

Climate Adaptation Synthesis **Factsheets**

Aviation and **Changing Wind**

In the lower troposphere, changes in wind strength and direction are projected.
In the upper troposphere, changes to the jet stream are projected.

Potential Impacts

Changes to prevailing wind direction

- Changes to, or deviation from, the prevailing wind direction at airports could affect runway utilisation and schedules. It may also change the criteria for approach and departure procedures.
- Flights might be cancelled, delayed or redirected when crosswinds are too strong for aircraft to safely take off or land which could reduce airport and aircraft operating efficiency and capacity. It may also reduce arrival and departure punctuality of flights.
- Changes to procedures due to deviation from prevailing wind direction could have environmental impacts, such as changes to noise distribution and increased emissions.

Reduction in wind speed

- A slowing of wind speed in parallel with higher temperatures could have impacts on aircraft take-off performance.

Extreme storms and strong winds

- Extreme storms and strong winds can result in flight delays and cancellations, economic losses, and passenger inconvenience. It can also damage or destroy assets and infrastructure.
- At high intensities, wind can represent a serious threat to the safety of ground operations and ground personnel.



ICAO

ENVIRONMENT

Climate Adaptation Synthesis **Factsheets**

Aviation and **Changing Wind**

Changes to the jet stream

- Changes to the jet stream could impact en-route traffic. For example the most efficient routings and flight times for transatlantic flights (expected to be faster eastbound and slower westbound) might change. This may result in modification of en-route flight levels and Air Navigation Service Providers (ANSPs) and airlines will have to react to changing flow patterns and sector loading. This may impact fuel-critical operations on transatlantic and other long-haul flights. There may be a knock-on effect for airports due to reduced arrival reliability.

Clear Air Turbulence

- There may be an increase in Clear Air Turbulence (CAT) leading to greater diversions and “bumpier” flights.
- It could also lead to increased injuries to passengers and crew and damage to aircraft.
- As the climate changes, maintenance intervals may need to be reviewed and inspection methods revised more frequently to detect any signs of aircraft fatigue, or equivalent, particularly when assessing new, composite materials of modern aircraft.
- Changes in the jet stream can cause a stall in the propagation of weather systems lower in the atmosphere (a ‘blocking pattern’ situation), which may result in weather systems moving more slowly or clearing less quickly compared with a mobile situation, causing longer exposure to weather events.



Climate Adaptation Synthesis **Factsheets**

Aviation and **Changing Wind**

Adaptation and Resilience Measures

Changes to prevailing wind direction

- Measures proposed or already being implemented are more limited for changes in wind conditions than for some other climate change effects. Implications of prevailing winds need to be assessed at the local level and operational measures identified to maintain safety and increase robustness and flexibility. More scientific research is needed as many uncertainties remain as to how winds may change.

Extreme storms and strong winds

- Updating design standards, reinforcing infrastructure and regular maintenance can enable airport buildings to withstand more extreme wind conditions.

Clear Air Turbulence

- The IATA Turbulence Aware platform provides pilots and flight planners with automated turbulence reports so that they can make informed decisions on routing and take safety measures in the cabin in good time.
- There is a need to improve the accuracy of operational CAT forecasts so as to be able to avoid areas of CAT as much as possible.
- Expanding the World Area Forecast System to use probabilistic multi-model forecasts rather than deterministic models to forecast turbulence could improve accuracy and therefore assist pilot and flight-planner decision-making
- Technologies for aircraft that can better assess wind and turbulence changes in real time are being needed.
- Airframe design may need to be adjusted to adapt to changing turbulence beyond the features manufacturers have already built in to accommodate CAT.

