



Performance  
Through  
Innovation

# Reducing weather-related ATM delay

Airline inquiry: *“Are your W/x prediction tools accurate enough, to justify such high convective weather-related (tactical) delay regulations?”*

Recent example from 4 May 2021: *“Stormy conditions. Associated convection is anticipated organising into narrow bands in the afternoon. The number of CB/TS will decrease in the evening but some convective clouds will linger on overnight. However, isolated CB/TS may develop over the mountainous terrain.”*

In essence: *“Pay attention, everything can, but nothing might happen. Partly cloudy to sunny”* - a forecast with a 100% hit rate. Practical usability of such a forecast for ATC or OCCs: close to non-existent. While the predictions at NM level appear to be sufficiently accurate, an ANSP requires more precise predictions to be sharper on the regulations.

For a few years, convective weather has been the increasing delay driver with major impact on efficiency in air transport. The cost of weather-related delays in Europe is meanwhile above EUR 900 million per year; **one third of these delays are due to thunderstorms.**

Whilst regulations based on weather forecast models are an essential tool to safeguard air traffic services, we must acknowledge that improving these forecasts would lower the financial burden on aircraft operators and enhance the level of air traffic services delivery.

Traditional model-based weather forecasts cannot deliver the precision required by ATC to regulate tactical sector capacity, whereas the detection and nowcasting of thunderstorms based on high-resolution satellite data has proven to be a much better means, but with limitations regarding the forecast lead time.

Similar to the pandemic uncertainty principle, we need to find a compromise between look ahead time and local precision. A combination of both, look ahead at network level and precision at ANSP level is the way ahead and combines the different objectives effectively.

In the last years, MUAC has integrated a system in its operations that does skilful fusion of forecasts, nowcasts and observations called Cb-Fusion. This development achieves

nowcast precision in space and time that enables effective ATC regulation procedures up to six hours in advance.

Flight efficiency can be improved, filling the gap between nowcasting thunderstorm cells and forecasting convective activity. In 2020, together with the scientists from WxFUSION - a spin-off of the German DLR (German Aerospace Centre) - MUAC successfully validated a nowcasting tool that makes the difference for both ATC and OCCs.

The objective is to effectively mitigate more frequent thunderstorms accompanied by increased turbulence, wind shear and microbursts as an effect of climate change. Collaborative ATM initiatives which take these weather impacts into account, can help improve flight efficiency, reduce CO2 emissions, increase ATC capacity, and reduce network flow management delays.

The system was successfully tested and evaluated in operational conditions, with the result that delay attributed to severe weather in 2017 (with Cb-Fusion) at MUAC totalled 407,931 minutes - a decrease of 30% on 2018 without Cb-Fusion.

From experience, it is known that ATFM delay constitutes about 10% of delays at MUAC, and according to the PRU (University of Westminster), 1 min of ATFM delay costs EUR 104.

The benefit of using Cb-Fusion operationally can therefore be estimated to reduce wx-related ATFM delay by 3%, meaning a potential cost saving of more than EUR 1.3 million/year.

The following conclusions can therefore be drawn:

- Cb-Fusion provides strategic situational awareness about Cb developments up to six hours in advance.
- The nowcast precision of Cb-Fusion in space and time enables MUAC to timely and effectively regulate ATM sector capacity.
- The use of Cb-Fusion for sector capacity planning reduces over- and under-regulations.
- If Cb-Fusion information is shared between aviation stakeholders' common information sharing (CIS) and decision making, (CDM) will be enabled, improving flight efficiency.
- Cb-Fusion contributes to flight safety and flight efficiency, i.e. fuel savings, CO2 emission reduction, and delay reduction.

If your airline also wants to take part in the 2022 collaborative convective weather mitigation with MUAC, contact us: [Volker.stuhlsatz@eurocontrol.int](mailto:Volker.stuhlsatz@eurocontrol.int).

