

ENVIRONMENTAL REPORT

2017

French Civil Aviation Authority (DGAC)



MINISTÈRE
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The French Civil Aviation Authority's (DGAC) Environmental Report provides us with a yearly opportunity to take stock of our past actions to better prepare the future. The actions outlined in this Report are promises of innovative progress on which future aviation will be based. Aviation has always been able to push back its boundaries through R&D investments and the ensuing innovations. The sector is now a means of mass transportation and is faced with perhaps the most major challenge aviation has ever come up against: our next hurdle is the environment.

The fight against global warming is, undoubtedly, the early 21st century's primary challenge. The focus in 2017 was to not hinder the momentum set by the 191 ICAO Member States who adopted the CORSIA scheme (Carbon Offsetting and Reduction Scheme for International Aviation). CORSIA aims to attain CO₂-neutral growth emissions in global civil aviation as of 2020, despite the air transport industry growth dynamic. Major progress achieved in 2017, to which France greatly contributed within the ICAO, led to the creation of recommended CORSIA standards and practices so that this approach would apply as of January 1st, 2019. Moreover, the first standard to limit aircraft engine CO₂ emissions was signed in March 2017. Air transport is, therefore, the very first sector to adopt a global standard for propulsion engine design certification.

Future air transport will run on sustainable biofuels. Within the space of a few years, drafts have given way to the first certifications and ambitious development programs. The French Council for Civil Aeronautics Research reviewed its objectives to steer research bodies and manufacturers towards developing alternative energies to kerosene. In December 2017, the French government and aviation industrialists launched an ambitious partnership to produce French sustainable aeronautic biofuels.

Improving air quality ranks number one on the aviation sector's list of priorities. The atmospheric protection plan for the Paris region commits the air transport sector, especially airports, to reducing their environmental impact. A national air transport action plan has also been rolled out to help reduce emissions during peak pollution periods.

In terms of tackling noise, it is essential to meet and talk with local residents; the working group on night flights at Paris-Charles de Gaulle made it possible to take numerous concrete noise-reduction measures, such as continuous descents at the end of 2016, the benefits of which could be appreciated from 2017. The introduction of a system to classify light aircraft according to their sound performance index (CALIPSO) should lead to more productive talks between light aircraft users and

local residents. As part of its role as mediator, French Civil Aviation Authority departments meet with airfield operators, passengers, and local residents throughout France to promote sustainable aviation.

At a time when biologists are warning the public of a potential sixth mass extinction, the aviation sector is able to contribute to protecting and improving biodiversity. The substantial airport network provides French regions with fields and open spaces, where ordinary biodiversity takes refuge, thus contributing to its preservation. The opportunity of combining avian, and more generally animal, risk management - which is vital to aviation safety - with rational management of airport green spaces is a growing practice. In France, for example, around 15 pioneering sites have already changed their practices in order to reconcile air transport safety with the protection of local biodiversity. Efforts must be continued to convince general opinion that, according to scientific research, sustainable management of airport green spaces, is at least as effective and often superior to current practices, particularly in terms of reducing avian risks.

These examples illustrate the wealth of tools and solutions implemented by the whole aviation sector to meet current and future environmental challenges. Even though there is still much more to do and invent, the collective work achieved in recent years, combined with the sector's steadfast determination, has paved the way to undoubtedly meeting the ambitious objective of sustainable development that civil aviation has set itself.

Patrick Gandil,
Director General of Civil Aviation



04 A LOOK BACK AT 2017	S	U
M	06 INTERNATIONAL MEASURES	M
10 PREVENTING NUISANCES	A	18 REDUCE THE ENVIRONMENTAL IMPACT OF AIR TRANSPORT
R	24 INNOVATING	Y
28 GLOSSARY		

REPORT ENVIRONMENTAL

French Civil Aviation Authority [DGAC]

2017

A LOOK BACK AT 2017 THE SKY: OUR HOME TOGETHER

The environmental performance of air transport will be as decisive to its future as its performance according to economic and territorial criteria. Since the aviation stakeholders are working together to reduce emissions from aircraft, a significant step forwards was taken with the final adoption of a standard on CO₂ applicable to the new generations of aircraft, under the aegis of the International Civil Aviation Organization [ICAO]. This progress supplements the various initiatives taken by States in favor of more sustainable development of the aviation sector, whose prospects for growth remain strong.



THE INTERNATIONAL STANDARD

In the wake of the 2015 Paris Climate Change Conference agreements, and after years of efforts, on March 6, 2017, the ICAO adopted the first standard limiting CO₂ emissions from jet airplanes. As a consequence, aeronautics is the first sector to adopt a worldwide certification standard that urges manufacturers to improve the energy efficiency of their aircrafts. The standard will apply to new aircraft types from 2020.



PARIS-CHARLES-DE-GAULLE A ROADMAP FOR NIGHT FLIGHTS

The group working on night flights at Paris-Charles-de-Gaulle submitted its recommendations to a monitoring committee. The selected working priorities are "continuous descent" approach procedures, specific configurations adapted to night time slots, and informing and consulting local residents.



PREPARING FOR THE RETURN OF SUPERSONIC AIRPLANES

The experts from the French Civil Aviation Authority [DGAC] who are contributing to the ICAO's work have been looking into the noise standards for future supersonic airplanes, in readiness for their introduction in 2025. This work concentrates mainly on noise levels on take-off and landing. They are studying the development of a method to measure the "bangs" the airplanes make when they break the sound barrier.



A NATIONAL PLATFORM FOR CONSULTATION

In June and November 2017, the Collaborative Environmental Management [CEM] platform met to discuss the environmental impacts of airport and air navigation operational activities. The French Air Navigation Service Provider [DSNA] and aeronautical operators presented the actions they have taken on flight paths to reduce noise pollution and to improve the information provided to residents. Discussions will continue in 2018 to gain a firmer grasp of technological progress in the realm of the reduction of environmental impacts.



SPOTLIGHT ON FRENCH SOLUTIONS

A total of 55 airport, industry and civil aviation representatives attended the "French technologies for sustainable airports" study day, organized in the French Civil Aviation Authority's [DGAC] offices by Proavia (the French association for the promotion of airport services) and the ATC (Airport Technology Trade Association).

Paris, Nice, and Abidjan airports gave details of the outlines of their environmental policies. More than 30 French companies also presented their solutions for waste management, energy efficiency, water management, and the production of renewable energy.



THE AIR TRANSPORT SECTOR AIMS TO WIN BACK BIODIVERSITY

In 2017, air transport players continued to take action to encourage biodiversity within airport green spaces. HOP ! Biodiversity is an organization which works towards protecting airport biodiversity. It now includes Paris-Charles-de-Gaulle airport, the leading French airport in terms of traffic and size [32 km²], on its member list. The French civil aviation technical department [STAC] also made an active contribution by organizing the first technical day fully dedicated to this theme.



CONTINUED REGIONAL ACTION

Dialog is a must for major airports, as has been proven by the progress made by the working group for the Paris-Charles-de-Gaulle night flights. However, dialog is also a primary concern for the French Civil Aviation Authority departments in the local regions and numerous and varied examples of local environmental impact actions have been taken: environmental charter in Montluçon-Guéret; noise measuring campaigns in the Paris region and the French shores of Lake Geneva; improved complaints procedure in Caen -Carpignat; and numerous adoptions of noise exposure plans.



ENVIRONMENTAL REPORT

Fench Civil Aviation Authority [DGAC]

2017

INTERNATIONAL MEASURES

The international standard on CO₂ was adopted a few months after the introduction of the Carbon Offsetting and Reduction Scheme for International Aviation [CORSIA]. The implementation of these measures by aircraft manufacturers and airlines will open the way to the creation of a common carbon market. International discussions in the fields of navigation and the sharing of environmental knowledge also contribute to the significant progress made.



THE INTERNATIONAL STANDARD ON CO₂ GETS OFF TO A FAST START

The ICAO has opted to take concrete measures for the aviation sector. The organization's standard is particularly strict on the operation of wide-body aircraft [more than 60 tons] that are responsible for more than 90% of the emissions from international aviation. The aircraft ranges currently in production will be impacted as of 2023. If sufficient modifications are not made by 2028, the production of these aircraft will no longer be possible if they do not meet the regulatory requirements. The impacts of the agreement will be reinforced throughout the coming decade, requiring airlines to renew their fleets earlier.



MANUFACTURERS COME ONBOARD

Major manufacturers view the adoption of this new CO₂ standard as an opportunity to continue the progress they have already made with their new families of aircraft, rather than as a constraint. By 2020, the consumption of the A320 Neo will be 20% lower than that of the initial model. The A380, which came into service in 2007, has reduced its emissions to 40% less than the preceding generations of large wide-body aircraft.

A MODERNIZED EUROPEAN TRADING SYSTEM

Airlines operating in European Economic Area [EEA] member countries, i.e., the European Union, Norway, Iceland, and Liechtenstein, pay compensation for every ton of CO₂ emitted by aviation activities. They do this by buying an emission allowance, from which the income is reinvested in the fight against global warming. The European Emission Trading System [ETS] will be limited to internal flights inside the EEA until 2023 in order to facilitate the implementation of the CORSIA system, the global system for offsetting international aviation emissions. This reform was introduced at the end of 2017. It provides for a gradual increase of the contributions made by airlines to the ETS from 2021, because the issuing of free quotas will be reduced. Prices will be maintained by a stability reserve.



HOW DOES EMISSIONS TRADING WORK?

On March 31 of each year, the operators of French and foreign aircraft managed by France declare their CO₂ emissions for the preceding year. Their equivalent is calculated in the form of quotas by the Caisse des Dépôts et Consignations before April 30. A quota is returned for each ton of CO₂ emitted by aircraft for flights flown within the EEA. In 2017, the rate of returned quotas reached 99.98% for airlines managed by the French authorities. Only French airlines achieved a return rate of 100%.

TOWARDS A COMMON CARBON MARKET

The European Union and Switzerland signed an agreement to link their emission trading systems. This agreement resembles the first step towards a common carbon market for aviation between the two countries and should come in force as from 2021. Airlines will offset their emissions by returning quotas from either the EU or the Swiss ETS.

CORSIA: CREATING A NEW IMPETUS

In 2013, the 38th assembly of the ICAO confirmed the need to stabilize net worldwide aviation carbon emissions from 2020. At that time, the ICAO was counting on the ramp-up of low-fuel consumption technologies, the introduction of a new standard on the reduction in CO₂ emissions, the renewal of fleets and improved air navigation procedures. In view of their dissatisfaction with the progress made, the stakeholders in aviation decided to step up their efforts to combat global warming. Consequently, at the end of 2016, the 39th assembly adopted an international system for offsetting greenhouse gas emissions. The Carbon Offsetting and Reduction Scheme for International Aviation [CORSIA] proposes an initial voluntary experimental phase [2021-2026], followed by an obligatory phase [2027-2035]. A total of 70 States, representing more than 80% of worldwide aviation activity, will take part in the first phase alone.

SHARING KNOWLEDGE

CAEP PRESENT ON EVERY LEVEL

The Committee on Aviation Environmental Protection (CAEP) implements the ICAO's guidance on the environmental performance of international air transport. As a participant in the work for the 2016-2019 cycle, the French Civil Aviation Authority (DGAC) is focusing on operational noise-reduction measures, operational interdependencies or the definition of environmental indicators. The French civil aviation technical department (STAC) made an active contribution to three working groups looking into polluting emissions and ultra-fine particles, database maintenance, the production of an airport services manual, and the adaptation of the aviation sector to climate change. These works adopt the methodology for the assessment of the climate vulnerability of an airfield (VULCLIM), presented by the French Civil Aviation Authority (DGAC) at the ICAO Seminar on Green Airports in November 2017.

A FRANCO-INDIAN CURRICULUM

The French Civil Aviation Authority (DGAC) and the French School of Civil Aviation (ENAC) have been offering a master's degree in the management of air navigation services for the personnel of the Indian civil aviation authority since 2014. The French Civil Aviation Authority's (DGAC) Environment Mission hosted a session on the environmental impact of air traffic for Indian air traffic controllers for the third year in a row.

OPTIMIZATION OF AIR ROUTES CONCLUSIVE RESULTS

THE FABEC UNIVERSALLY ADOPTS DIRECT ROUTES

The air navigation service providers in the Functional Airspace Block Europe Central (FABEC) have created 1,505 direct routes since 2010. Between 2011 and 2014, the air navigation service providers from six European States (France, Germany, Belgium, Luxembourg, the Netherlands, and Switzerland) associated with the Maastricht control center, managed to reduce the average deviation between the most direct air route and the route actually followed by 12%. On the strength of this result, in 2017, they committed to a new objective of reducing this gap by a further 10% in two years, in keeping with the commitments made as part of the European Single European Sky Air Traffic Management Research (SESAR) program. FABEC contributes to reducing the environmental impact of flights, while also reducing the division of airspace.

BELGOCONTROL ADOPTS ELVIRA®.

After spending 3 years using the technical module, BELGOCONTROL has acquired the complete ELVIRA software suite that detects and precisely analyzes deviations from flight paths, unstable approaches and continuous descent approaches. The French Air Navigation Service Provider (DSNA) trained the Belgian air traffic control teams on site in September 2017.



FOCUS

INCREASINGLY ACCURATE MEASUREMENTS

The French Civil Aviation Authority (DGAC) continued to contribute to the activities of the FABEC Environment Task Force by improving its 3D flight efficiency indicator. This indicator takes into account entire flight paths and combines the horizontal and vertical aspects. The final result is expressed as a quantity and a percentage of excess fuel consumption, and thus of excess emissions. The result in 2017 was 6.51%. In 2012, it was 7.33%.



CLOSER FRANCO-SWISS COOPERATION

On December 19, 2017, Swiss and French delegations attended the first consultative meeting on cross-border environmental questions in Gex.

THE BENEFITS OF SEASONAL PLANNING

The French Civil Aviation Authority (DGAC) and the Swiss air navigation services, Skyguide, are cooperating very closely to propose more route options, in areas where the intensity of traffic flows is subject to seasonal variations. More than 100 routes, or almost 180,000 flights per year, have already been optimized. In 2017, this represented about 4,000 tons of fuel savings.

LISTENING TO THE POPULATION AROUND LAKE GENEVA

As part of the PETAL project, Skyguide has looked into alignment measures on the runway prior to ILS (Instrument Landing System) in order to limit flights over the local residents living on the shores of Lake Geneva. The impact study conducted by the French Civil Aviation Authority's (DGAC) Environment Mission demonstrated that these changes will reduce the noise perceived by the French population living in Excenevex, Messery, Nernier and Yvoire on the southern shores of Lake Geneva. This improvement applies to around 10 daily flights.



FOCUS

PROTECTING BIRD LIFE WITH SOFTWARE

At the symposium on the reduction of wildlife hazards, organized jointly by the ICAO and the ACI in Montreal, the French Civil Aviation Authority (DGAC) presented the features and the enhancements of the PICA software that analyzes avian collision data.

ENVIRONMENTAL REPORT

French Civil Aviation Authority [DGAC]

2017

PREVENTING NUISANCES

The development of sustainable aviation depends to a large extent on the optimization of air traffic. Efforts to reduce noise emissions and to protect air quality have been supplemented by innovative airport management practices and environmental partnerships. The French Civil Aviation Authority [DGAC] is multiplying its actions in these areas, while building a genuine culture of consultation with the populations living near airports.



BETTER KNOWLEDGE AND UNDERSTANDING OF AIR TRAFFIC

ALL CHANGES IN PROCEDURES ARE PRECEDED BY **IMPACT STUDIES**

The French Civil Aviation Authority [DGAC] always conducts an air traffic impact study [EICA] before publishing, creating or modifying instrument flight procedures. The air traffic impact study [EICA] is submitted to the Consultative Commission for the Environment [CCE] and the French airport pollution control authority [ACNUSA] whenever the change concerns one of France's busiest airports. In 2017, numerous studies were conducted at Beauvais, Avignon, Chambéry, Nantes, Perpignan, Rennes, Saint-Nazaire, Biarritz-Pays-Basque and Paris-Orly, mainly concerning RNAV type procedures. Complex noise, overflight and gas-emission indicators were implemented at Bordeaux and Marseille to assess impacts before and after the proposed amended procedures.

100 %

100% of the air traffic impact studies [EICA] submitted to the CCE by the French Air Navigation Service Provider [DSNA] were favorably received.



FLIGHT PATH DISPLAYS

The ENTRACT (Characteristic flight path environment) online application has been accessible on the French Ministry for an Ecological and Solidary Transition website since February 2017. ENTRACT displays the flight paths of tracked aircraft on days characterized by heavy traffic around the 11 busiest airports in France [Basel-Mulhouse, Beauvais-Tillé, Bordeaux-Mérignac, Lyon-Saint Exupéry, Marseille-Provence, Nantes-Atlantique, Nice-Côte d'Azur, Paris-Charles-de-Gaulle, Paris-Le Bourget, Paris-Orly and Toulouse-Blagnac].

VITRAIL displays flight paths in near real-time on dedicated computers in the environmental centers at Paris-Charles-de-Gaulle and Paris-Orly, and in 31 town halls. The system developed by Aéroports de Paris will soon be accessible online. The publication of flight paths on the Internet will be protected by reinforced computer networks and radar data-processing security.

PREVENTING NUISANCES WITH THE BALANCED APPROACH

NEW PROCEDURES AT LYON-SAINT-EXUPÉRY

Activity at Lyon-Saint-Exupéry increased by +7% in 2017 to more than 10 million passengers and 110,000 movements. The new balanced approach procedure was deployed in response to this sharp rise in activity and the opening of the new terminal T1B. At the same time, 25 detections of flight path deviations and excessive noise levels were also reported.

MARSEILLE, BORDEAUX, NICE...

New approach procedures that avoid flying over the north-east districts of Marseille and L'Estaque were introduced in 2016. Even if the avoidance rate has increased by 64%, more efforts must be made to universally apply satellite navigation procedures (GNSS). "Full GNSS" will be introduced at Nice on January 1, 2019. The Radius-to-Fix (fixed-radius turn) satellite procedure will be studied for departures from runway 23 at Bordeaux-Mérignac in order to limit the dispersion of flight paths. In all of these situations, the rate at which aircraft are equipped with systems which can follow the new flight paths is key to adopting these new procedures.

WHAT IS A BALANCED APPROACH?

According to the provisions of the ICAO, the balanced approach consists of identifying the sources of noise at an airport and analyzing the means of reducing the noise pollution. The approach is based on four pillars:

- > noise abatement at source by using quieter aircraft,
- > planning and managing land use,
- > operational noise abatement procedures (flight paths and aircraft handling)
- > and operational restrictions if applicable



IMPROVING PARALLEL APPROACHES

As part of the SESAR 2020 Enhanced Arrivals and Departures project, the Experimental Eurocontrol Center at Brétigny-sur-Orge and the Paris regional air navigation services are working on the improvement of the regulation of triple, parallel and simultaneous approaches that make traffic control at Paris-Charles-de-Gaulle so complex. Low-altitude, inter-axis cross-overs and movements will be reduced by separating the north and south approaches and by introducing new tailwind flight paths. This project took off in 2017, with a packed schedule of simulations in the various wind configurations and in all the arrival and departure configurations.

PERFORMANCE-BASED NAVIGATION MAKES PROGRESS

Performance-Based Navigation (PBN) is based essentially on the use of satellite systems. Work on digitalization is continuing with the national PBN procedures development plan.

The satellite-based procedure (GNSS) at Paris-Orly allows for better flight predictability and the perfect tracking of the published flight path. On December 11, 2017, when

a strong southerly wind was blowing, the Paris-Orly Regional Air Navigation Service (SNA) landed 70 airplanes using this procedure. New departure procedures have been introduced at Marseille-Provence airport to replace all the conventional procedures with low noise and visual impacts controlled.



FOCUS

TO THE NEAREST METER...

Like lateral localization, vertical satellite navigation is based on a GNSS system and a correction system (SBAS). Display on an ILS-type instrument offers a degree of precision of 1.5 meters for the lateral position and 2 meters for the vertical position.

380 000 tons

The quantity of CO₂ saved by air traffic controllers by multiplying direct routes.



AN EMERGING CULTURE OF CONSULTATION

WESTERN FRANCE AIRPORTS [AIRPORT OPERATOR] IN-DEPTH STUDIES

The redevelopment of Nantes-Atlantique airport alone puts the issues of mobility and the development of western France at the heart of the ecological transition. The French Civil Aviation Authority [DGAC] took part in the assessment of the effects of developing the airport on wetlands, on the fauna in Grand Lieu lake and on noise pollution in the Nantes conurbation. An independent company also conducted a comparative assessment of the resulting land occupation and the carbon emissions balance. From now on, as the Notre Dame des Landes airport project was canceled early 2018, all government departments must be actively involved to successfully reconcile the development of Nantes-Atlantic and the control of the nuisances it generates.

MEETINGS IN THE FIELD

The South-West Civil Aviation Safety Directorate [DSAC] met the populations living near the Biscarrosse, Ixassou, Andernos, Montluçon-Guéret and Saint-Pierre-d'Oléron airfields. The initiative produced some concrete solutions to recurrent problems by: preparing environmental charters; explaining sailplane and runway circuit activities; moving an aerobatics axis at Biscarrosse; drawing up an aerobatics environmental charter at Montluçon-Guéret; and applying dissuasive fees on banner-towing aircraft that are not based at the airfield at Andernos. Complaints stopped once latest-generation Skytec silencers and new takeoff procedures at Saint-Pierre-d'Oléron were implemented.

RESTORING DIALOG THANKS TO NOISE MEASUREMENTS

Campaigns of in situ noise measurements are an effective means of restoring dialog with local residents and politicians. Following numerous complaints, a measurements campaign at Chens-sur-Léman and Thonon-les-Bains highlighted the overflight conditions of the French bank of Lake Geneva by aircraft approaching Geneva international airport.

A similar initiative was taken at Eaubonne at the request of the elected representatives from Conflans-Sainte-Honorine and Chatou, and the ADVOCNAR residents association. In the summer of 2017, measurement stations were installed to assess the impact of the noise made by aircraft approaching Paris-Charles-de-Gaulle and Paris-Le-Bourget.

A CHARTER AND COMMITMENTS

The monitoring of the Cannes-Mandelieu charter revealed that the new altitudes introduced in March 2016 have been properly observed. Noise pollution above Roquette-sur-Siagne, where most of the complaints were concentrated, has been sharply reduced. Since the results of the noise measurements made after the VFR circuit for single-engined aircraft was raised by 200 feet were inconclusive, the South-West Civil Aviation Safety Directorate [DSAC] has launched a new campaign.

CHARTERS FOR SMALL AIRFIELD TOO

Environmental charters are not limited to airports. Areas of land with restricted activity are also concerned. By way of example, the charter for Ixassou airfield was signed in January 2017 by the town's mayor, the presidents of the sailplane center [ACBL] and of the association against nuisances caused by the Ixassou airfield [ANAI]. The 1st Navy Parachutist Infantry Regiment [RPIMa] based in Bayonne contributed to the operation.

ADDRESSING THE RISE IN THE NUMBER OF COMPLAINTS

As the numbers of aviation movements increase, complaints are spreading to hospital heliports, like the ones in Orleans and Dieppe. This increase requires additional centralized capacity to process complaints by theme. Caen is a typical example. Complaints are registered via the website and an acknowledgment of receipt is sent immediately.



NOISE EXPOSURE PLANS OR NOISE POLLUTION PLANS?

Noise exposure plans [PEB] and noise pollution plans [PGS], which are produced using the same noise measurement tools, respectively define the perimeters inside which urban development controls and housing soundproofing programs are implemented.

URBAN DEVELOPMENT TOOLS

EASIER ACCESS TO NOISE MAPS

The noise maps of the noise exposure plans [PEB] or the noise pollution plans [PGS] provide the general public with an accurate representation of noise pollution around airports. The French Civil Aviation Authority [DGAC] has signed an agreement with the Paris regional noise observatory [Bruitparif] to incorporate the data used to produce airborne noise maps in a broader repository including all the major modes of transport (road, rail, air). This information will be used by Bruitparif's RUMEUR network that provides direct access to the region's main acoustic indicators.

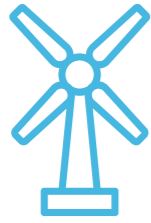
RISE IN NOISE EXPOSURE PLANS

In order to limit the number of residents who are disturbed by nuisances, noise exposure plans make it possible to manage the urban development of areas close to airfields. Noise exposure plans are urban development documents that can be enforced on third parties and are included in community and inter-community local urban development plans. Their revisions account for forecast traffic developments. From Alençon to Nantes, and from Angers to Morlaix, 27 airfields in the West Civil Aviation Safety Directorate's [DSAC] territory already have a noise exposure plan. The plan for Amboise is currently under construction. 11 of the North Civil Aviation Safety Directorate's [DSAC] 25 noise exposure plans are currently under construction or being revised. The noise exposure plan for Dijon-Longvic airfield is currently being developed on the North-East Civil Aviation Safety Directorate's [DSAC] patch.

Two new noise exposure plans in La Réunion

The noise exposure plans of both airfields in Reunion Island [Roland Garros and Saint Pierre Pierrefonds] were approved in October and March 2017. The decision followed the favorable conclusions of the CCE and a public inquiry. The feasibility of the draft noise exposure plan of Mayotte Dzaoudzi-Pamandzi airfield is currently being studied, following an initial failure in 2013.





IMPROVED COHABITATION WITH WIND FARMS

The North-East Civil Aviation Safety Directorate (DSAC) is collaborating with the French State airport engineering agency (SNIA) on numerous studies of the installation of high obstacles. The studies range from cranes and wind turbines, to measurement masts, isolated pylons, and preliminary consultations. The installation of 235-meter high wind turbines on the Civil Aviation Safety Directorate's (DSAC) territory is currently being investigated. Several wind turbine manufacturers have joined forces to improve how they coordinate their projects to install or extend existing wind farms in the vicinity of Vatry airfield.

SIMPLE INITIATIVES

Nantes-Atlantique airport has presented its commitments in favor of sustainable development for 2016-2018. The program includes safety culture development, new waste management methods, increased awareness of biodiversity and interaction with local schools. Since great oaks from little acorns grow, Caen airfield has introduced waste sorting, the recycling of working clothes by social and charitable organizations and a plan to control water and electricity consumption.

HOP! BIODIVERSITY IN AJACCIO

The national biodiversity round table took place in Ajaccio from July 5 to 7, 2017. Ajaccio-Napoléon Bonaparte airport, which belongs to the HOP ! Biodiversity organization, presented the wealth and the variety of the protected ecosystems within the airport's perimeter. They are home to some endemic species under very serious threat, including the Corsican snail (*Tyrrhenaria ceratina*) and Corsican yellow toadflax (*Linaria flava*). The airport occupies 175 hectares next to a beach, ranging from coastal scrub land to cork oak forests.

OF AIRCRAFT AND BEES

Nantes, Brest and Caen airports have installed beehives in order to colonize the airport grassland with bees. Castres-Mazamet airport has begun a grassland restoration program which helps protect pollinators and, in 2017, crops were planted to improve this ecosystem.

29 tonnes

The quantity of CO₂ saved by the French Civil Aviation Authority (DGAC) in French Polynesia, thanks to the installation of solar panels. 41 MW/h were produced in 2017.

THE FRENCH SCHOOL OF CIVIL AVIATION (ENAC) ADDRESSES THE ENVIRONMENT

The French school of civil aviation's (ENAC) mobility plan for agents and students includes five main actions:

1. A mobility diagnostic and survey of the ENAC's nine sites;
2. The promotion of car-sharing during European mobility week, in partnership with Tisséo Collectivités, the authority responsible for organizing mobility in the Toulouse conurbation;
3. The loan of numerous types of bicycles (electric, folding, etc.) for three months; the relocation of the bicycle repair workshop and the introduction of bicycle mileage allowances;
4. A presentation of the public transport network at the start of the academic year;
5. And the development of home working, starting on January 1, 2018.

The ENAC is also rolling out plans to save energy and produce renewable energy, including geothermal heating, solar panels and the optimization of air conditioning.

AIRPORTS TAKE ON BIODIVERSITY!

On October 12, 2017, the French civil aviation technical department (STAC) organized the first Airports and Biodiversity Conference. More than 100 participants from a range of business sectors with various objectives and issues at stake attended the event (airport management companies, nature conservation associations, government departments, etc.).

Air transport safety and development stakes can sometimes conflict with biodiversity conservation issues. On average, airports are comprised of more than 75% of green spaces and therefore are home to many habitats and species which need protection or are considered as heritage interest. Air transport and biodiversity are, therefore, reconcilable.

Concrete examples of actions implemented at airports have also shown that biodiversity may be protected and enhanced without compromising aviation safety, which remains a priority. However, airport biodiversity and its interaction with airport management must be assessed using a scientific approach to improve both environmental and air transport safety efficiency.

The French Civil Aviation Authority (DGAC) intends to launch a national network in 2018 to unite its services, in particular the French civil aviation technical department (STAC) and the South-East Civil Aviation Safety Directorate (DSAC), airports and environment and research partners to collaborate on reconciliation and interactions between biodiversity and airports.

OVERSEAS AIRPORTS EXEMPLARY DEVELOPMENT

THE FRENCH CIVIL AVIATION AUTHORITY (DGAC) HAS ENTERED A LONG-TERM PARTNERSHIP TO PROTECT THE FORESTS IN NEW CALEDONIA

The partnership with WWF New Caledonia has proven to be particularly effective. The French Civil Aviation Authority (DGAC) performs transportation operations on the reforestation sites and provides support for the spraying operations during periods of drought. A tank containing water and fertilizer has been placed at the organization's disposal to facilitate the watering operations on the plots of land under its protection. WWF New Caledonia has also offered to sponsor a plot that will be entirely planted and maintained by the New Caledonia DAC's agents. Logistical support was also provided for the Pandathlon, a non-profit race organized by the local WWF that raised sufficient funds to buy and plant 1,500 trees in Dumbéa provincial park.

NOUMEA-MAGENTA A VIRTUOUS TRANSFORMATION

The contracts signed to bring Noumea-Magenta airfield up to standard include a major program to create green spaces. The environmental quality of the buildings is also at the heart of the building process. The specifications were drawn up by architects at the very birth of the project according to acoustic, thermal (solar protection, insulation and natural ventilation) and visual (natural lighting) criteria. Environmentally virtuous materials and technologies have also been preferred. All the sites managed by the New Caledonia DAC, from Pouembout and Mont Doré high schools, to the Digital and Technological Center of the University of New Caledonia, are "green projects".

Protecting water resources

The wastewater from the five hangars is released into the mains network, while the rainwater from the aircraft parking aprons is treated in hydrocarbon separators, before being returned to the natural environment. These initiatives have sharply reduced discharges of effluents into the natural environment and, ultimately, into the ocean.

ALTERNATIVE FORMS OF MOBILITY IN NEW CALEDONIA

The agents working for the New Caledonia DAC always prefer car-sharing for their professional trips. Recommendations on CO₂ emissions are applied to service vehicles, which are serviced and maintained by a service provider specialized in waterless washing. Since hybrid vehicles can now be imported into New Caledonia, the DAC plans to buy four hybrids before the end of 2018.

TRIPLE CERTIFICATION FOR LA RÉUNION - ROLAND GARROS

Roland-Garros airport's triple certification for Quality, the Environment and Energy (ISO 9001, 14001 and 50001) has been renewed. An AFNOR audit is currently in progress to identify any points that can still be improved.

Staying cool without consuming water

How can temperatures be kept at a comfortable level in an airport terminal without air conditioning? The first step at the end of 2017 consisted of installing 6,000 m² of insulating material that is sufficiently efficient to reduce the interior temperature. Three ventilation chambers, measuring between 7 and 30 meters, will capture the warm air in the public hall thanks to the effect of roof wind alone. The system will be completed by installing large air fans and fitting Venetian blinds to openings in the glass facade. These measures will protect the comfort of both passengers and the airfield personnel.

TRAINING IN AIR QUALITY MEASUREMENT

The New Caledonia Civil Aviation Authority (DAC) plans to train all of its agents in BEGES greenhouse gas emission balances. The advantage of this method is that it applies to the entire airport, rather than to the aircraft alone. The communications department will produce "best practices" posters to encourage individual initiatives.



THE FIRST ARRESTOR BED IN FRANCE

Roland-Garros has become France's first airport to install a system intended to immobilize airplanes that leave the runway. Installed at the end of runway 30 in December 2017, the system supplied by Sweden's Runway Safe uses foam pellets made of recycled glass that collapse under the weight of the undercarriage and absorb the kinetic energy of an aircraft that passes the runway threshold. After Chicago and Zürich, Roland Garros has become the third airport in the world to adopt Runway Safe technology.

ENVIRONMENTAL REPORT

Fench Civil Aviation Authority [DGAC]

2017

REDUCE THE ENVIRONMENTAL IMPACT OF AIR TRANSPORT

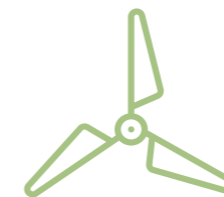
The environmental impact of air navigation can be reduced by re-examining approach and take-off procedures and adopting direct routes. Since these measures can have an immediate effect on an airport's surroundings, 2017 saw reinforced inspections and improved plans to combat air pollution.

ÎLE-DE-FRANCE INCREASED VIGILANCE

NIGHT FLIGHTS AT PARIS-CHARLES-DE-GAULLE CONCRETE MEASURES IN FAVOR OF LOCAL RESIDENTS

The committee that monitors the measures developed by the group working on night flights at Paris-Charles-de-Gaulle confirmed four priority areas of action. These actions make extensive use of the technical progress in air navigation procedures:

- > **The universal adoption** of the new continuous descent approach procedures intended to reduce noise pollution between 00:30 a.m. and 5:00 a.m..
- > **The preferential configurations** between 10:00 p.m. and 0:30 a.m. and between 5:00 a.m. and 6:00 a.m. will be maintained.
- > **Local residents will be consulted** on the relevance of the content of the electronic newsletter they receive.



OBEYING THE LEGISLATION TAKING ACTION ON EVERY FRONT

A REINFORCEMENT OF OPERATIONAL RESTRICTIONS?

Reduction at source, the acoustic performance of new-generation aircraft, measures regarding planning and the management and use of airfields, flight paths and operational procedures... European regulation No. 598/2014 requires that the foreseeable effect of all the means of reducing noise pollution caused by aviation activity be systematically examined. If, after analy-

sis, these measures are found to be inadequate in treating noise issues, operational restrictions may be considered if cost-benefit studies confirm their relevance. The process has been launched, or is currently being studied, at Saint-Exupéry and Marseille-Provence.

THE ROLE OF THE FRENCH AIRPORT POLLUTION CONTROL AUTHORITY (ACNUSA)

The ACNUSA examines breaches of operating rules and restrictions. Operators that breach night restrictions or exceed the aircraft noise thresholds are liable to pay fines of up to €40,000. Most of the observed violations concern time slots,

noise performance, low-noise flight paths or the procedures covering the use of auxiliary power units [APU] by commercial airplanes. The new method used to detect violations is now fully operational at Nantes.

243

The number of reported breaches of environmental orders at six airports and one heliport in the Île-de-France and Hauts-de-France regions (Paris-Charles-de-Gaulle, Paris-Orly, Paris-Le

Bourget, Beauvais-Tillé, Toussus-le-Noble, Pontoise-Cormeilles and Issy-les-Moulineaux), which are amongst the largest platforms in terms of traffic and nuisances.

NOISE REDUCTION

THE EXAMPLE OF THE SOUTH-EAST CIVIL AVIATION SAFETY DIRECTORATE (DSAC)

The night-time ban and operational restrictions on the noisiest aircraft have significantly reduced noise emissions around Marseille and Nice airports since 2010. The flight ban between 10:00 p.m. and 6:00 a.m. applies more particularly to certain jet aircraft with an aggregate acoustic margin below 10 EPNdB (Nice) and 13 EPNdB (Marseille). At Cannes-Mandelieu, both the noise emissions and the tonnage of the aircraft are taken into consideration. No

aircraft with a certified maximum takeoff mass greater than 35 tons can use the airport. Flight path deviations also come under close scrutiny. In April 2017, the South-East Civil Aviation Safety Directorate (DSAC) head office started using the ELIVRA application, which transfers radar data via a secure server on a daily basis and checks that flight paths adhere to aeronautical publications.

WHEN AVIATION ACTIVITY FINANCES HOUSING ENERGY RENOVATION

Every year, airlines pay a contribution to finance the French State housing agency (ANAH). When airlines buy allowances auctioned by France as part of the ETS, the proceeds are entirely donated to the ANAH, which is responsible for granting financial assistance for housing improvement works, in particular for the thermal renovation of housing.

... AND SOUNDPROOFING

The 11 main airfields - Basel-Mulhouse, Beauvais-Tillé, Bordeaux-Mérignac, Lyon-Saint-Exupéry, Marseille-Provence, Nantes-Atlantique, Nice-Côte d'Azur, Paris-Charles-de-Gaulle, Paris-Le Bourget, Paris-Orly and Toulouse-Blagnac - fall within the scope of the airport residents financial aid scheme for soundproofing. The scheme is managed by the concerned airport operators and is financed (except at Bâle-Mulhouse) by the French tax on noise pollution (TNSA). In 2017, almost 4,000 premises were granted soundproofing financing for a total which exceeded €43 M.



Key soundproofing figures:

- > **64,000 soundproofed premises** since 2004 for a total of €640 M;
- > **57,000 premises remain to be soundproofed - 49,000 of which are in the Paris region** - for an estimated total of €680 M.

CERTIFICATION AND NOISE CLASSIFICATION OF LIGHT AIRCRAFT THE RIGHT TEMPO...

In 2017, more than 500 requests for the classification of light aircraft according to their sound performance index (CALIPSO) were processed. The index makes it possible to classify light aircraft into four categories according to the noise they produce in real flight situations, particularly during runway circuits. The main goal of CALIPSO is to encourage long-term dialog between the users of light aviation and the populations living near airfields on the basis of objective data. CALIPSO also assesses the need to equip certain aircraft with exhaust silencers. Almost 900 airplanes have now been classified. The list is available on the French Ministry for an Ecological and Solidary Transition website <https://www.ecologique-solidaire.gouv.fr/calipso-classification-sonore-avions-legers>

What is EPNdB?

EPNdB stands for Effective Perceived Noise Level. This is the indicator which is used for jet aircraft certification whose noise-measurement unit is the EPNdB [Effective Perceived Noise Decibel]. It integrates auditory perception factors such as ear sensitivity levels to medium frequencies, the presence of pure sounds and the duration of the sound event, which contribute to creating sound discomfort.

204 530 €

The amount of the aid paid by the consultative committee on aid for residents to soundproof 28 housing units near Bordeaux-Mérignac airport.



200

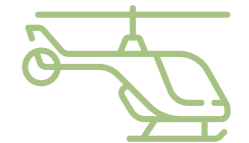
The number of aircraft added to the Noise-dB database in 2017. NoisedB, which was developed in France by the French Civil Aviation Authority (DGAC) under the aegis of the ICAO, now lists the certified noise levels of more than 12,500 public transport airplanes.

NEW RULES FOR HELICOPTERS AT SAINT-TROPEZ

Since the Saint-Tropez platform closed in 1998, helicopter flights between Cogolin, Gassin, Grimaud, Ramatuelle and Saint-Tropez have risen sharply. Aviation activity has been regulated since two official decrees were published in April and June 2017 (compulsory use of transponders, preliminary declaration of flight paths and restricted hours, etc.). The air transport police is present from June to September to ensure that the rules are obeyed and to process complaints in real time. Additional changes to the peninsula's service system will have to be planned in the near future in order to strengthen the management of summer-time nuisances.

BORDEAUX-MÉRIGNAC A PROGRAM OF LIMITED-IMPACT RAFALE FLIGHTS

In line with exportation contacts signed for Rafale, several meetings have been held between Dassault Aviation and the French Civil Aviation Authority (DGAC) to draw up a flight training program for foreign pilots at Bordeaux-Mérignac airport. In order to minimize environmental impacts, it was agreed that night and weekend flights, runway circuits and flights in formations of more than four aircraft will not be carried out at Bordeaux-Mérignac. The Works Council (CCE) meeting held on November 7, 2017 resulted in the creation of a flight sequence monitoring committee which will, however, be operated at this platform. The limited-duration program will start in 2019 and end in 2021.



COMMON REFERENCE STANDARDS TO MEASURE NOISE POLLUTION

The French Civil Aviation Authority (DGAC) is making a significant effort to mediate between users, residents living near airfields, local authorities, and aviation operators. This consultative policy is implemented largely in the permanent committees and working groups formed by the Consultative Commissions for the Environment (CCE). The solutions to the most specific questions are often found by meeting residents and local politicians. Increasingly reliable noise measurements encourage discussions on a common basis, thereby favoring the spread of a genuine culture of consultation on all sides. These measures also help to assess the benefits brought by the technical improvements made to aircraft. By way of example, the French Civil Aviation Authority (DGAC) assessed the performance of the noise-attenuation kits fitted on the fleet of A320 aircraft to the East of the Paris-Charles-de-Gaulle platform.



AIRPORT CARBON ACCREDITATION FRENCH AIRPORTS LEAD THE WAY

In 2017, 38 French airports were classified according to the four levels of Airport Carbon Accreditation (ACA) program. Nice-Côte d'Azur and Lyon-Saint Exupéry reached the program's highest level of carbon neutrality in 2016 and 2017 respectively. Sooner or later, other airports should reach the final stage of this program (Cannes-Mandelieu and Saint-Tropez and, at the end of the 2020s, Paris-CDG, Paris-Orly and Paris-Le Bourget).

Brest airport renewed its ACA in September 2017 and confirmed its commitments through an environmental charter, entitled "Taking action for the Environment" which ran from 2017 to 2019. The airport, which is already ISO 14001 certified, works every day to control the impact of its activities on the natural environment.



A PROGRAM BASED ON VOLUNTARY ACTION

The Airport Carbon Accreditation (ACA) program provides airports with a technical framework for the management and reduction of their CO₂ emissions. It is also a certification system that can be applied to both mapping and reducing emissions to ultimately lead to carbon neutrality. Based on voluntary action, this program enables airports to build a responsible environmental policy that includes soil and water quality and waste management.

CONSERVING THE ATMOSPHERE MORE EFFICIENTLY

A NEW PROTECTION PLAN FOR THE PARIS REGION

After spending much of 2017 in the development phase, the new atmospheric protection plan (PPA) for the Paris region was approved by an official decree on January 31, 2018. The protection plan sets forth the objectives and the regulatory measures, some of which are based on initiatives taken by local actors. The plan aims to return the concentration of air pollution to levels below the limits defined by the European Union for two categories of pollutants:

- > PM10 particles
- > Nitrogen dioxide (NO₂)

The protection plan contains no fewer than 46 concrete actions that can be taken easily in the fields of aviation, agriculture, industry, residential and tertiary constructions and transport. A significant improvement of air quality is expected as of 2020.



THREE CHALLENGES FACING THE AVIATION SECTOR

The French Civil Aviation Authority [DGAC] has joined the "Air Transport" working group, chaired by the French National Federation of Merchant Aviation, alongside associations of residents, the French Airport Pollution Control Authority [ACNUSA], Aéroports de Paris, the Technical Inter-professional Air Pollution Research Center [CITEPA], and AirParif.

While the associations were hoping for more ambitious proposals, the challenges assigned to the aviation sector are still significant. They mainly provide for:

1. The reduction of emissions from auxiliary power units (APU) and runway machinery,
2. The reduction of emissions when taxiing at Orly, by adopting the local departures management system that has already been in use for several years at Paris-Charles-de-Gaulle,
3. The improvement and distribution of a database containing the pollutants emitted by aircraft at the various airports in the Paris region.

POLLUTION PEAKS INCREASED VIGILANCE

As worldwide air traffic continues to grow by 5% per year, the joint actions taken by international organizations and aircraft manufacturers need to be actively taken up by the States. Each State must both ensure that new international air transport standards and EU obligations are correctly applied to reduce background air pollution, and also take action in the event of pollution peaks. In 2017, the French Civil Aviation Authority [DGAC] updated the national action plan launched by the minister responsible for civil aviation in the event of an air pollution peak. The plan provides for:

- > Tighter control of the use of auxiliary power units (APU);
- > A ban on engine tests unrelated to flights;
- > A ban on aerodrome circuit training, excluding initial training.

From now on, the launch of the plan no longer depends on criteria specific to the aviation sector: it is based on every activity sector (transport, industry, etc.).

LOCAL MEASUREMENTS IN RENNES

The measurement campaign carried out by Air Breizh, an approved air quality monitoring association for Brittany, conducted on and around Rennes airport concentrated on benzene and NO₂. The readings revealed values well below the regulatory requirements. A similar campaign took place on August 30 and September 27, 2017. The report is available on the Air Breizh website.

https://www.airbreizh.asso.fr/voy_content/uploads/2018/04/rapport_etude_2017_aeroport_rennes_v0_071217.pdf

THE SMARTSKI PROJECT EVERY POINT COUNTS...

The Center-East Regional Air Navigation Service (SNA) is reorganizing the flows into Chambéry – Aix-les-Bains airport. The precise objective is to modify arrivals from the British Isles, which represent 60% of total arrivals on the platform. An impact study by the French Civil Aviation Authority's [DGAC] Environment Mission revealed that gas emissions and fuel consumption had been cut by 1.3%.



ENVIRONMENTAL REPORT

French Civil Aviation Authority [DGAC]

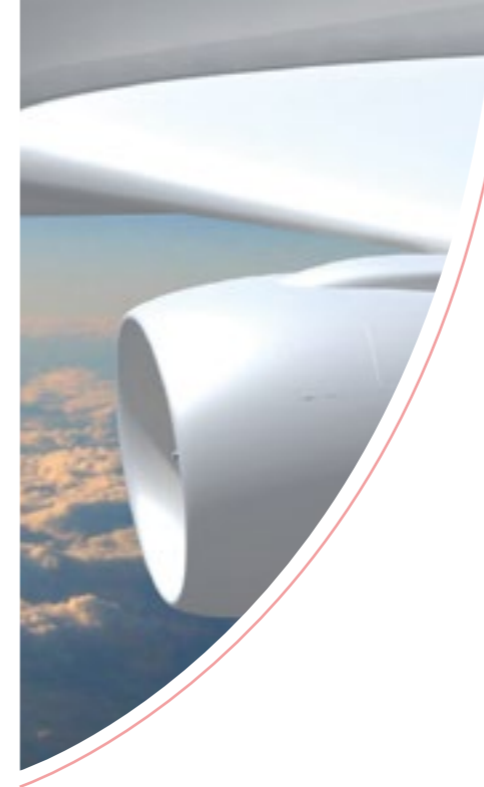
2017

INNOVATING

The aeronautics sector has made significant progress in terms of the reduction in the energy needs of commercial aircraft in less than a decade. Since the use of biofuels on a massive scale is not a realistic option in the course of the coming decade, the sector is looking into ever more efficient technical solutions, such as ultra-high dilution engines, electrical and hybrid propulsion and the use of composites. Research priorities are focused on making these innovations operational in the very short term. Innovators in the aeronautics sector can call on the new guidelines of the French Council for Civil Aeronautics Research [CORAC].

25%

The average rate of the reduction of emissions from aircraft in 15 years.



A NEW ROADMAP FOR AERONAUTICS RESEARCH

The CORAC has revised its objectives in order to effectively coordinate the efforts being made by the various research organizations and manufacturers. It is contributing to the emergence of a new generation of aircraft by consolidating technological breakthroughs and design, manufacturing and usage processes. The top three priorities defined in 2017 are:

- > **Autonomy, connectivity and operability**, which are all essential factors of the development of a connected and autonomous airplane,
- > **New development and production methods** that aim to adapt artificial intelligence technologies to aeronautics through new production, simulation and digital certification processes,
- > **The development of the optimized-energy airplane.**



THE CORAC: 10 YEARS OF INNOVATIONS

Founded in July 2008 in the wake of the Grenelle environmental round table, the French Council for Civil Aeronautics Research [CORAC], chaired by the French Minister of Transport, brings together all the French actors in the sector: industrial manufacturers, airlines, airports, as well as academic organizations, like the French national office of aerospace study and research [ONERA]. The Environmental Thematic Network [RTE] covers a broad variety of projects, from the study of condensation trails, to the reduction of aircraft consumption or the diversion of the noise from jet engines by the fins.



A LONG ROAD AHEAD FOR BIOFUELS

The activities launched in several European countries to develop sustainable aviation fuels still do not benefit from favorable regulatory conditions [CORSIA, the CO₂ standard, etc.]. While the 50 Lab Line flights, conducted in 2016 by Air France, in partnership with the French Civil Aviation Authority [DGAC], Total and Safran, demonstrated that biofuels do not diminish engine performance or flight safety; widespread deployment of bio-based fuels capable of totally replacing kerosene still faces many challenges, including economic profitability. Nevertheless, all researchers share the common goal of finding the ideal biofuel, made from renewable plant-based sources that are a part of the natural carbon cycle. The ultimate challenge consists, therefore, of harnessing sufficient biomass, but without harming plant, forest and agricultural resources. The solution could be the more extensive use of algae and the transformation of the residual gases produced by industry.

The ICAO organized the second Alternative Aviation Fuels Seminar in autumn 2017. At the close of the Seminar, the ICAO member States confirmed that they had taken the issue of the sustainability of these fuels on board. The French Civil Aviation Authority [DGAC] also took part in a national alliance of research coordination for energy working group [ANCRE] with the aim of publishing a biofuel research roadmap. In December 2017, the French government made a commitment to French sector manufacturers [Air France, Airbus, Safran, Suez and Total] by committing to Green Growth, an innovative public-private partnership to prove the feasibility of implementing sustainable aeronautical biofuels in France.

IMPROVED ENERGY MANAGEMENT WITH GENOME

The second phase of the CORAC's GENOME program was launched in 2017. The works aim to optimize onboard energy management by reducing the ratio between the installed power capacity and the average consumed power. The goal is to cut kerosene consumption (excluding propulsion) by 20%, which amounts to a 1% gain in the energy efficiency of the complete airplane.

POLLUTION PEAKS AIR IN A RIGHT STATE

Five years after publishing its report on air quality, the CORAC launched the MOSIQAA (Modeling and simulation of air quality in airport environment) project to precisely model and simulate air quality in airports, especially at times of peak pollution. This initiative is the first of its kind and is being funded in full by the French Civil Aviation Authority (DGAC).

THE ICAO

hopes to progress from 2% of sustainable fuels by 2025 to 32% around 2040.

POLLUTION MODELING AIR IN A RIGHT STATE

Five years after publishing its report on air quality, the CORAC launched the MOSIQAA (Modeling and simulation of air quality in airport environment) project to precisely model and simulate air quality in airports, especially at times of peak pollution. This pioneering approach is fully financed by the French Civil Aviation Authority (DGAC). Maximum safety during the landing and take-off phases.

MORE ECOLOGICAL DEFROSTING

The research made by the Civil Aviation Technical Department (STAC), in partnership with the CEREMA (center of research and expertise in risks, the environment and development) was presented at the Aerotech convention, an important event in the world of aeronautics innovation. It should soon be possible to optimize the use of defrosting products, while maintaining optimal safety during landing and takeoff, thanks to a prototype that measures the residual quantities.



FOCUS

REEDS WITH A DIFFERENCE

The Civil Aviation Technical Department (STAC) selects plants with high phytoremediation qualities. This technique consists of degrading the molecules in defrosting and de-icing products using the bacteria that grow around the plants' root systems. Two particularly resistant species have been identified: *Typha latifolia* and *Typha angustifolia*, which belong to the bulrush family. In situ experiments are in progress.



IS THE NOISE IN US (TOO)?

The structure of noise pollution is usually based on cognitive perception tests. Since the results are essentially interpreted on the basis of acoustic factors, the human factors are usually ignored. In 2017, the members of the CORAC's RTE-Bruit group launched actions to highlight the interactions between these two types of factors.

The goal was to model the mechanisms of noise pollution more precisely and to develop innovative techniques to offset or reduce the impacts.



CLEAN SKY TWO PROMISING STEPS FORWARDS

The European Clean Sky 2 aeronautics research program is the largest of its kind ever, bringing together almost 800 industrial manufacturers, research organizations and small and medium-sized companies. This unprecedented public-private partnership in favor of cleaner aviation, and of which the French Civil Aviation Authority (DGAC) is a member, has contributed to the progress of innovative propulsion processes, such as turbojets with unducted fans and high-dilution engines. 2017 saw two particularly conclusive demonstrations: the flight of an A340 with laminar wings, a technology that should cut CO₂ emissions by 5%, and a Safran open-rotor engine bench test.

ELECTRICALLY-PROPELLED HELICOPTERS HOW TO FLY FOR LONGER

Two years after setting the world record for the longest-ever flight by an electric helicopter, the Volta project's researchers are now striving to further increase flying time and to improve flight safety. The improved demonstrator should be able to make 50-minute flights (with a 10-minute reserve) for two people in urban environments. While the funding still has to be found, both France and Europe are already emerging as leading players in the ecological transition of air transport.

FUEL CELLS AFTER THE CAR, IS IT THE AIRPLANE'S TURN?

After more than two decades of research, and in spite of production costs that remain very high, the automotive industry is now developing the first series of hydrogen-powered cars. While electric commercial airplanes may still be a long way off, hybrid propulsion is an option worth exploring. The adaptation of the technology to the aviation sector could take the form of conventional turbojets combined with batteries or a fuel cell powered by hydrogen. Closer to home, the ENAC is one of the partners in Safran Power Unit's PIPAA project to develop a fuel cell for aeronautical applications, which is funded partly by the French Program of Investments for the Future. The initial goal consists of drastically cutting polluting and noise emissions on airports. Hydrogen-powered electric taxiing is one of the most promising applications.

LED RUNWAY LIGHTING

The technical division of the Regional Air Navigation Service (SNA) in New Caledonia is preparing to replace the current runway lights with LED lights. This process will reduce energy consumption and heat dissipation. The low-intensity lights have a lifespan of 100,000 hours.

FLIGHT EFFICIENCY BIG DATA MAKES ITS ENTRY

The French Civil Aviation Authority (DGAC) and SOPRA-STERIA have launched a Big Data project to monitor the horizontal efficiency of flights and the overflight conditions of towns in France. The first operational version of the FEAT@DSNA tool will use operational radar and flight plan data, plus the development of various scenarios. At the same time, the French Air Navigation Service Provider (DSNA) will continue to ramp up its skills by setting up a Big Data laboratory and generating synergies with the ENAC. The ultimate goal is to gain a strong command of the entire data chain.



FOCUS

THE OPEN-ROTOR ENGINES OF THE FUTURE

Open-rotor engines are a genuine technological breakthrough which aim to reduce fuel consumption by 30% to 35% compared to a conventional engine (such as the CFM56 engine) and by 10% to 15% compared to the latest generation LEAP engines. It is made up of a conventional gas generator and a turbine with contra-rotating propellers that significantly increase the quantity of displaced air. The ONERA is looking particularly closely at the reduction of the noise made by this "open" engine and aircraft safety if a blade breaks.

ENVIRONMENTAL REPORT

Fench Civil Aviation Authority [DGAC]

2017

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- A** **ACA:** Côte d'Azur's Airport
ACA: Airport Carbon Accreditation
ACI: Airport Council International
ACNUSA: French airport pollution control authority
ANAI: Association against nuisances caused by the Itxassou airfield
APU: Auxiliary Power Unit
ATC: Airport Technology Trade Association
- B** **BEGES:** Greenhouse gas emission balances
- C** **CAEP:** Committee on Aviation Environmental
CALIPSO: Classification of light aircraft according to their sound performance index
CCE: Consultative Commission for the Environment
CEM: Collaborative Environmental Management
CEREMA: Center of research and expertise in risks, the environment and development
CO₂: Carbon dioxide
CORAC: French Council for Civil Aeronautics Research
CORSIA: Carbon Offsetting and Reduction Scheme for International Aviation
CVV: Sailplane center
- D** **DGAC:** French Civil Aviation Authority
DSAC: French civil aviation safety authority
DSNA: French air navigation service provider in France
- E** **ENAC:** French school of civil aviation
EICA: Air traffic impact study
ENTRACT: Characteristic flight path environment
- F** **FABEC:** Functional Airspace Block Europe Central
- G** **GNSS:** universally apply satellite navigation procedures
- I** **ICAO:** International Civil Aviation Organization
- M** **MOSIQAA:** Modeling and simulation of air quality in airport environment
- N** **NoisedB:** ICAO database of the certified noise levels of aircraft
- O** **ONERA:** French national office of aeronautical studies and research
- P** **PBN:** Performance Based Navigation
PEB: Noise exposure plans
PIPAA: Pile à combustible pour applications
PGS: Noise pollution plans
PPA: Atmospheric protection plan
PROAVIA: The French association for the promotion of airport services
- R** **RTE:** French environment thematic network
- S** **SBAS:** Correction system
SESAR: Single European Sky ATM Research
SNA: Regional air navigation service in France
SNIA: the French State airport engineering agency
STAC: French civil aviation technical department
- V** **VULCLIM:** The French civil aviation technical department (STAC) tools available to airports so that they can measure their vulnerability to climate change.
- W** **WWF:** World Wide Fund for Nature

ENVIRONMENTAL REPORT

French Civil Aviation Authority (DGAC)

2017

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