



MINISTÈRE
CHARGÉ
DES TRANSPORTS

*Liberté
Égalité
Fraternité*



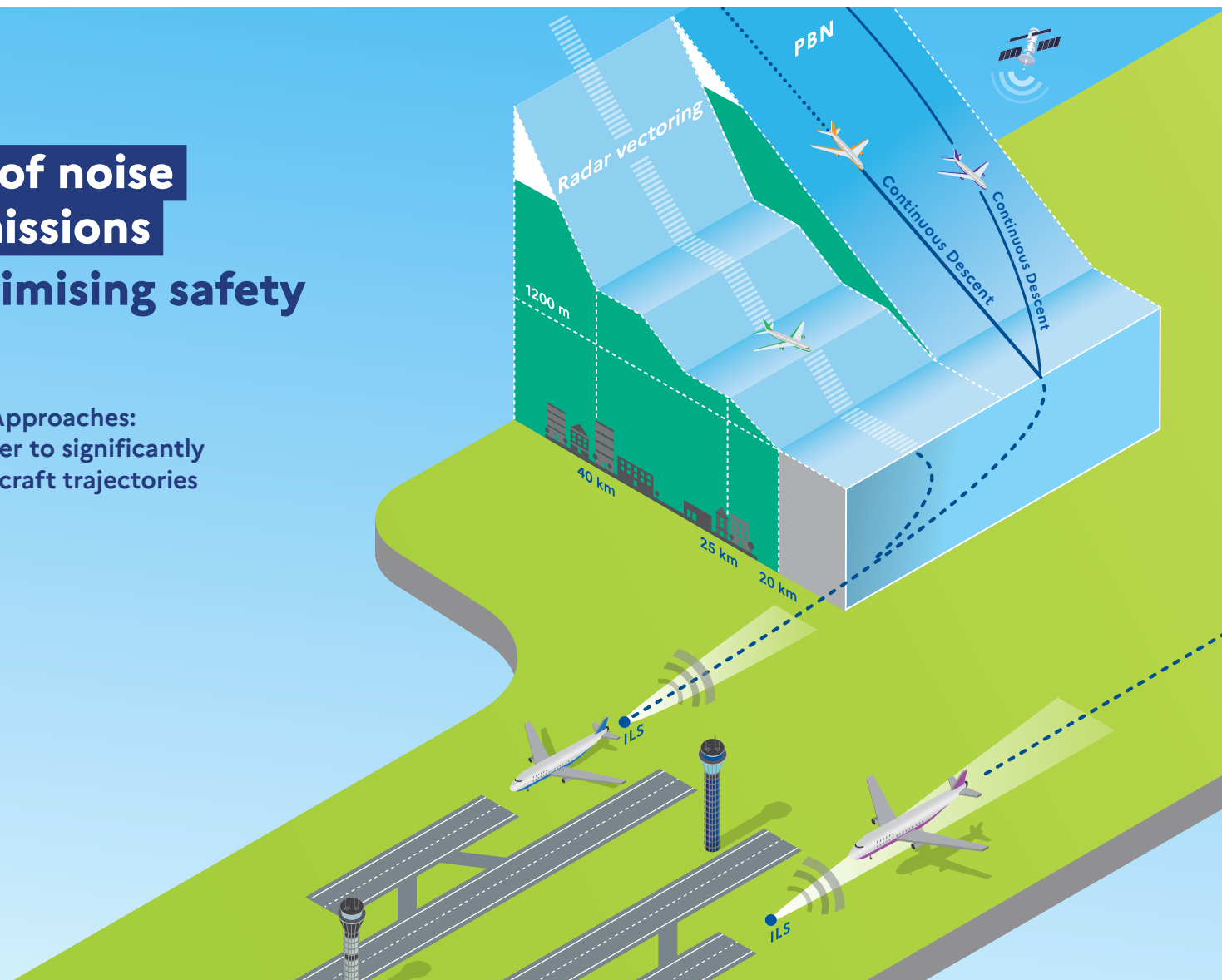
PARIS-CDG

Limiting the impact of noise and reducing gas emissions for arrivals while optimising safety

Round-the-clock Continuous Descent Approaches:
redesign of the air traffic system in order to significantly
improve vertical flight profiles, with aircraft trajectories
less spread around.



CONTINUOUS DESCENT





The global crisis brought about by the coronavirus pandemic represents definitely an incredible challenge for all partners in the aviation industry. The magnitude of the stakes is unprecedented to rebuild a new economic model of our business sector where environmental requirements will be a prerequisite for the effective restart of air transport in a sustainable manner.

With the commissioning of continuous descents for arrivals at major airports, the Government and all stakeholders have set up ambitious goals for a more environmentally-friendly air transport.

The air traffic controllers at Paris-Charles de Gaulle airport already operate specific continuous descent procedures in the heart of night by using satellite technologies. The challenge in extending this concept throughout the day, with high traffic peaks, is tied to the complexity of feeding the airport's two parallel runway pairs. This represents a particularly innovative project in Europe! An initial phase will have to demonstrate the viability of the new air traffic procedures, which will bring significant gains in terms of safety with less inter-runways crossings at low altitude, and environmental benefits by reducing noise pollution and gas emissions. Implementing this new air traffic pattern will require major changes within one of the busiest airspace in the world.

In this context of deep uncertainty, our collective resilience and forecasting capacity are our assets for the future. They must allow us to build this transition safely and to promote a 'greener' aviation on a daily basis. Thanks to their high degree of skills, all DSNA staff is committed to providing a high quality public service for a more environmentally-friendly air navigation.

Maurice GEORGES
Director of France's DSNA



A NEW AIR TRAFFIC PATTERN FOR GREENER AVIATION

On a day-to-day basis, the DSNA and its partners are very involved at Paris-CDG in the continuous improvement of environmental actions enabling an exemplary development of the platform. This collaborative work has already led to the implementation of many operational enhancements at the cutting edge of innovation. Thus, according to EUROCONTROL, amongst the three major European hubs, Paris-CDG is the one where air traffic in the terminal area is the most fluid on arrival and where taxiing time on the ground is the most optimised.

An ambitious air traffic project is currently under study: **extending continuous descent operations (CDO) all day long, thanks to the design of PBN to ILS procedures. Through this concept, inbound flights will benefit from a smoo-**

ther descent, limiting levelling off at low altitude, and aircraft trajectories will be less spread around. All aircraft landing to the airport will have to be equipped with latest generation satellite navigation systems.

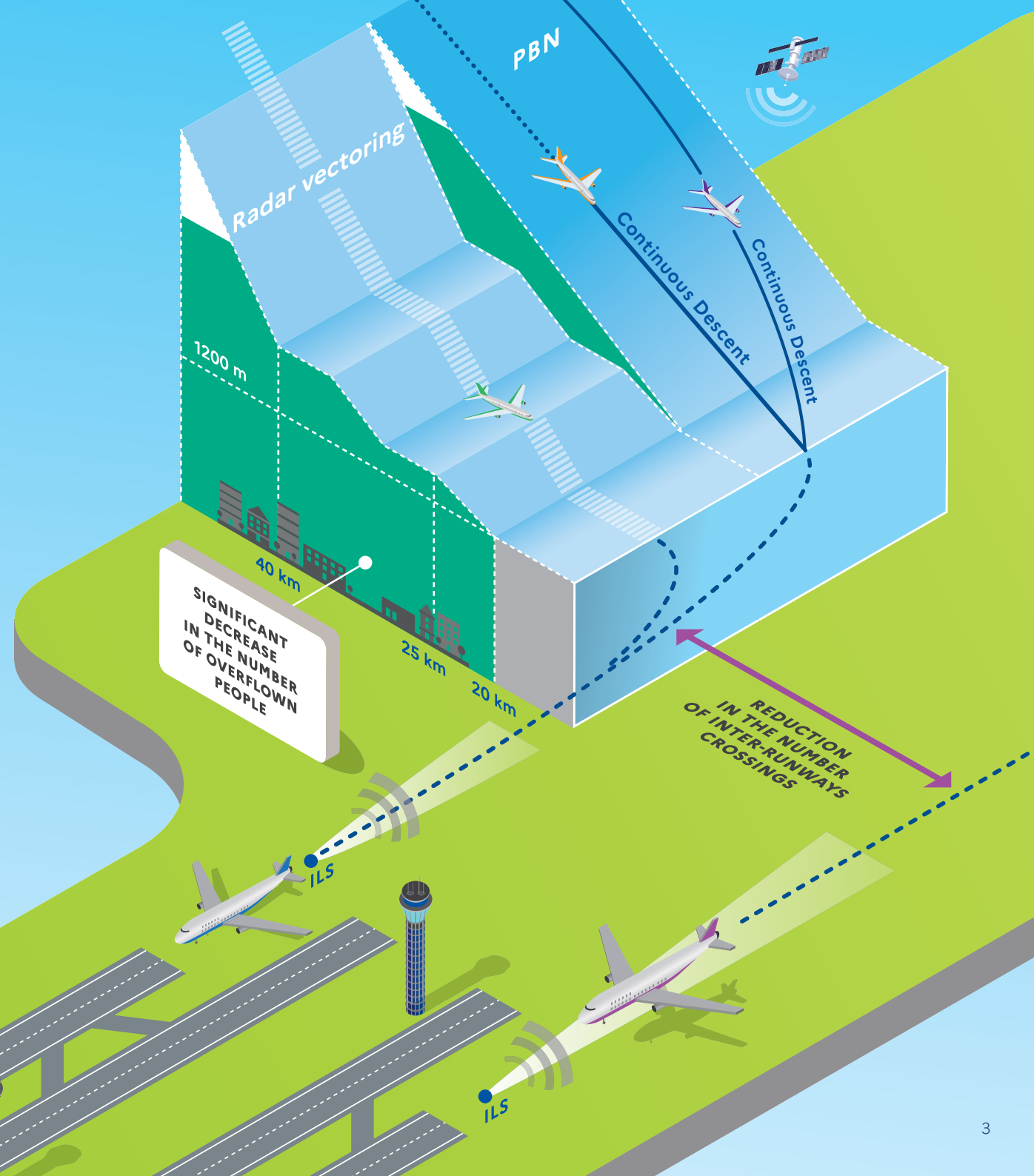
This innovative arrival procedure is the result of experiments led through the *Merge Point* concept, fitted to Paris-CDG Approach airspace specific constraints. It is based upon a SESAR solution defined as part of the Single European Sky technical modernisation programme and DSNA strong experience over Performance Based Navigation (PBN) implementation. A number of simulator sessions have been performed since 2017 at EUROCONTROL's experimental centre in Brétigny-sur-Orge to consolidate this new configuration and ensure a sufficient level of maturity.

PARIS-CDG AIRPORT

- 505,000 movements in 2019, with peaks of 73 arrivals per hour
- 76 million passengers in 2019

Along with London-Heathrow and Frankfurt airports, **Paris-CDG** is one of the busiest airports in Europe. It has two pairs of parallel runways, each pair with one runway for take-offs and the other for landings. During peak hours, one aircraft can take off every 50 seconds and another can land every 50 seconds.

Three control towers (of which one primarily manages night air traffic), assisted by two look-outs dedicated to apron management, are in operation.

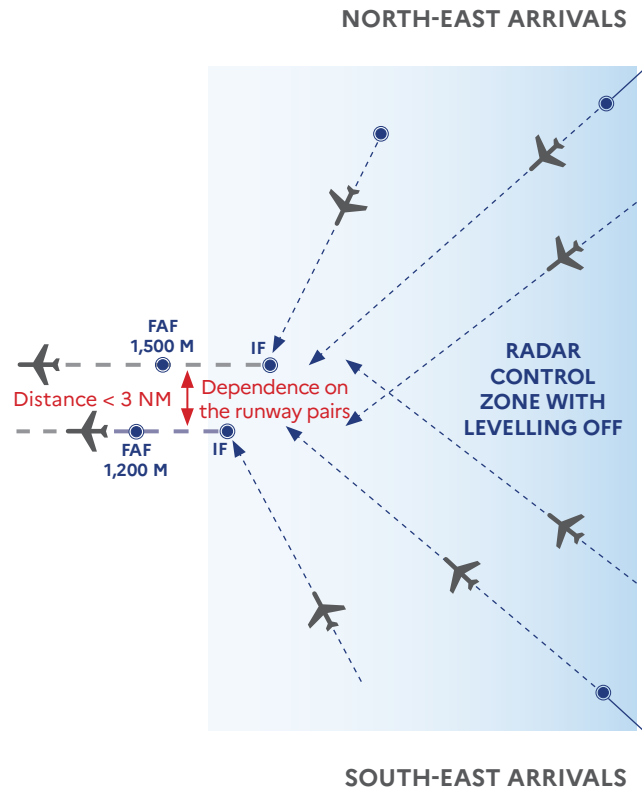


OUR PRIORITY: FLIGHT SAFETY

Before changing such a complex air traffic pattern, it is necessary to first make sure that flight safety will not be impacted. The objective is to **best prepare the landing phase by using the two pairs of runways independently during simultaneous parallel arrivals, and to reduce axis crossings at low altitude only for operational purposes.** For this, the arriving flows must be reorganised upstream: the approach controller must separate the North / South flows at around 5,000 meters above sea level, making the crossings during the downwind leg and thus, mirror the arrival and feeding procedures of the two landing runways.

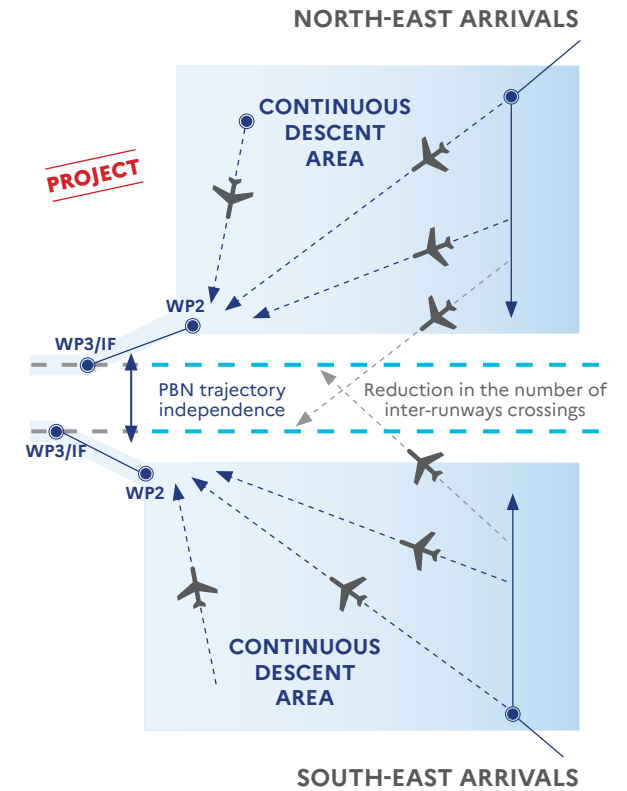


CURRENT SITUATION



Landing runway assignment takes place in the radar control area, which may require levelling off to ensure safe aircraft crossings.

THE "PBN TO ILS" PROJECT

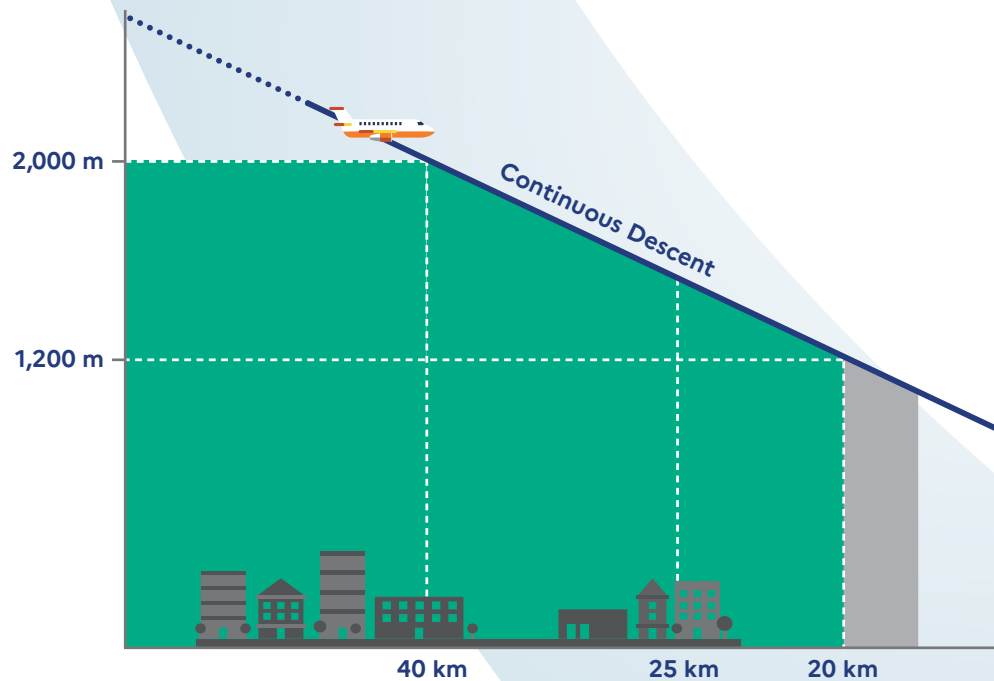


Flight crossings are anticipated upstream in the terminal area at medium altitude to take into account the landing runway assignment, which allows a continuous descent path until touchdown. For operational reasons, inter-runways crossings at low altitude may be cleared.

MORE ENVIRONMENTALLY-FRIENDLY FLIGHTS

For aircrews, the approach is a demanding phase. The pilot must control speed, altitude, engine thrust, landing gear, extend the flaps and/or airbrakes. At the same time, the pilot must adapt to changes in wind, traffic and follow the instructions of the air traffic controller. The goal is to fly as quietly and as economically as possible thanks to an optimised flight profile and an anticipated flight management.

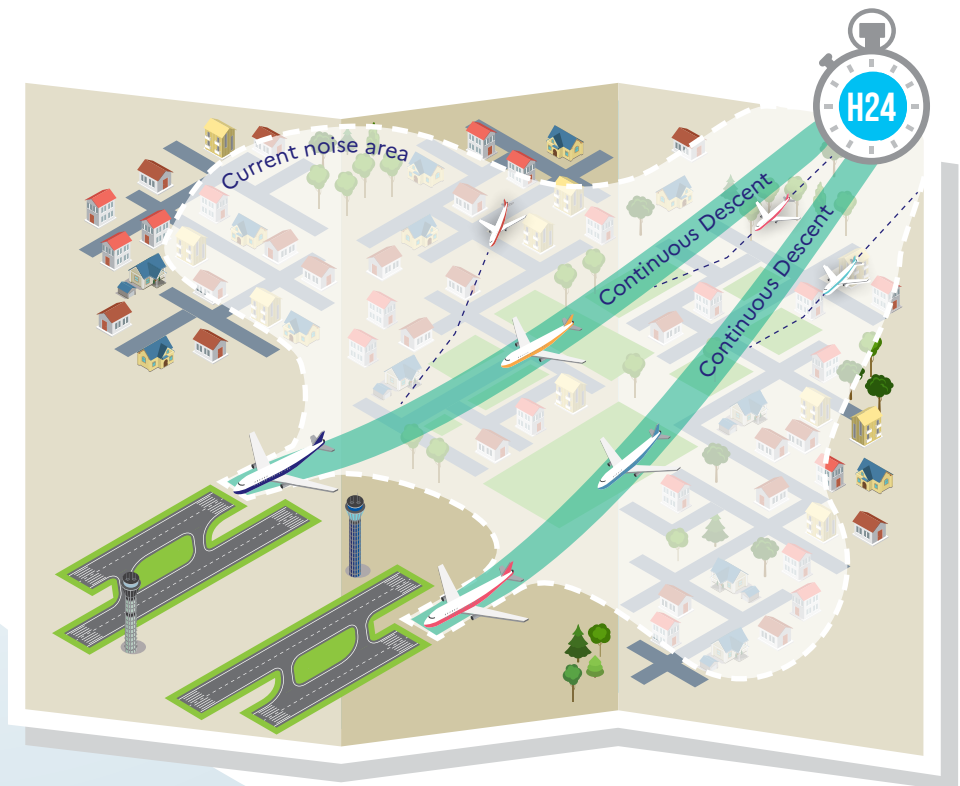
ON THE VERTICAL PLANE, thanks to this reorganisation of traffic flows, flights will be able to start their descent towards Paris-CDG from 3,000 meters above sea level without levelling off, with a much more constant speed while minimising the use of the airbrakes. This will greatly reduce their noise footprint. Flights will intercept the ILS axis by following satellite procedures.

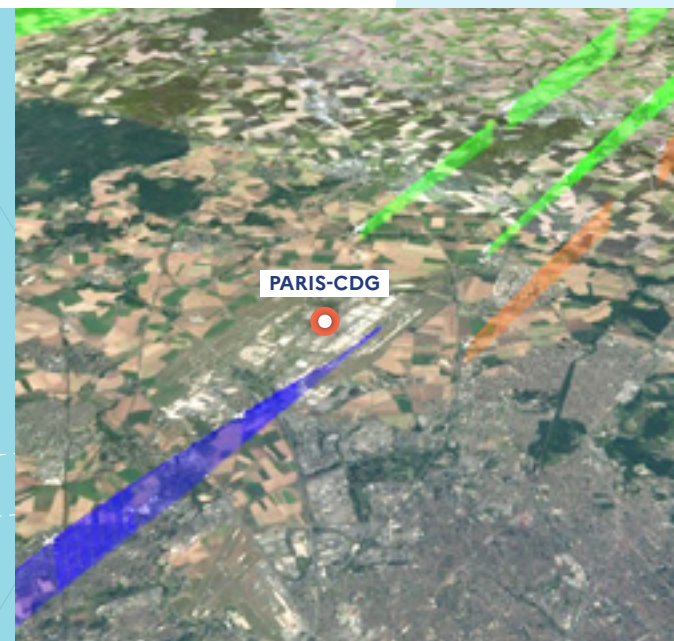
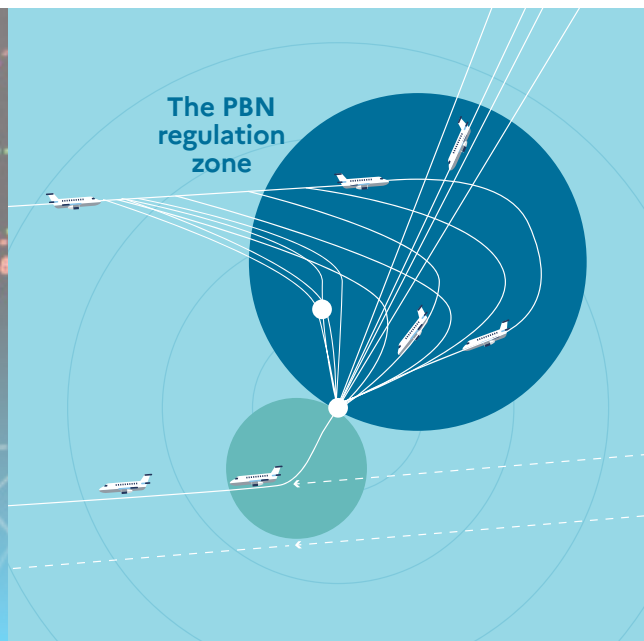


Expected gains regarding noise pollution for local residents when the ILS axis is intercepted at 1,200 meters above sea level (configurations with the North runway pair facing East and the South runway pair facing West).



ON THE HORIZONTAL PLANE, this new pattern will modify the conditions of overflights of urbanised areas located under the arrival trajectories, with aircraft trajectories less spread around.





EVALUATION PHASE

Live Trials involving real traffic aim to validate the technical challenges of the future air traffic pattern, both on board and on the ground. Management of arrival flows will be reorganised once aircraft entry into the Paris terminal area at an altitude of 5,000 meters above sea level, and before entering into the PBN regulation zone. In this area, aircraft must track an accurate trajectory in order to reach the ILS axis via the so-called PBN satellite segments.

Since January 18, 2021 and until in April, specifically trained air traffic controllers have been conducted live trials only for arrivals facing West on the North runway pair, as part of the safety framework validated by the National Supervisory Authority. All airlines landing at Paris-CDG airport are involved.

This exercise will assess the operational and environmental efficiency:

- maintaining a high level of safety (navigation accuracy in satellite-guided procedures, interception of the ILS axis).
- reducing aircraft dispersion and thus less local residents overflown, reducing CO₂ emissions. In situ measurements are carried out to assess the noise impacts.

These results will also be analysed in the context of SESAR 2020.

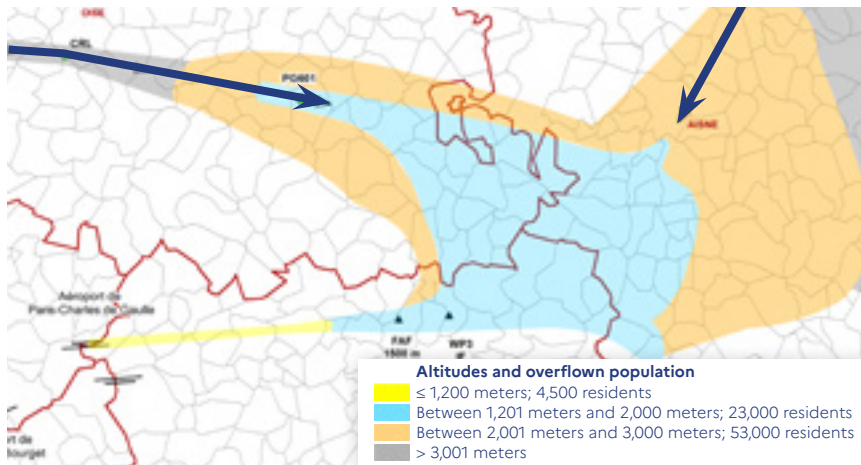
DID YOU KNOW?

Scientists agree that during the last 20 years, the gas emissions per passenger have significantly decreased. The aviation industry has committed to halve its CO₂ emissions by 2050 of what they were in 2005.



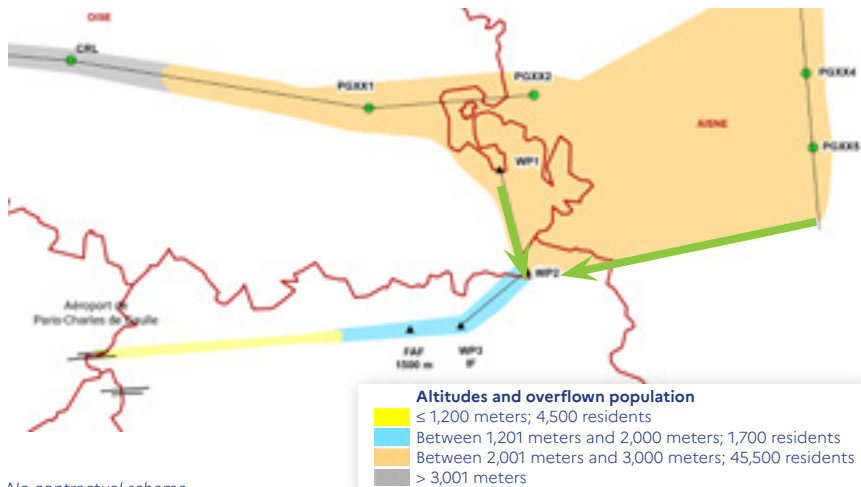
CURRENT SITUATION

Altitudes envelopes for arrivals facing West of the North runway pair



EVALUATION OF A NEW AIR TRAFFIC PATTERN FOR CDO

Estimated altitudes envelopes for arrivals facing West of the North runway pair



No contractual schema

Several variants will be tested during the first quarter 2021. The configuration shown here doesn't anticipate the one that will be put into service.

RETHINKING AIR TRAFFIC CONTROLLERS WORKING METHODS

With this new project, the workload distribution between the different sectors of approach control will be better balanced. Controllers will have to change their mental control scheme from "radar sequencing towards an axis" to "sequencing towards a point".

The approach controller will give a 'direct-to' instruction at the appropriate time in the sequence towards a PBN way-point (he will use an RNP segment instead of giving a radar heading), then the pilot will intercept the ILS axis of the final approach. The number of heading and altitude instructions should be minimised, thus freeing up the frequency and alleviating the workload of the controller who will be able to focus on its main control tasks regarding speeds and separations between aircraft.

On board, all aircraft serving the airport will have to be equipped with appropriate satellite navigation systems by the commissioning of this project. The pilot will need to ensure that its trajectory over the PBN segments is correctly followed, in particular during turns, until the ILS axis is intercepted.

The DSNA has released the regulatory aeronautical information intended for pilots. The DSNA is in regular contact with its customers and partners as part of its collaborative management process (CDM).

INFORMING AND CONSULTING

Since the autumn 2020, extensive information has been provided to the prefectures of the relevant departments and to overflown cities officials, in order to explain how this new system will be evaluated and the expected benefits of the project as a whole.

This information has also been presented to the ACNUSA, an independent authority, and the local Consultative Commission for the Environment (CCE).



ROUND-THE-CLOCK CONTINUOUS DESCENT APPROACHES

The implementation of this environmental project is scheduled at the end of 2023 at Paris-CDG. All operational players are mobilised to be ready to handle a large volume of more environmentally-friendly traffic for the Summer Olympic Games in Paris!



DEPLOYMENT PHASE

FROM A TECHNICAL STANDPOINT, DSNÀ will propose an optimised air traffic project in 2022, with different variants. All arrival procedures at Paris-CDG airport will be able to be operated in round-the-clock continuous descent. It will also be necessary to update the technical and aeronautical documentation, and train the 250 air traffic controllers at Paris-CDG on a simulator.

On the airline's side, the databases of automated flight management systems will have to be updated, and pilots informed. In addition, bringing the new ultimate

system into service will require all aircraft landing at Paris-CDG airport be equipped with an RNP 1 satellite navigation system.

FROM A CONSULTATION STANDPOINT, the future air traffic pattern will be the subject of a public inquiry in early 2023. Prior to any entry into service, the Paris-CDG CCE and the ACNUSA will be consulted for advice.

ACRONYMS

ACNUSA

The Airport Noise Control Authority

CCE

The Consultative Commission for the Environment

CDM

Collaborative Decision Making

CDO

Continuous Descent Operations

DSNA

Direction des Services de la Navigation Aérienne, the French Air Navigation Service Provider

ILS

Instrument Landing System

PBN

Performance Based Navigation

RNP

Required Navigation Performance

SESAR

Single European Sky Air Traffic Management Research

TMA

Terminal Manoeuvring Area



Direction générale de l'Aviation civile
Direction des services de la Navigation aérienne
January 2021
www.ecologie.gouv.fr

