-5.0%
South SNA	165,148	↗	+0.9%	238,131	↗	+1.8%
West SNA	161,290	↗	+2.2%	236,611	↘	-6.8%
North SNA	88,503	↗	+7.5%	152,803	↗	+1.7%

FRENCH OVERSEAS TERRITORIES	IFR			VFR		
West Indies-French Guyana SNA	99,101	↘	-1.7%	64,478	↘	-5.2%
Indian Ocean SNA	26,412	↘	-4.7%	26,312	↘	-11.8%
Saint-Pierre and Miquelon DSNA	2,681	↗	+20.2%	2,025	↘	-7.1%

Le Mans airport: high concentration of business aircraft during the 24-hour race.

IFR flights: aircraft operating according to the instrument flight rules (commercial flights, corporate aviation, etc.)
VFR flights: aircraft operating according to the visual flight rules (light and recreational aircraft)
* Limitation of the airport capacity (page 15).

AIR NAVIGATION SAFETY & PUBLIC SERVICE

Average delay caused by air traffic regulations — Source: DSNA

Number of flights in millions

In minutes per flight

Average ATFCM delay per flight

Breakdown of ATFCM delay volumes between airports and en-route — Source: DSNA

In minutes

1.33 min/flight

■ Approaches & Airports ■ En-route

HUMAN AND COLLECTIVE – Data excluding trainees.

Breakdown by body in 2019

Other staff
ATCO
TSEEAC
ATSEP

17% (1,238)
15% (1,078)
50% (3,717)
18% (1,321)

TOTAL
7,354 people

Changes in workforces

ATCO	3,717	4,077
ATSEP	1,321	1,398
TSEEAC	1,078	1,188
Other staff	1,238	1,324

■ 2009 ■ 2019

Age pyramid on 31 December 2019

	Age	
390	60-65 years	129
1,375	50-59 years	490
1,772	40-49 years	702
1,348	30-39 years	587
400	20-29 years	161

72%

28%

Air traffic controller at the Orly tower using the IODA tool.

DIRECTORATE FOR AIR NAVIGATION SERVICES (DSNA)

Organization chart from 1 May 2020

DIRECTOR FOR AIR NAVIGATION SERVICES
Maurice GEORGES
Deputy
Éric BRUNEAU

CABINET
Director
Didier SERRANO
Technical Advisor
François RICHARD-BÔLE

SPECIAL ADVISOR
Frédéric GUIGNIER

ADVISORS
Management of technical modernization
Damien FIGAROL
Scientific and industrial
Dominique STAMMLER
Overseas
Pascal SÉNARD

PROGRAM DIRECTORS

FABEC Robert ANTON	4-FLIGHT Yannick MESTON
SESAR Patrick SOUCHU	Coflight Guillaume RAMONET
CDM Erwan PAGE	CAUTRA/4-FLIGHT transition Stéphane RICCI
GNSS & PBN Benoît ROTURIER	SYSAT Pierre-Yvon MOAL
Innovation Stéphane CHATTY	New ATM services Antoine MARTIN
	Management information systems Franck MONTEIL

HEADQUARTERS

DIRECTORATE OF OPERATIONS (DO)
Acting Director
Éric BRUNEAU

DIRECTORATE FOR TECHNICS AND INNOVATION (DTI)
Director
Chistophe ROUQUIÉ

PLANNING AND STRATEGY SUB-DIRECTORATE (SDPS)
Sub-Director
Philippe BARNOLA
Deputy
Marc TENENBAUM
SEARCH AND RESCUE DEPARTMENT
CDT Olivier ROUQUET

HUMAN RESOURCES SUB-DIRECTORATE (SDRH)
Sub-Director
Jérôme MEYER
DEPARTMENT FOR THE MANAGEMENT OF AIR NAVIGATION TECHNICAL BODIES
Sylvain RICQ
Deputy
Christian BADOCHE
DEPARTMENT FOR THE TRAINING OF AIR NAVIGATION TECHNICAL BODIES
Gwénaël LAURAIN
COLLECTIVE MANAGEMENT DEPARTMENT
Emmanuel BOURDON

FINANCE SUB-DIRECTORATE (SDFI)
Sub-Director
Patrick ROUX
Advisors
Blande CHABROL
Marie-Christine FOURNIER
Nathalie PETIT
FEES AND MANAGEMENT CONTROL DEPARTMENT
Édouard GAUCI
Deputy
Alan HUET
DEPARTMENT FOR EXPENSES AND REVENUE EXCLUDING FEES
Édith TARTRY
Deputy
François BEDEL

MISSION FOR SAFETY, QUALITY AND SECURITY MANAGEMENT (MSQS)
Head of Mission
Loïc ROBIN
Deputy
Stéphane DEHARVENGT
Officer for security
Marc SALTON
INTERNAL AUDITING AND CERTIFICATION DIVISION
N.
REGULATORY COMPLIANCE ASSURANCE DIVISION
Pierre CHEVASSON
PERFORMANCE ASSURANCE DIVISION
Hervé FORESTIER
SYSTEMS SAFETY DIVISION
Elisabeth LEFÈBVRE

ENVIRONMENT MISSION (ME)
Head of Mission
Alain BOURGIN
Deputy
Sophie BARANES
Feedback Program Manager
Vincent BACHELIER
PARIS REGION DIVISION
Philippe TRASSART
ACTION PLAN, SERVICE QUALITY AND COMMUNICATION DIVISION
Sébastien BOMONT
ANALYSIS, METHODS AND TOOLS DIVISION
Didier MARTIN

DIRECTION DES SERVICES
DE LA NAVIGATION AÉRIENNE
50, rue Henry Farman
75015 Paris

SDRH is located at
the Athis-Mons site

DIRECTORATE OF OPERATIONS (DO)

Organization chart from 1 May 2020

DIRECTOR OF OPERATIONS
Éric BRUNEAU

Operational Deputy
Geoffroy VILLE

Paris Region Deputy
Julien PRIEUR

Resources Deputy
Antonio DI PALO

SAFETY AND PERFORMANCE DEPARTMENT
Fanny TEJEDOR
Deputy
Olivier TEYSSANDIER

AIRSPACE DEPARTMENT
René FEILLET
Deputy
Sarah DE MAZANCOURT

INFRASTRUCTURE, SYSTEMS AND TECHNICAL PLANNING DEPARTMENT
Francis BRETON
Deputy
Etienne GUÉRIN

FINANCE UNIT
Christian MIGNOT

HR UNIT
Hervé BRIAND

PARIS REGION AIRNAVIGATION SERVICES (ATHIS-MONS)
Julien PRIEUR
Deputy
Marc LE MOUEL
General Secretary
Françoise RODRIGUEZ

PARIS ACC (ATHIS-MONS)
Julien PRIEUR

PARIS-CDG AND LE BOURGET CONTROL UNITS
Guillaume BLANDEL

PARIS-ORLY CONTROL UNIT AND GENERAL AVIATION
Stéphane LE FOLL

SOUTH-WEST AIR NAVIGATION SERVICES (BORDEAUX)
Gilles PERBOST
Deputy
Estelle LE GUILCHER
General secretary
Sylvie PLACIER

BORDEAUX ACC
Gilles PERBOST

SOUTH-WEST SNA
Estelle LE GUILCHER

AERONAUTICAL INFORMATION SERVICE (SIA)
Philippe PUSSET
Deputy
Aude LE BERRE

CENTRAL AIR NAVIGATION SYSTEMS OPERATION CENTRE (CESNAC)
Antoine GRELET
Deputy
Jean BEIJARD

BREST ACC
Emmanuel JACQUEMIN

REIMS ACC
Philippe BASSOT
Deputy
Nicolas BOULAY

MARSEILLE ACC
Pierre OUTREY
Deputy
Lionel BANÈGE

WEST SNA (NANTES)
Frédéric DANTZER

NORTH SNA (LILLE)
Alexandre CROZAT

NORTH-EAST SNA (STRASBOURG)
Claude MIQUEL

CENTRE-EAST SNA (LYON)
Simon BESSE

SOUTH-EAST SNA (NICE)
Pascal AVON

SOUTH-SOUTH-EAST SNA (MARSEILLE)
Francis PREUX

SOUTH SNA (TOULOUSE)
François-Dominique DIOT

WEST INDIES-GUYANA SNA (FORT-DE-FRANCE)
Philippe VERSI

INDIAN OCEAN SNA (SAINT-DENIS)
Sabine DELPIERRE

SAINT-PIERRE-AND-MIQUELON DSNA
Benoît GOSSET

DIRECTION DES OPÉRATIONS
9 rue de Champagne
91200 Athis-Mons

DIRECTORATE FOR TECHNICS AND INNOVATION (DTI)

Organization chart from 1 May 2020

TECHNICAL AND INNOVATION DIRECTOR

Christophe ROUQUIÉ

Executive Deputy
Jean-Marc FERNANDEZ DE GRADO

Strategy and HR
Deputy
Alain POUECH

COMMUNICATION UNIT
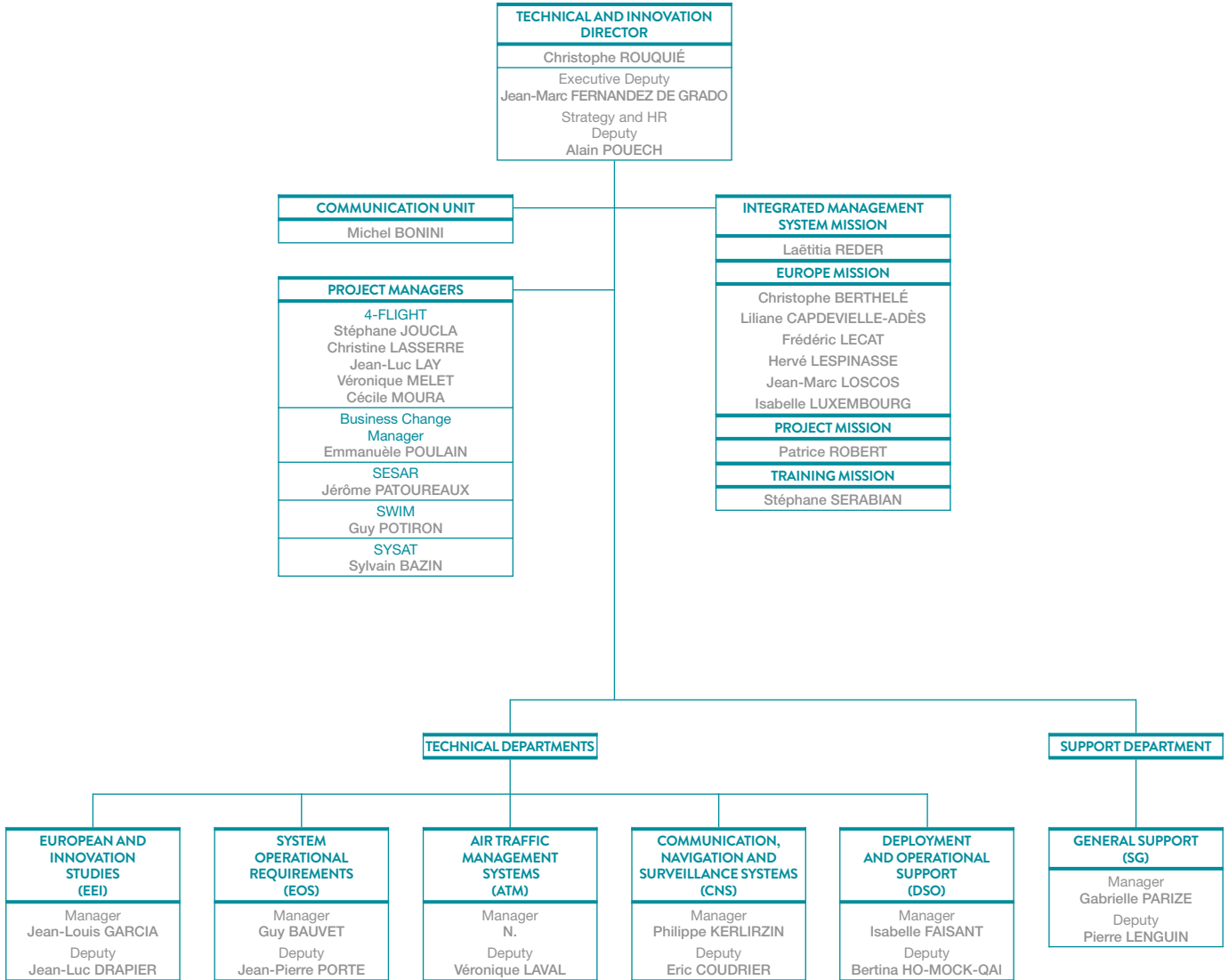
Michel BONINI

PROJECT MANAGERS

4-FLIGHT
Stéphane JOUCLA
Christine LASSERRE
Jean-Luc LAY
Véronique MELET
Cécile MOURA

Business Change
Manager
Emmanuèle POULAIN

SESAR
Jérôme PATOUREAUX

SWIM
Guy POTIRON

SYSAT
Sylvain BAZIN

INTEGRATED MANAGEMENT SYSTEM MISSION

Laëtitia REDER

EUROPE MISSION

Christophe BERTHELÉ
Liliane CAPDEVIELLE-ADÈS
Frédéric LECAT
Hervé LESPINASSE
Jean-Marc LOSCOS
Isabelle LUXEMBOURG

PROJECT MISSION

Patrice ROBERT

TRAINING MISSION

Stéphane SERABIAN

TECHNICAL DEPARTMENTS

SUPPORT DEPARTMENT

EUROPEAN AND INNOVATION STUDIES (EEI)

Manager
Jean-Louis GARCIA

Deputy
Jean-Luc DRAPIER

SYSTEM OPERATIONAL REQUIREMENTS (EOS)

Manager
Guy BAUVET

Deputy
Jean-Pierre PORTE

AIR TRAFFIC MANAGEMENT SYSTEMS (ATM)

Manager
N.

Deputy
Véronique LAVAL

COMMUNICATION, NAVIGATION AND SURVEILLANCE SYSTEMS (CNS)

Manager
Philippe KERLIRZIN

Deputy
Eric COUDRIER

DEPLOYMENT AND OPERATIONAL SUPPORT (DSO)

Manager
Isabelle FAISANT

Deputy
Bertina HO-MOCK-QAI

GENERAL SUPPORT (SG)

Manager
Gabrielle PARIZE

Deputy
Pierre LENGUIN

DIRECTION DE LA TECHNIQUE
ET DE L'INNOVATION
1, avenue du Dr Maurice Grynfogel
31000 Toulouse

French Civil Aviation Authority (DGAC)
The French Air Navigation Service Provider (DSNA)
50, rue Henry Farman
75720 Paris Cedex 15 - France

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DE LA TRANSITION
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ET SOLIDAIRE

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