Smoother Rides Through Better Turbulence Forecasting

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DTN has devoted years of research with some of the top scientists in the aviation weather community to fuel the future of turbulence forecasting, vastly improving awareness of adverse weather for pilots, flight operations managers, and flight dispatchers.
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These forecasts are part of a larger suite of Enhanced Flight Hazards (EFH) suite. They are designed to bring precision and accuracy to EDR turbulence forecasting, increase in-flight safety, and reduce costs through smarter routing.

This advanced offering provides higher-resolution, more frequently updated forecasts than other currently-available technology. The information is easily integrated into flight planning systems to support flight plan optimization, used in flight following by dispatchers, and finally, as a display on board in the electronic flight bag (EFB), ensuring a common weather view for all involved stakeholders.

Despite advances in weather prediction and modeling, commercial airlines continue to experience unexpected turbulence, presenting serious hazards to passengers and crews. Turbulence encounters account for more than 70% of all weather-related incidents. While meteorologists can show skill in forecasting certain types of turbulence, other more subtle causes are far more challenging, leading to errors ranging from over-forecasting an event to missing it entirely.

You can divide turbulence or rough air into visible and invisible root causes. Convective clouds — especially thunderstorms — can create turbulence of varying severities. Strong convective clouds (cumulonimbus) are filled with parcels of air moving up and down at great speeds and often contain ice crystals and raindrops. These particles are visible by the aircraft's radar and can be avoided. However, the onboard radar only returns the first reflections; one cannot look behind the first storm cells. EFH will tell you what you can expect further into the flight path so you can be more proactive.

Convective turbulence

This turbulence occurs within and around convective weather, and is often associated with thunderstorms. A cumulonimbus cloud hanging with protuberances (mammatus) is usually indicative of severe turbulence around storm cells. It is challenging to forecast with a high degree of precision.

Clear air turbulence (CAT)

The most treacherous kind of turbulence, CAT is invisible, occurring in clear air — often without warning and at any time during a flight. Caused by air masses moving at different speeds, it typically is encountered around the jet stream where the troposphere and the tropopause meet. Proper science and modeling make it possible to predict CAT, but precision varies by model.

Mountain wave turbulence (MWT)

Air masses flowing over mountains create waves that cause MWT. The waves' strong amplitude may cause them to break, propagating MWT up to FL400. Although severe MWT at that altitude is uncommon, moderate MWT often appears over U.S. and European mountain ranges. Lenticularis clouds are good indicators of MWT.

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$500M

The total direct cost of turbulence for airlines each year.[1]

80%

of all personnel injuries are received by flight attendants.[1]

28%

of the time, flight crews had no warning of turbulence.[1]

$165M

The projected costs of airframe inspections for North American airlines in 2030.[2]

65,000

aircraft experience moderate turbulence in the United States each year.[1]

5,500

aircraft suffer severe turbulence in the United States each year.[1]

$1.3B

the potential annual fuel, maintenance, and depreciation savings from connected aircraft and in-flight weather updates.[3]

[1] https://edition.cnn.com/travel/article/clear-air-turbulence-climate-change/index.html and https://www.ntsb.gov/news/events/Pages/2021-DCA18SS003-BMG.aspx

[2] https://www.statista.com/statistics/922711/projected-turbulence-and-airframe-inspection-costs-north-america/

[3] https://www.lse.ac.uk/business/consulting/assets/documents/sky-high-economics-chapter-two-evaluating-the-economic-benefits.pdf