Net zero 2050: operational and infrastructure improvements

Fact sheet

The aviation industry's net-zero carbon emissions target is focused on delivering maximum reduction in emissions at source, through the use of sustainable aviation fuels (SAF), innovative new propulsion technologies, and other efficiency improvements (such as improvements to air traffic navigation).

This factsheet looks at the potential for operations and infrastructure efficiency improvements to contribute to reducing CO_2 emissions and help meet the 2050 carbon goal. While the overall emissions reductions from operations and infrastructure efficiency improvements are not by themselves sufficient to meet net-zero, these measures can often be implemented at scale faster than aircraft-level technologies (that are constrained by the rate of entry of aircraft into the fleet) and therefore the impacts from operations and infrastructure efficiency improvements can be significant in the near term.

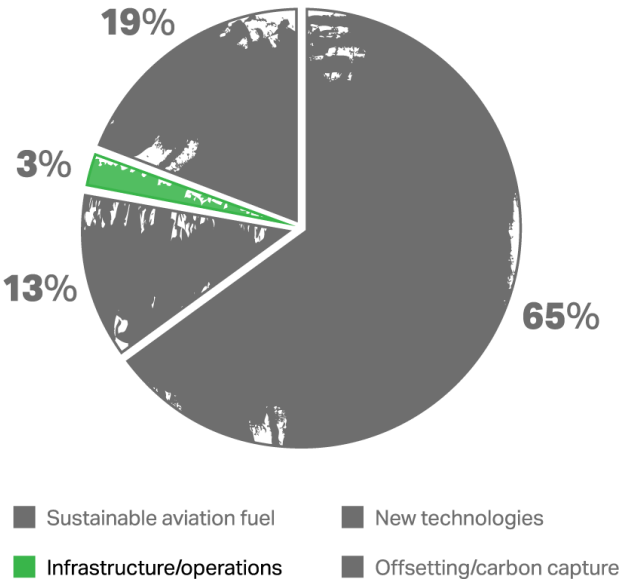
Historic trend

The aviation industry has a history of continuous improvement in efficiency. Until the pandemic, there was a steady improvement in the passenger load factor to a record average of over 82% in 2019. Operational efficiencies have resulted in a 55% improvement in fuel burn per passenger km since 1990. It remains the case, however, that some long-sought infrastructure improvements have not progressed as rapidly as originally envisaged.

Aircraft operations (airline and aircraft operator focus) include measures such as:

- weight reduction,
- improvements in aerodynamics of in-service aircraft, and
- use of systems to improve efficiency during the operation of aircraft.

Contribution to achieving Net Zero Carbon in 2050



Infrastructure improvements (air traffic management and to a lesser extent airport operations) include measures such as:

- structural changes in air traffic management (ATM) operations, and
- energy savings at the airport such as limitations on the use of auxiliary power units, single engine taxi, and reduced taxi times.

(For more in-depth information into potential operations and infrastructure improvements, see IATA's Operations Roadmap.)

Operational improvement examples

- Retrofitting winglets - These aerodynamic modifications enable airlines to save more than 4% in fuel, and reduce aircraft noise and NOx emissions. Over 9,000 aircraft have been retrofitted, saving over 100 million tonnes of CO_2 since 2000.
- Light-weight aircraft cabin equipment (including electronic flight bag), seating and cargo containers.
- Electric or assisted taxiing - Reduced engine taxiing, where pilots taxi on a reduced number of engines and then start the rest nearer the runway, has saved one airline 4,100 tonnes of fuel per year at its hub airport.
- Exterior paint – thinner, more aerodynamically efficient, and better maintained paint schemes can improve aerodynamic efficiency.

Infrastructure improvement examples

Airport improvements:

- fixed electrical ground power at gate,
- airport collaborative decision making, and
- surface congestion management (reducing taxiing delays).

ATM improvements:

- performance-based navigation,
- required navigation performance (RNP),
- space-based navigation,
- continuous descent / climb,
- expansion of 'perfect flight' partnerships,
- 4D Trajectory-based Operations (TBO),
- flexible tracks / free-route airspace, and
- flexible use of military airspace.

3 vital ATM programs

Single European Sky: It is estimated that some 6-10% of wasted emissions in Europe could be recovered through more efficient air traffic management. The Single European Sky initiative aims to reduce the fragmentation of European airspace and to modernize Europe's airspace structure and air traffic management technologies. The delivery of seamless air traffic services is built on optimized airspace organization, supported by progressively higher levels of automation, common ATM data services and an improved role of the Eurocontrol Network Manager to optimize the ATM network. Regrettably, the new SES2+ compromise has showed a lack of political leadership that will not deliver a true reform of Europe's airspace.

NextGen: NextGen is a wide-ranging transformation of the entire US air traffic management system. It will replace ground-based technologies with new and more dynamic satellite-based technology. It is a collaborative effort between the Federal Aviation Administration and partners from the airports, airlines, manufacturers, government agencies, state, local and foreign governments, universities and associations. US airspace faces less political complexity than in Europe. Nevertheless, a more rapid roll-out of NextGen will enable more rapid emissions cuts.

ICAO Aviation System Block Upgrades: The ICAO Global Air Navigation Plan (GANP) sets out a series of Aviation System Block Upgrades or technology modernization projects focused on four performance improvement areas: airport operations; global interoperable systems and data; optimum capacity and flexible flights; and efficient flight paths. The initiatives reflect consensus around the series of technologies, procedures, and operational concepts needed to meet future capacity and ATM challenges. An analysis by ICAO found that if implemented Block 0 and 1 elements would deliver global fuel and CO_2 savings of between 1.6 – 3.0% in 2025. Governments must carry through implementation plans for this vital project.