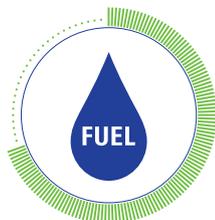




ENABLING GREENER FLIGHTS

Air traffic management (ATM) affects when, how far, how high, how fast and how efficiently aircraft fly. In turn, this influences how much fuel aircraft burn, the level of greenhouse and other gases emitted from their engines, and how much noise they emit.

The environmental performance of aviation has improved dramatically since the 1960s:



70% improvement in fuel efficiency



75% quieter aircraft compared to those manufactured 50 years ago



50% reduction in the levels of carbon monoxide

Source: IATA 2015

However, there is still a lot of work to be done in the air transport sector, especially considering that:



Air traffic currently accounts for about **2% of the global emissions of carbon dioxide**



Aviation is responsible for **12% of carbon emissions from all transport sources**

Source: ATAG

And with **European traffic expected to increase from 9.5 million flights in 2012 to nearly 14.4 million in 2035**, the challenge is meeting this expected growth in demand while minimising its environmental impact.

This is where the **Single European Sky ATM Research (SESAR)** project can and will play a role.

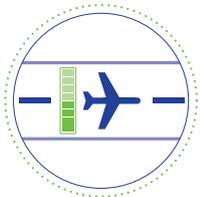
Greater flight efficiency

SESAR contributes to the targets of the Single European Sky (SES)¹ by designing, defining, developing, validating and deploying innovative technological and operational solutions for managing air traffic in a more efficient manner. SESAR's contribution to these high-level goals are continuously reviewed by SESAR and kept up to date in the European ATM Master Plan. In the area of environment, SESAR aims to contribute to the SES 10% CO₂ reduction target by **reducing fuel burn by between 250 and 500 kg per flight** by 2035 – this corresponds to between **0.8 to 1.6 tonnes of CO₂ emissions per flight**.



In the air

SESAR is making it possible for airlines to freely plan and fly the most efficient route between departure and destination. Known as free routing, this solution provides the greatest contribution to emission and fuel efficiency by reducing flown distances and flight times in dense and complex en-route airspace categories. Recent trials in the Maastricht Upper Airspace Control Centre have shown that **free routing could reduce flight distances by 5%**, while **flight times could be shortened by 2 minutes**, leading to a **reduction in fuel burn ranging between 6% and 12%**. Considering the expected increase of flights in the future, these are significant gains.



On the ground

Before an aircraft leaves the airport, it may have already burnt up to one third of its fuel while queuing and taxiing for take-off. SESAR works with airport operators on solutions to optimise taxi and runway usage in order to avoid unnecessary fuel burn. Trials at Paris Charles de Gaulle airport show that this solution can result in around a **10% reduction in taxiing time** and an **average reduction of 20% in waiting time at the runway** threshold during peak hours. This represents **fuel savings of approximately 10% per flight**.



Take-off and landing

SESAR also tackles fuel inefficiencies during the take-off, approach and landing phases of the flight through the development of solutions, such as continuous climb and descent operations, time based separation (TBS) and extended arrival management (E-AMAN). For instance, trials of E-AMAN in London have shown that early sequencing of aircraft can **reduce by up to one minute in holding times**, resulting in **EUR 1.25 million in fuel savings and 5,000 tonnes of CO₂**, as well as reducing noise for communities.

¹ The SES high-level goals are: enable a 3-fold increase in capacity which will also reduce delays both on the ground and in the air, improve safety by a factor of 10, reduce the fuel consumption per flight by 10%, and provide ATM services to the airspace users at a cost of at least 50% less.

Addressing local environmental sustainability

Improved air quality (LAQ)

Aircraft operations at airports impact local air quality through pollutants emitted during landing and taking off, taxiing, fuel storage, engine testing and the use of auxiliary power units. The key gases produced are oxides of nitrogen (NOX – includes nitrogen oxide and nitrogen dioxide), carbon monoxide (CO), sulphur oxides (SOX), unburnt hydrocarbons (HC) and smoke as well as different sizes of particulate matter (PM2.5 and PM10). The concern about these emissions surrounds their potential negative impact on human health. When validating SESAR Solutions, an impact assessment on LAQ emissions is made through a model to make sure that **the solution does not degrade the existing situation and helps the local stakeholders maintaining the quality of the air around airports.**



Noise abatement

While airport noise is essentially a local concern, it can represent an obstacle to the implementation of ATM improvements that offer other important airport performance gains, such as fuel efficiency. Noise abatement is an important part of SESAR's environmental work and, while not subject to quantitative targets, it is taken into consideration when developing solutions. **SESAR Solutions aim to improve the management of noise and its impact through precision landing using satellite navigation, optimised flight paths, including optimised climb and descent operations**, thus allowing ATM to comply with local environmental rules. For instance, recent SESAR validation exercises have shown that SESAR optimised descent operations can enable aircraft to reduce its noise impact when approaching airport runways.



Measuring success: SESAR environment assessment tools

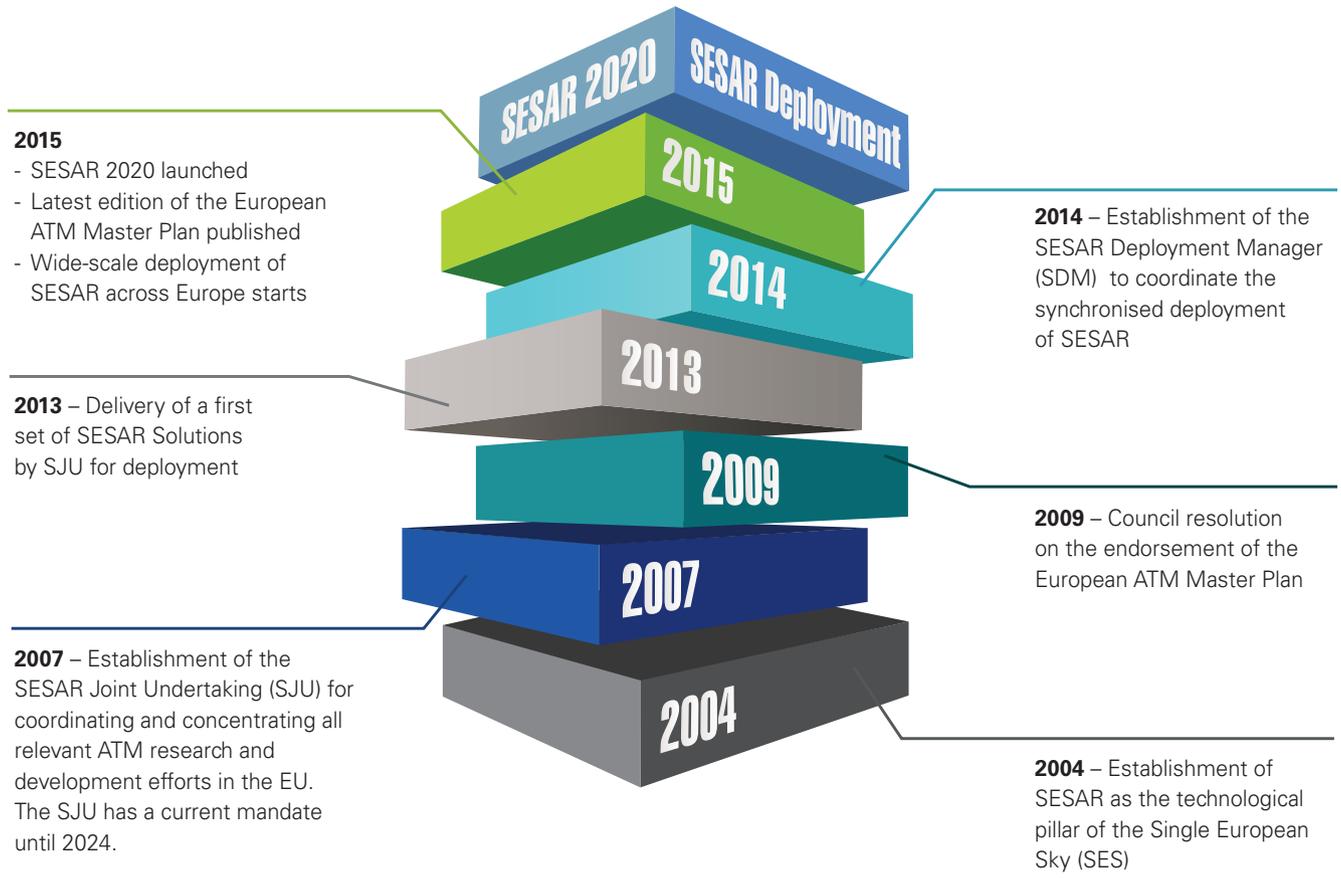
SESAR has developed a set of tools to measure the environmental impact of each of its solutions. The outcome of these assessments is provided as part of the SESAR Solution Packs, the documentation which is released when a solution is ready for industrialisation.



For more information, visit www.sesarju.eu/benefits/environment

About SESAR

These are only a few examples of the positive environmental results that SESAR has achieved to date. Thanks to SESAR, these results are being implemented progressively in the day-to-day operations of ATM stakeholders in Europe. SESAR is clearly on track to making European aviation greener!



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